October Specifications Committee Meeting Agenda

Meeting Date

Wednesday, October 12th @ 9:00am
Building 5, Room 122
Only WVDOT & FHWA personnel may attend the Specifications Committee meeting.

Approved Permanent Specification changes from last Committee meeting (8/3/16)

- **None**

Approved Project Specific Provisions (SP) from last Committee meeting (8/3/16)

- **SP494 - Cold In-Place Recycled Asphalt Pavement**
- **SP425 - Asphalt Emulsion Slurry**
- **SP615 - Elastomeric Bearings**
- **SP636 - Maintaining Traffic**

Items removed from Committee Agenda

- **SP425 - Asphalt Emulsion Slurry**
- **ID/IQ Paving Contract Provisions**
- **207.2 - Quality Control Testing**
- **SP671 - Horizontal Directional Drilling**

Old Business - Provisions discussed at last Committee meeting

SECTION	TITLE	DESCRIPTION
Various	**Material/Aggregate related**	**Discussed in March, April, May & August; 5th time to Committee.** Permanent Specification changes to aggregate related items in the Material Subsection. No updates to the Provisions. Specification Section's: 1. 218 - Slope and Foundation Protection 2. 307 - Crushed Aggregate Base Course 3. 604 - Pipe Culverts 4. 609 - Sidewalks Provision updated per comments at the August meeting; a redline copy, showing the latest changes/updates to the specs (from what was presented in August) is included. Approval expected in October.

521	**SP 521 - Full Depth Reclamation**	**4th time to Committee; discussed at April, May, & August meetings. Update to previously approved SP's.** Project Specific provision for Full Depth Reclamation (FDR). No update to the Provision. Approval expected in October.
110	**110.4 - Provisions for WV State Funds Contracts**	**4th time to Committee; discussed at April, May, & August meetings.** This Permanent Specification change has been updated to delete the entire subsection from the spec book as it is outdate & not used. No update to the Provision. Approval expected in October.
639	**639 - Construction Surveying**	**4th time to Committee; discussed at April, May & August meetings.** Permanent Specification change. Complete section re-write. The revision adds "As-Built Utility Survey" to the Section and updates Construction Layout Stakes section. The "As-Built" item is needed for locating new/proposed DOH-owned utilities (i.e. - electrical service lines, conduit, signals, lights, etc) which are being installed on projects. Provision updated per comments at the August meeting; a redline copy, showing the changes/updates to the spec (from what was presented in August) is included. Approval expected in October.
514	**514 - Roller Compacted Concrete**	**Discussed in May & August; 3rd time to Committee.** Permanent Specification change. Update to subsection 514.3.1-RCC mix design requirements & 514.7.2-mixing time. No updates to the provision. Approval expected in August.
687	**687 - Shop Painting Metal Structures**	**Discussed in May & August; 3rd time to Committee.** Permanent Specification change. New addition to the Spec book. Provision updated per comments at the August meeting; a redline copy, showing the changes/updates to the spec (from what was presented in August) is included. Approval expected in October.

615	**SP 615 - Temporary Falsework**	**Discussed in August; 2nd time to Committee.** Project Specific provision for temporary falsework to support (East Burke Street - stone arch bridge) bridge during rehabilitation of structure. Provision updated per comments at the August meeting; a redline copy, showing the changes/updates to the spec (from what was presented in August) is included. Approval expected in October.
498	**SP 498 - Ultra-Thin Asphalt Overlay**	**This is an update to previously approved SP's. It was discussed in August; 2nd time to Committee.** Project Specific provision update for Ultra-Thin Asphalt Overlay. No updates to the provision. Approval expected in August.
501	**501 - Portland Cement Concrete Pavement**	**2nd time to Committee; discussed in August.** Permanent Specification change to sections 501.4-test methods, 501.19-tolerance in pavement thickness, and 501.23-basis of payment. No updates to the provision. Approval expected in August.
601	**SP 601 - FRP Concrete Patching, Structural Repair**	**2nd time to Committee; discussed in August.** Project Specific provision for concrete patching of bridge substructure units (prior to their wrapping of FRP w/ SP below). A 'Non-structural' version of this SP was approved at the February '16 meeting… whereas this version is intended to be used on structural repair FRP projects. This is part of WVDOT research project and will require collaboration with WVU during work. Provision updated per comments at the August meeting; a redline copy, showing the changes/updates to the spec (from what was presented in August) is included. Approval expected in August.
601	**SP 601 - Fiber Reinforced Polymer (FRP), Structural Repair**	**2nd time to Committee; discussed in August** Project Specific provision for Fiber Reinforced Polymer (FRP) wrap system. A 'Non-structural' version of this SP was approved at the March '16 meeting… this version is intended to be used on structural repair FRP projects. This is part of WVDOT research project and will require collaboration with WVU during work.

		Provision updated per comments at the August meeting; a redline copy, showing the changes/updates to the spec (from what was presented in August) is included. Approval expected in October.
603	**603.10.2-Defects and Breakage**	**2nd time to Committee; discussed in August** Permanent Specification change to the Prestressed Concrete Members section. The revision adds procedure/requirements for crack repair via epoxy injection. No updates to the provision. Approval expected in August.
616	**SP 616 - Drilled and Grouted Micropiles**	**2nd time to Committee; discussed in August** Project Specific provision for drilled and grouted Micropiles. Provision updated per comments at the August meeting; a redline copy, showing the changes/updates to the spec (from what was presented in August) is included. Approval expected in October.
630	**SP 630 - Masonry Wall, Stone Facing**	**2nd time to Committee; discussed in August** Project Specific provision for stone facing. No updates to the provision (the formatting has been updated). Approval expected in October.
679	**SP 679 - Overlaying of Portland Cement Concrete Bridge Decks**	**2nd time to Committee; discussed in August** Project Specific provision for concrete deck overlay. The SP specifies Latex Modified Concrete is to be used on the project. No updates to the provision.

New Business - New Provisions for Spec Committee

SECTION	TITLE	DESCRIPTION
105	**SP 105 - Dates of Governing Specifications and Standard Details**	**1st time to Committee.** Project Specific provision to provide overriding dates for the Standard Specifications and Standard Details Book, Volume I and II. The special provision would be added to the project proposal and will alleviate need for the designer updating plan notes when these manuals are updated. Approval expected in October.
109	**SP 109 - FEMA Reimbursement**	**This is an update to previously approved SP's. 1st time to Committee.** Project Specific provision for FEMA reimbursement projects. The

		update to the SP adds documentation to account for waste outside of the Departments Right-of-Way. The provision is a redline copy, showing the changes/updates to the special provision. Approval expected in October.
604	**SP 604 - HDPE Pipe Liner**	**This is an update to previously approved SP's. 1st time to Committee.** Project Specific provision for HDPE Pipe Liner. The update adds ASTM references for this type of work. The provision is a redline copy, showing the changes/updates to the special provision.
627	**SP 627 - Finger Expansion Dam & Drainage System**	**1st time to Committee.** Project Specific provision for a finger expansion dam.
651	**651 - Furnishing and Placing Topsoil**	**1st time to Committee.** Permanent Specification change to the material subsection of the Furnishing and Placing Topsoil Section. The provision is a redline copy, showing the changes/updates to the special provision.
703	**703.4 - Grading of Coarse Aggregates**	**1st time to Committee.** Permanent Specification to update Table 703.4 - Standard Sizes of Coarse Aggregates (AASHTO M 43). Approval expected in October.
715	**715.42.8 - Cabinets**	**1st time to Committee.** Permanent Specification change with a rewrite of the Cabinets subsection
715	**SP 715.42.10- Electrical Conduit**	**1st time to Committee.** Project Specific provision for Type H (High Density Polyethylene HDPE) conduit.

Deadline for Comments is OCTOBER 5, 2016

Comments are requested on these Specification Changes and Project Specific Special Provisions. Please share your comments, they help in the decision making process.

Please Send Comments to: DOHSpecifications@wv.gov

Deadline for new items & updates to these provisions is NOVEMBER 2, 2016

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 minor per comments and discussion in Spec Committee.. *Failure to submit updates may result in removal of item and/or delays.*

Next Meeting

Wednesday, December 7, 2016 at 9AM
Building 5, Room 122: *(If Available. If not available a change in venue will be attached on the door)*

2016 Supplemental

The 2016 Supplemental is currently located online at this location:
http://www.transportation.wv.gov/highways/contractadmin/specifications/Pages/default.aspx

2016 Specifications Committee

The Specification Committee typically meets the first Wednesday of the month.
The remaining 2016 Committee dates are as follows:

December 7th

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

Specifications Committee Website

Committee meeting day, deadlines for submissions/comments, and a copy of the meeting agenda can be found on the Specifications Committee Website
http://www.transportation.wv.gov/highways/contractadmin/specifications/SpecComit/Pages/default.aspx

Material Procedures

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

For questions regarding the Standard Specifications Roads and Bridges, Supplemental Specifications, Project Specific Special Provisions, or the Specifications Committee please e-mail DOHSpecifications@wv.gov

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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 Specification & Project Specific Special Provision as they progress thru Specification Committee. This procedure would facilitate a means of tracking changes from meeting to meeting; as the agendas & 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 permeant 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 – Are changes/edits/updated to SP that have been approved by spec committee.

NEW BUSINESS ITEMS:

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

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

Each items 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 in which indicate removal or addition of text. You can redline a Microsoft Word document by using the built in "Track Changes" feature or you can manually redline 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, than 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 next meeting.
- SP's in committee may be used in advertised project. Hope to work to address comments & finish approving at subsequent meeting.

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 218

SLOPE AND FOUNDATION PROTECTION

218.2-MATERIALS:

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

Materials shall meet the requirements specified in the following Sub-sections of Division 700:

MATERIALS	SUBSECTION
Cement for Grout	701.1 or 701.3
Sand for Grout	702.1.1 through 702.1.5 and 702.6, or 702.2
Stone for Riprap	704.2
Stone for Gabions	704.3
Gabions	715.23
Reinforcement	709.3, 709.4
Shot Rock	704.8
Engineering Fabric for Erosion Control	715.11

The stone for crushed rock slope protection shall meet the requirements of 704.6, Class 7, except 704.6.3. Acceptance for Gradation of Class 7 aggregate shall be by visual inspection; a written explanation of the manufacturing process shall be provided if requested by the Engineer. Class 7 from a non-approved source, shall not exceed a weighted loss of 30 percent when subjected to five cycles of the Sodium Sulfate Soundness Test, ASTM C 88, will be acceptable.

An alternate to this gradation shall be AASHTO size No. 1. Certified test data from the producer showing the AASHTO No. 1 material meets the gradation requirements of 703.4.~~, when tested from samples obtained at a minimum frequency of one sample per day of stockpiling, and does not exceed a weighted loss of 30 percent when subjected to five cycles of the Sodium Sulfate Soundness Test, ASTM C 88, will be acceptable.~~

Stone for foundation protection shall conform to the requirements of riprap stone, except for size and shape.

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

STANDARD SPECIFICATION

FOR

SECTION 307

CRUSHED AGGREGATE BASE COURSE

307.1-DESCRIPTION:

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

This work shall consist of furnishing, spreading, and compacting one or more courses of crushed aggregate on a prepared surface in accordance with these Specifications and in reasonably close conformity with the lines, grades, thicknesses, and typical cross sections shown on the Plans or established by the Engineer.

307.2-MATERIALS:

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

The crushed aggregate base course shall be composed of materials meeting the requirements of 704.6 for the class shown on the Plans except that 704.6.3 shall not apply.

307.2.1-Quality Control Testing: Quality control of the crushed aggregate base course is the responsibility of the Contractor as specified in 106.1.

The Contractor shall maintain necessary equipment and qualified personnel to perform all sampling and testing necessary to determine the magnitude of the various properties of the material governed by the Specifications and shall maintain these properties within the limits of the Specifications.

The Contractor shall submit a quality control plan detailing the methods by which the quality control program will be conducted. This plan, prepared in accordance with the guidelines set forth in the appropriate portions of MP 307.00.50 and MP 717.04.21, shall be submitted to the Engineer at the preconstruction conference. The work shall not begin until the plan is reviewed for conformance with the contract documents.

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307.2.2-Acceptance Testing: Acceptance sampling and testing of crushed aggregate base course is the responsibility of the Division, except for furnishing the necessary materials. Quality control sampling and testing performed by the Contractor may be used by the Division for acceptance.

307.2.3-Sampling and Testing: Frequency of sampling and testing shall be in accordance with the Contractor's quality control plan. The minimum frequencies shall be as indicated in applicable portions of MP 307.00.50. Crushed aggregate shall be sampled in accordance with MP 700.00.06, Aggregate Sampling Procedures.

307.2.4-Acceptance Procedure: Material conforming to the specification requirements will be accepted at full contract price. Material failing to comply with the quality requirements of Table 704.6.2B shall not be incorporated into the work.

Acceptance of crushed aggregate base course for compaction and for gradation shall be in accordance with appropriate portions of 307.2.4.1.

307.2.4.1-Acceptance Plan:

307.2.4.1.1-For Compaction: Acceptance for compaction shall be on a lot by lot basis. A lot shall consist of a single layer of not more than 2,000 linear ft. (600 meters) per width being placed. A lot shall be divided into five approximately equal sized sublots. One nuclear moisture and density measurement in accordance with applicable portions of 717 shall be made at a random location within each of the five sublots. The random locations shall be determined in accordance with MP 712.21.26. If the result of five density tests on a lot indicates that at least 80 percent of the material, in accordance with 106.3.1 (West Virginia AP-A), has been compacted to the specified target percentage of dry density, the lot will be accepted. If less than 80 percent has been compacted to the specified target percentage of dry density, no additional material shall be placed on that layer until it has been reworked to meet the specified requirements. Reworking and retesting shall be at the expense of the Contractor. When the Division performs the testing in the evaluation of reworked lots, the testing will be at the expense of the Contractor at the unit cost specified in 109.2.2.

Compaction of shoulder aggregate on resurfacing projects adjacent to asphalt or concrete pavement shall be based on visual inspection to assure that the surface of the shoulder has been compacted to the level of the finished pavement surface.

Compaction of Class 7 aggregate shall be based on visual inspection to assure that the aggregate particles are arranged in a stable manner.

307.2.4.1.2-For Gradation: Acceptance for gradation shall be on the basis of test results on consecutive random samples from a lot. A lot shall be considered the quantity of material represented by an average test value, not to exceed five sublots. Generally at the beginning of the project, the average shall be started on the second sample in accordance with MP 300.00.51. A sublot is the quantity of material represented by a single gradation test. In the case where only one sample is taken, this sublot shall be considered the lot. The material shall be sampled and tested in accordance with 307.2.3. The gradation test results shall be plotted on a control chart in accordance with MP 300.00.51. When the average, or when the most recent three consecutive individual test

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values fall outside the limits of Table 704.6.2A the lot of material represented will be considered nonconforming to the extent that the last of its sublots is nonconforming. When this occurs, the last sublot shall have its price adjusted in accordance with Table 307.9.1. In the case where the average is nonconforming and the last sublot contained is conforming, then there would be no price adjustment. In no event shall a sublot of material have its price adjusted more than once, the first adjustment shall apply.

Acceptance for Gradation of Class 7 aggregate shall be by visual inspection; a written explanation of the manufacturing process shall be provided if requested by the Engineer. Class 7 from a non-approved source, shall not exceed a weighted loss of 30 percent when subjected to five cycles of the Sodium Sulfate Soundness Test, ASTM C 88, will be acceptable.

307.2.4.2-Degree of Nonconformance: When a sublot of material is to have its price adjusted, the percentage point difference between the nonconforming test value and the specification limit shall be determined for each sieve size determined to be nonconforming, and this value shall be multiplied by its appropriate multiplication factor as set forth in Table 307.2.4.2 to determine the degree of nonconformance on that sieve.

TABLE 307.2.4.2

NONCONFORMING SIEVE SIZE	MULTIPLICATION FACTOR
2 in. (50 mm)	1.0
1 ½ in. (37.5 mm)	1.0
¾ in. (19 mm)	1.0
No. 4 (4.75 mm)	1.0
No. 40 (425 µm)	1.5
No. 100 (150 µm)	2.0
No. 200 (75 µm)	2.5

The total measure of nonconformance of an individual sublot is the sum of all nonconformances on the various sieve sizes of that sublot.

When the total degree of nonconformance has been established and it is 12.0 or less, the material will be paid for at an adjusted contract price as specified in Table 307.9.1.

When the degree of nonconformance is greater than 12.0, the nonconforming sublot shall be resolved on an individual basis, requiring a special investigation by the Engineer to determine the appropriate course of action to be followed. Pending resolution of the matter, additional lifts of base or pavement shall not be placed over the nonconforming material.

307.2.5 –Reclaimed Asphalt Pavement: Reclaimed Asphalt Pavement (RAP) may be substituted for Class 10 Shoulder Stone material on roadways where edge line pavement markings exist or are installed. Materials testing will be waived, however the Top Size gradation shall not exceed 1 ½ inches (37 mm) or the maximum shoulder placement thickness as defined on the Plans (whichever is less). Approval shall be by visual inspection by the Engineer.

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Payment for RAP shoulder material substitution shall be at the same unit bid price for Shoulder Stone Material in the Contract documents.

CONSTRUCTION METHODS

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 604

PIPE CULVERTS

604.2-MATERIALS:

ADD THE FOLLOWING TO THE TABLE:

MATERIAL	SUBSECTION
Crushed Aggregate Backfill	704.6 Class 1 or Class 3

604.2.1-Quality Control Testing:

DELETE THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

604.2.1-Quality Control Testing: Quality control of the granular material and crushed aggregate backfill is the responsibility of the Contractor as specified in 106.1.

The Contractor shall maintain necessary equipment and qualified personnel to perform all sampling and testing necessary to determine the magnitude of the various properties of the material governed by the Specifications and shall maintain these properties within the limits of the Specifications.

The Contractor shall submit a quality control plan detailing the methods by which the quality control program will be conducted. This plan, prepared in accordance with the guidelines set forth in the appropriate portions of MP 307.00.50 and MP 717.04.21, shall be submitted to the Engineer at the preconstruction conference. The work shall not begin until the plan is reviewed for conformance with the contract documents.

604.2.2-Acceptance Testing: Quality control sampling and testing performed by the Contractor ~~shall~~ may be used by the Division for Acceptance.

604.2.3-Sampling and Testing: Frequency of sampling and testing shall be in accordance with the contractor's quality control plan. The minimum sampling and testing frequencies for gradation shall be as indicated in Attachment 1 of MP 307.00.50. The

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material shall be sampled in accordance with MP 700.00.06. The minimum sampling and testing frequency for compaction will be in accordance with MP 717.04.21.

604.2.4-Acceptance Plan:

604.2.4.1-Compaction: Compaction of backfill material shall meet 604.8.

604.2.4.2-Gradation: Acceptance for gradation shall be on the basis of test results on consecutive random samples from a lot. A lot shall be considered the quantity of material represented by an average test value, not to exceed five sublots. Generally at the beginning of the project, the average shall be started on the second sample in accordance with MP 300.00.51. A sublot is the quantity of material represented by a single gradation test. In the case where only one sample is taken, this sublot shall be considered the lot. When the average, or when the most recent three consecutive individual test values fall outside the limits specified in Table 704.6.2A, the lot of material represented will be considered nonconforming to the extent that the last of its sublots is nonconforming. When this occurs, the last sublot shall have its price adjusted in accordance with Table 604.13.1. In the case where the average is nonconforming and the last sublot contained is conforming, then there would be no price adjustment. In no event, however, shall a sublot of material have its price adjusted more than once, and the first adjustment, which is determined, shall apply.

604.2.4.3-Degree of Nonconformance: When a sublot of material is to have its price adjusted, the percentage point difference between the nonconforming test value and the specification limit shall be determined for each sieve size determined to be nonconforming, and this value shall be multiplied by its appropriate multiplication factor as set forth in Table 604.2.4.3

TABLE 604.2.4.3

Nonconforming Sieve Size	Multiplication Factor
1 ½ in. (37.5 mm)	1.0
¾ in. (19 mm)	1.0
No. 4 (4.75 mm)	1.0
No. 40 (425 µm)	1.0
No. 200 (75µm)	~~1.0~~2.0

The total measure of nonconformance of an individual sublot is the sum of all nonconformance of an individual sieve sizes of that sublot.

When the total degree of nonconformance has been established and it is 12.0 or less, the material will be for at an adjusted contract price as specified in Table 604.13.1.

When the degree of nonconformance is greater than 12.0, the nonconforming sublot shall be resolved on an individual basis, requiring a special investigation by the Engineer to determine the appropriate course of action to be followed.

604.13-BASIS OF PAYMENT:

ADD THE FOLLOWING SUBSECTION:

604.13.1-Price Adjustment: Crushed aggregate backfill not conforming with the gradation requirements as described in 604.2.4.2 will be paid for at the adjusted contract price base on the degree of nonconformance as specified in Table 604.13.1.

A revised unit price for calculation purposes in 307.9.1 will be established based on the unit bid cost minus the cost of the pipe.

TABLE 604.13.1

Adjustment of Contract Price for Gradation not Within Specifications	
Degree of Nonconformance	Percent of Contract Price to be Reduced
1.0 to 3.0	2
3.1 to 5.0	4
5.1 to 8.0	7
8.1 to 12.0	11
Greater than 12	*

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

604.14-PAY ITEMS:

DELETE THE FOLLOWING ITEMS FROM THE TABLE:

ITEM	DESCRIPTION	UNIT
604009-*	"size" Corrugated Steel Pipe End Section, YZ	Each
604016-*	"size" Corrugated Metal Pipe Arch End Section	Each
604072-*	"size" Corrugated Steel Pipe Safety Slope End Section	Each

ADD THE FOLLOWING ITEMS TO THE TABLE:

ITEM	DESCRIPTION	UNIT
604090-*	"size" Corrugated Steel Pipe End Section, YZ	Each
604091-*	"size" Corrugated Metal Pipe Arch End Section	Each
604092-*	"size" Corrugated Steel Pipe Safety Slope End Section	Each

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 609

SIDEWALKS

609.2-MATERIALS:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

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

MATERIAL	SUBSECTION
Expansion Joint Filler (Preformed)	708.1, 708.2
Joint Sealing Material	708.3
Sand	702.2
Asphalt Plastic Cement	708.9
Bed Course Material	704.6 – Class 1 or Class 3

Concrete shall meet the requirements of 601, Class B, or 501.

609.2.1-Detectable Warning Surfaces: Detectable warning panels shall have a detectable warning surface meeting ~~ADAAG~~ Proposed Accessibility Guidelines for Pedestrian Facility in Public Right of Way (PROWAG), latest edition, requirements. The panel dimensions shall not deviate more than 1/16 in (3 mm). The panel colors shall be as shown in the plans or as approved by the engineer. The color shall contrast to the adjacent sidewalk, sidewalk flares and pavement. The panels shall ~~have~~ maintain a minimum skid resistance of .60 wet when tested with ASTM C 1028.

There shall be two types of warning~~s~~ surfaces: Panels for fresh concrete surfaces while the concrete is still plastic, and products for cured concrete surfaces. A wet or plastic set-in-place system shall be installed at the time of the placement of the sidewalk, while the concrete is still plastic. Mold-in-place concrete domes, brick pavers, or iron or steel warning systems shall not be used. ~~Additionally, No bricks, iron, or set-in-place concrete domes or paint will be accepted.~~

Products must be approved and on the WVDOH Approved Products List. The material approval for detectable warning panels will be based on results from WVDOH field

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evaluation tests. Detectable warning systems may also be accepted or rejected based on actual performance on WVDOH projects. All materials to be used shall be covered by a ~~3~~ 5 year warranty under normal conditions.

609.2.2-Quality Control Testing: Quality control of bed course material is the responsibility of the Contractor as specified in 106.1.

The Contractor shall maintain necessary equipment and qualified personnel to perform all sampling and testing necessary to determine the magnitude of the various properties of the material governed by the Specifications and shall maintain these properties within the limits of the Specifications.

The Contractor shall submit a quality control plan detailing the methods by which the quality control program will be conducted. This plan, prepared in accordance with the guidelines set forth in the appropriate portions of MP 307.00.50, shall be submitted to the Engineer at the preconstruction conference. The work shall not begin until the plan is reviewed for conformance with the contract documents.

609.2.3-Acceptance Testing: Quality control sampling and testing performed by the Contractor shall be used by the Division for Acceptance.

609.2.4-Sampling and Testing: Frequency of sampling and testing shall be in accordance with the contractor's quality control plan. The minimum sampling and testing frequencies for gradation shall be as indicated in Attachment 1 of MP 307.00.50. The material shall be sampled in accordance with MP 700.00.06.

609.2.5-Acceptance Plan:

609.2.5.1-Gradation: Acceptance for gradation shall be on the basis of test results on consecutive random samples from a lot. A lot shall be considered the quantity of material represented by an average test value, not to exceed five sublots. Generally at the beginning of the project, the average shall be started on the second sample in accordance with MP 300.00.51. A sublot is the quantity of material represented by a single gradation test. In the case where only one sample is taken, this sublot shall be considered the lot. When the average, or when the most recent three consecutive individual test values fall outside the limits specified in Table 704.6.2A, the lot of material represented will be considered nonconforming to the extent that the last of its sublots is nonconforming. When this occurs, the last sublot shall have its price adjusted in accordance with Table 609.2.4.2. In the case where the average is nonconforming and the last sublot contained is conforming, then there would be no price adjustment. In no event, however, shall a sublot of material have its price adjusted more than once, and the first adjustment, which is determined, shall apply.

609.2.5.2-Degree of Nonconformance: When a sublot of material is to have its price adjusted, the percentage point difference between the nonconforming test value and the specification limit shall be determined for each sieve size determined to be nonconforming, and this value shall be multiplied by its appropriate multiplication factor as set forth in Table 609.2.5.2.

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TABLE 609.2.5.2

Nonconforming Sieve Size	Multiplication Factor
1½ in. (37.5 mm)	1.0
¾ in. (19 mm)	1.0
No. 4 (4.75 mm)	1.0
No. 40 (425 µm)	1.0
No. 200 (75µm)	1.0

The total measure of nonconformance of an individual sublot is the sum of all nonconformances on the various sieve sizes of that sublot.

When the total degree of nonconformance has been established and it is 12.0 or less, the material will be paid for at an adjusted contract price as specified in Table 609.10.1.

When the degree of nonconformance is greater than 12.0, the nonconforming sublot shall be resolved on an individual basis, requiring a special investigation by the Engineer to determine the appropriate course of action to be followed. Pending resolution of the matter, additional lifts of base or pavement shall not be placed over the nonconforming material.

609.10-BASIS OF PAYMENT:

ADD THE FOLLOWING SUBSECTION TO THE SECTION:

609.10.1-Price Adjustment: Bed course material not conforming to the gradation requirements as described in 609.2.5.1 will be paid for at the adjusted contract price based on the degree of nonconformance as specified in Table 609.10.1.

TABLE 609.10.1 Adjustment of Contract Price for Gradation not Within Specifications	
Degree of Nonconformance	Percent of Contract Price to be Reduced
1.0 to 3.0	2
3.1 to 5.0	4
5.1 to 8.0	7
8.1 to 12.0	11
Greater than 12	*

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

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

FOR

SECTION 521

FULL DEPTH RECLAMATION

521.1 – DESCRIPTION:

This work consists of pulverizing and mixing a combination of virgin aggregate (if/where specified), Reclaimed Asphalt Pavement, Reclaimed Aggregate Material, and Subgrade Material to the length, width, and depth specified in the contract documents. Once pulverized, add the Chemical Stabilizing additives as per the job mix formula, mix the materials together, grade, and compact in place to create a chemically stabilized base course. This work also consists of shaping, finishing, fine grading, and compaction of the reclaimed base material.

521.2 – MATERIAL:

521.2.1 – Reclaimed Material: 95% of the pulverized surface material is required to pass through a 2 inch (50 mm) sieve and 55% passing the 3/8 inch (9.5mm) sieve. Incorporate all reclaimed material into the stabilized base.

521.2.1.1 – Reclaimed Aggregate Material (RAM): In-situ aggregate material which is incorporated in the stabilization.

521.2.1.2 – Reclaimed Asphalt Pavement (RAP): Processed paving material containing asphalt cement and aggregates.

521.2.2 – Stabilizing Agents: The amount of stabilizing agents to be used shall be determined by the Contractor by mean of a mixture design process and the establishment of an approved Job Mix Formula (JMF) for each specific project.

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521.2.2.1 – Cement: Section 701.1, 3% to 10% by weight as called for in the JMF. A change in cement content may be directed by the Engineer during construction based on changes in field condition.

521.2.2.2 – Emulsified Asphalt: Approved emulsion from an approved source meeting the requirements of Section 703. When specifically designed emulsions are to be used the contractor shall provide the Division with a sample of the material prior to construction accompanied with a data sheet of the manufactures testing. Continued samples will be taken and tested through the project to verify the material.

521.2.2.3 – Foamed Asphalt: Liquid asphalts used as foamed asphalt stabilizer shall be PG graded and on the current West Virginia approved source list.

521.2.2.4 – Other Stabilizing Agents: The use of fly ash, hydrated lime, or other agents will be permitted so long as the agent conforms to the established West Virginia standard specification or are otherwise pre-approved by the Engineer.

521.2.3 – Aggregate: Section 703: Sizes 8, 10, 57, and 67. Add the gradation and quantity to the mix as required by the JMF. Processed and graded RAP from other sources is permitted so long as the JMF mix design has included this RAP.

521.2.4 – Mix Design: Contract duties include obtaining samples of RAP, RAM, and subgrade soils to the specified depth and perform appropriate testing to establish a project mix design and JMF. The mix design shall be submitted to the Division for approval at least two weeks before the planned start of work.

The Division may provide some preliminary testing including non-destructive data such as Ground Penetrating Radar, Falling Weight Deflectometer measurements, and a preliminary subsurface investigation with associated laboratory analysis. However, the agency is not required to do so in this specification and if such information is provided, it is only for informational purposes to help facilitate the required investigation by the contractor and in no way should be viewed as the final values for mix design or otherwise.

521.2.4.1 – Mixture: Samples must be obtained inclusive of the depth to be recycled. Sampled materials must be properly processed and prepared to closely simulate field conditions. A qualified Geotechnical Representative will analyze the samples and provide the following information as part of the mix design to the Division as described in 521.2.4.

- Location and type of all samples obtained.
- Thickness and description of existing pavement and aggregate layers to be reclaimed.
- Moisture Contents of layers — AASHTO T 265
- Gradation of Pavement Layers — AASHTO T 30
- Gradation of Aggregate Base — AASHTO T 27 and T 11
- Moisture-Density Relationship of Reclaimed Materials — AASHTO T 99, Method C

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- Moisture-Density Relationship of Combined Materials with additive AASHTO T 134, Method B

- Full Soils Classification*

*If the depth being reclaimed includes at least 20% underlying subgrade soils, then a full classification shall be performed. This will include AASHTO T 88, *Standard Method of Test for Particle Size Analysis of Soils*, AASHTO T 89, *Standard Test Method for Determining the Liquid Limit of Soils*, and AASHTO T 90, *Standard Method of Test for Determining the Plastic Limit and Plasticity Index of Soils*. Unconfined compressive testing should also be performed and completed in accordance with AASHTO T 208 (ASTM D 2166), *Standard Method of Test for Unconfined Compressive Strength of Cohesive Soil.*

521.2.4.2 – Strength Requirements: Make, cure, and test three unconfined compressive strength specimens of FDR material and stabilizing agent(s) in accordance with ASTM D 1633, Method A. The specimens should be molded at a density of at least 98% of the maximum density established using AASHTO T134, Method B, *Standard Method of Test for Moisture-Density Relations of Soil-Cement Mixtures*. Once fabricated, each specimen shall be wrapped in plastic wrap then sealed in an airtight, moisture-proof bag and cured for a period of 7 days. The final mix design will be based on a targeted percentage of stabilizing agent(s) which provides an average unconfined compressive strength of the three specimens between 200 psi and 400 psi at 7 days.

Mix designs resulting in an average strength up to 500 psi may be used in some cases as needed. However, note that any mix design resulting in strengths at the high end of the range discussed above or any resulting in strengths above that range and up to 500 psi should be carefully evaluated for use. A system of pre-cracking is likely necessary to be used during early strength gain in field applications in order to prevent very high strengths that could result in excessive block-cracking of the prepared reclaimed section.

521.3 – CONSTRUCTION:

521.3.1 – Equipment: Use equipment that will produce the completed chemical stabilized base as follows:

521.3.1.1: Use equipment capable of automatically metering liquids with a variation of not more than ±2% by mass (weight) of liquids. Calibrate before use.

521.3.1.2: Maintain all equipment in a satisfactory operating condition as specified in Section 108.5.

521.3.1.3 – Reclaimer: Use a self-propelled, traveling rotary reclaimer or equivalent machine capable of cutting through existing roadway material to depths of up to 16 inches (406 mm) with one pass. The equipment will be capable of pulverizing "in-place" the existing pavement, base and subgrade at a minimum width of 6 feet (1.83 meters), and mixing any added materials to the specified depth. The cutting drum must have the

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ability to operate at various speeds (rpm), independent of the machines forward speed, in order to control oversized material and gradation.

Use a machine equipped with a computerized integral liquid proportioning system capable of regulating and monitoring the water application rate relative to depth of cut, width of cut, and speed. Have a mounted spray bar to allow the water or other stabilizing agents to be injected directly into the cutting drum/mixing chamber. The practice of Top Watering shall not be permitted. Provide equipment capable of mixing water, dry additives, wet additives, and the pulverized pavement materials into a homogenous mixture. Keep the cutting drum fully maintained and in good condition at all time throughout the project.

521.3.1.4 – Placement Equipment: Motor Grader or other methods approved by the Engineer.

521.3.1.5 – Compaction Equipment: Use sufficient equipment to obtain 98% of the required density based on the mix design.

521.3.2 – Weather Limitations: Do not place paving mixtures from October 1 to March 31 unless allowed in writing by the Engineer. Do not place mixtures when surfaces are wet or frozen or when the air or surface temperature is 40º F (4º C) or below. Do not place mixtures when overnight temperatures are expected to fall below 32 degrees or if those temperatures are anticipated within 7 days of the end of placement.

521.3.3 – General: Full Depth Reclamation (FDR) consists of a series of steps that include pulverization and mixing of the existing roadway surface between 5 – 16 inches (125 and 406 mm) in depth with the aggregate base.

521.3.4 – Pulverization/Shaping: Before the application of any stabilizing additives pulverize the roadway materials to the depth specified by the project mix design. Shape to within 1¼ inch (32mm) of irregularity to the lines, grades and/or cross-slope of the proposed roadway and compacted until no further densification is achieved. Protect all manholes, valve covers, or other buried structures from damage prior to pulverizing. Water will be added to the pulverized material to adjust the moisture content to at least Optimum Moisture Content (OMC), but no more than 3% over OMC. Addition of this water can be done through the machines liquid additive system and/or through top watering. After acceptance by the Engineer the additive spreading and mixing will be done as described below.

521.3.4.1 – Additive Application:

521.3.4.1.1 – Cement: Upon completion of the pulverization pass the stabilizing additives previously outlined will be applied at the rate established by the JMF. The additive will be accurately and uniformly spread on the pulverized pavement by using an adjustable rate auger/vane type dry additive distributor. The contractor will provide a 1 square yard (0.84 square meter) canvas swatch and scale to check the application rate of the spreader. Dry additives will be spread in a manner to minimize dusting. The dry additive will not be applied when the wind conditions, in the opinion of the Engineer, are

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such that blowing additives become objectionable to traffic or adjacent property owners. Manual and/or gravity (tail gate) spreading of the additives is unacceptable.

521.3.4.1.2 – Cement Slurry: If slurries are to be used, the distributor and tanker trucks will be equipped with a recirculating pump and/or agitation system to prevent settling of the materials before application.

521.3.4.1.3 – Asphalt Emulsion: Injection into the pulverized mix shall be conducted by use of a spray bar in the mixing chamber of the pulverizing equipment.

521.3.4.1.4 – Foamed Asphalt: Both foaming and injection of PG graded asphalt shall be done in process of mixing with the pulverizing equipment and in accordance with the JMF.

521.3.5 – Stabilization/Mixing: Once the stabilizing agent is applied thoroughly mix the agent and pulverized pavement together at the design specified treatment depth while simultaneously injecting any additional water needed (if any) through the machines computerized integral liquid proportioning system to create a homogenous mixture. The moisture content before compaction cannot be more than 3% over OMC.

521.3.6 – Compaction: Shape, grade and compact to the lines, grades, and depth shown on the plans and cross sections after the material has been processed. Commence rolling at the low side of the course. Leave 3 to 6 inches (80 to 150 mm) from any unsupported edge(s) unrolled initially to prevent distortion. Compaction should be completed as soon as possible after the application of the stabilizing agents and water. Compaction testing shall be performed by a certified Asphalt Field and Compaction Technician.

Determine the in-place density requirements by the construction of at least one control strip. A control strip shall be constructed to determine the Maximum Density via MP 700.00.24 with the following exceptions:

- Section 8.3 - References to 100 ft. shall become 300 ft
- Section 8.4 - 5 subsections shall become 10 subsections
- Section 8.7 - 12 roller passes will be less, start with two passes
- Section 8.10 - Backscatter shall be used in lieu of Direct Transmission
- Section 8.16 - "sites 3, 4, and 5." shall become "sites 3 through 10."
- Section 8.17 - "5 density readings" shall become "10 density readings"

If any additional Control Strips are necessary due to changing existing materials, the new Control Strip will revert back to 5 tests for an average Maximum Density in Sections 8.4, 8.16, and 8.17 within MP 700.00.24 and as discussed below.

Compact the chemically stabilized base to a target density of at least 98% of the average in-place density of the control strip. Determine the in-place density for each 3000 square yard (2500 square meter) area. If the density of an area is less than the minimum density, but the base course is uniform in texture, stable and otherwise acceptable, try additional compaction. If additional compaction does not achieve the minimum density, complete an

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additional control strip in order to verify that proper density is being obtained. Take a minimum of five tests at random locations to determine the average in-place density of the control strip. The new minimum density is 98% of the average in-place density.

If it is determined that the contractor is achieving the minimum density with minimum compactive effort, the Engineer may require a new control strip to verify or establish a new minimum density.

If the completed chemically stabilized base is unacceptable for any reason do not continue construction until the cause of any deficiencies is determined and corrected.

521.3.7 – Finishing: Complete all portions of the chemical stabilized base during daylight hours, unless otherwise allowed.

521.3.8 – Protection: Protect any finished portion of the chemical stabilized base upon which any construction equipment is required to travel, and accesses to private property to prevent marring, distortion or damage of any kind. Immediately and satisfactorily correct any such damage.

521.3.9 – Surface Tolerance: When directed by the Engineer, test the completed chemical stabilized base for smoothness and accuracy of grade, both transversely and longitudinally using suitable templates and straightedges. Satisfactorily correct any 3000 square yard (2500 square meter) area where the average surface irregularity exceeds ¾ inch (19 mm) under a template or straightedge, based on a minimum of at least three measurements.

521.3.10 – Curing: Protect the surface from drying until surface treatment of pavement surface is placed. This shall be accomplished by application of a bituminous or other approved membrane as soon as possible, but no later than 24 hours after completing finishing operations. The surface shall be kept continuously moist prior to application of the curing memebrane. Bituminous memebrane shall consist of an asphalt emulsion fog seal apllied uniformly across the surface at a rate of 0.10 to 0.20 gal/yd2 (0.4 to 0.8 L/m2). Any excess material should be covered with sand.

521.3.11 – Surface Course: The final surfacing shall be as defined by the project documents.

521.4 – METHOD OF MEASUREMENT:

The quantity of Full Depth Reclamation to be paid for will be the number of square yards (square meters) complete in place and accepted. The width for measurement will be the width of the pavement shown on the surface of the typical section of the Plans and additional widening where called for or as otherwise directed by the Engineer. The length will be measured on the surface along the centerline of the roadway.

All Cement, Asphalt and Aggregate materials required for Full Depth Reclamation will be paid for under their respective items as shown in Section 521.6 – Pay Items. Weigh tickets will be used to establish the pay quantity for final payment.

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521.5 – BASIS OF PAYMENT:

The quantities, determined as provided above, will be paid for at the contract unit price bid for the item listed below, which prices and payments shall be full compensation for furnishing all the materials and performing all the work prescribed in a workmanlike and acceptable manner, including all incidentals necessary to complete the work.

521.6 – PAY ITEMS:

ITEM	DESCRIPTION	UNIT
521010-*	Full Depth Reclamation	Square Yard (Meter)
521011-*	Cement	Ton (Megagram)
521012-*	Aggregate	Ton (Megagram)
521013-*	Asphalt Stabilizing Agent	Gallon (Liter)

*Sequence Number

March 17, 2016

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 110

MISCELLANEOUS PROVISIONS

110.4-PROVISIONS FOR WEST VIRGINIA STATE FUNDS CONTRACTS:

DELETE THE ENTIRE 110.4 SUBSECTION:

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

SECTION 639

CONSTRUCTION LAYOUT STAKES

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

CONSTRUCTION SURVEYING

639.1-DESCRIPTION:

This work consists of construction surveying, calculations, and staking, in accordance with these specifications.

639.2-MATERIALS:

Provide the necessary materials to complete the specified surveying services.

CONSTRUCTION METHODS

639.3-CONSTRUCTION LAYOUT STAKES:

The Division shall provide, to the Contractor, reference points along the line of improvement for proper layout of work. The reference points will serve as the horizontal and vertical control for the project.

The Contractor shall provide field forces and shall set all additional stakes needed, such as offset stakes, reference point stakes, slope stakes, pavement and curb line and grade stakes, stakes for bridges, sewers, roadway drainage, pipe underdrains, paved gutter, fence, culverts or other structures, supplementary bench marks, and any other horizontal or vertical controls necessary to secure a correct layout of the work. The Contractor shall also do all layout work and shall set stakes necessary for carrying out utility changes when such utility changes are an obligation of the Contractor under the Contract. The location of the slope stakes for grading work shall be determined by a calculation method. Stakes for line and grade of pavement and curb shall be set at station intervals of 25 feet (10 meters) maximum distance on curves and at 50 feet (20 meters) maximum distance on tangents. Elevation control points with guard stakes shall be set, at a convenient distance outside the construction limits, opposite every 50-ft (20 meters) station and all stations where original cross-sections have been taken. The centerline station, the distance from centerline, and the elevation of the hub shall be recorded on each guard stake. For right-of-way

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staking, iron pins (WVDOT CAP on #5 Bar, 36" in length) with guard stakes shall be set on both sides of roadway at all locations where right-of-way changes width; the station number and the distance from the centerline shall be marked on each guard stake.

The Contractor shall be responsible for having the layout staking work conform to the lines, grades, elevations, and dimensions called for on the Plans. The Contractor shall furnish a copy of their survey records for checking by the Engineer and for the Division's permanent file. These records shall be furnished as they are completed during the progress of the work. Any inspection or checking of the Contractor's layout by the Engineer and the acceptance of all or any part of it shall not relieve the Contractor of their responsibility to secure the proper dimensions, grades, and elevations of the several parts of the work.

The Contractor shall exercise care in the preservation of stakes and bench marks and shall have then reset at their expense when any are damaged, lost, displaced or removed. The Contractor shall use competent personnel and suitable equipment for the layout work required and shall provide that it be done under the supervision of, or directed by, a Registered Professional Engineer or Registered Land Surveyor. The Contractor shall not engage the services of any person or persons in the employ of the Division for the performance of any of the work covered by this item.

639.4-AS-BUILT UTILITY SURVEY:

The Contractor shall locate and submit to the Division an "As-Built" survey of all of the specified items being performed as part of the project under Sections 631, 657, 658, 659, 660, 661, 662, and 664. Meeting the following minimum survey requirements:

a. Coordinate system – UTM Zone 17N with a reference to datum of NAD83(2011). Elevation reference is NAVD88. All units shall be US Survey Feet.
b. Horizontal and tolerance – No single observed point shall be greater than one foot from the true location of the point.
c. Features to be collected – See Table 639.3.2.

Survey data shall be submitted in a comma separated value (.csv) formatted file. The file structure shall be as defined below:

POINT NAME, NORTHING, EASTING, SURFACE ELEVATION, CODE, ATTRIBUTE, DEPTH

The elements of the file structure shall are defined below:

1. POINT NAME: This shall be an alpha or alpha numeric value unique to a single point.
2. NORTHING: This shall be the reported northing value in US Survey Feet to the nearest tenth of a foot.
3. EASTING: This shall be the reported easting value in US Survey Feet to the nearest tenth of a foot.
4. SURFACE ELEVATION: This shall be the orthometric height referenced to NAVD88 in US Survey Feet reported to the nearest tenth of a foot.
5. CODE: This shall be the predefined feature code provided in Table 639.3.2.
6. ATTRIBUTE: This value shall be a descriptive note specific to this feature used to further define the point as described in Table 639.3.2
7. DEPTH: This value shall only be applicable to underground conduit and shall be a field measured distance from the top of the conduit to the top of the trench in US Survey Feet to the nearest tenth of a foot.

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TABLE 639.3.2.
FEATURE CODES AND ATTRIBUTES

Feature Code	Attribute	Description
DOH_CNDT	Conduit diameter and material type i.e. "6-Inch Plastic"	This value shall be for any underground conduit, as surveyed in the trench. Point shall be the location(s) of the terminal. Intermediate points shall be at significant transitions (i.e. – elbow, tee, bends, etc.) and/or within 75' of adjacent conduit point.
DOH_CNSTA	Mounting type (Pole or ground) and electrical service (underground or /overhead) i.e. "Ground -Overhead"	This value is for a DOH Lighting Control Station or DOH Signal Control Cabinet. Four (4) corner points of the concrete pad or fence whichever is the greatest in width.
DOH_JBOX	Box size i.e. "18x18"	This value is a single point in the center top of a DOH electrical Junction Box
DOH_SGNP	Signal Pole Type (C1, C1L, A1, A1L, E) i.e. "E~~?~~"	This value is a single point at a DOH Signal Pole
DOH_LITP	Light Type (I thru VII) i.e. "III"	This value is a single point at a DOH Light Pole
DOH_LITSGN	Sign Type (advanced flasher, school zone, overhead cantilever structure, overhead truss structure, etc) i.e. "Overhead Truss Structure"	This value is a single point at a DOH Lighted Sign.
DOH_MISC	Description of item i.e. "RWIS"	This value is for all other DOH Utility items. Such as CCTV, RWIS, Free Pass, Message Sign, Weigh in Motion, Signal Loop

The survey records generated shall be the property of the Division and shall be available to the Engineer for inspection or reproduction at all times. All survey records shall be transmitted before final project acceptance.

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639.4-METHOD OF MEASUREMENT:

"Construction Layout Stakes" will be measured as a complete unit.

“As-Built Utility Survey” will be measure as a complete unit.

639.5-BASIS OF PAYMENT:

The quantity, determined as provided 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, setting, maintaining, and resetting, when necessary, the stakes, and for furnishing all engineering personnel, equipment, materials, and all incidentals.

639.6-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
639001-*	Construction Layout Stake	Lump Sum
639003	As-Built Utility Survey	Lump Sum

* Sequence number

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 514
ROLLER COMPACTED CONCRETE

514.3 – PROPORTIONING:

514.3.1 – RCC Mix Design Requirements:

ADD THE FOLLOWING TO THE END OF THE SUB-SECTION:

The mix design shall be accompanied by a document listing the source of materials and certified test data from a Division approved laboratory demonstrating the adequacy of the mix design. The Contractor shall notify the Engineer of any change in the source of materials or the addition of admixtures during the progress of work, since such change may necessitate a new mix design.

514.7 – MIXING RCC:

514.7.2 – Mixing Time:

ADD THE FOLLOWING SUB-SECTION:

514.7.2.1 – Mixing Time for Truck Mixers: When truck mixers are used to mix RCC, the mixer capacity shall be limited to 5 cubic yards (3.8 cubic meters) per batch and mixing time shall be a minimum of 3 minutes. If the condition of the blades in the drum of any truck mixer, used for mixing RCC, is such that the adequacy of mixing after 3 minutes is questionable, or if there is any other reason to question the adequacy of the mixing, uniformity testing, in accordance with AASHTO M157, for mass per cubic foot (meter) and coarse aggregate content, shall be performed on that truck prior to using it during production. If that truck mixer cannot produce a uniform RCC mix after 3 minutes of mixing, then the required mixing time shall be increased to the mixing time which is shown to produce a uniform mix.

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 687

SHOP PAINTING METAL STRUCTURES

687.1-DESCRIPTION:

The shop painting (coating) of metal structures shall follow the provided requirements set forth in this specification unless otherwise noted in the Contract. This specification shall apply to surface preparation, coating application, contractor/fabricator responsibilities, environmental and worker protection, and waste handling/disposal.

687.2-GENERAL:

687.2.1-Surface Preparation: Shall meet the requirements of this section.

687.2.1.2-Blasting: The compressed air used for nozzle blasting shall be free of water or oil. The cleanliness of each compressed air system shall be verified at least once per shift using the blotter test in accordance with ASTM D4285, "Standard Test Method for Indicating Oil or Water in Compressed Air".

687.2.1.2.1-Commercial: Shall meet the requirements of SSPC-SP 6 prior to painting. The appearance of the steel surface after blast cleaning shall correspond to the applicable and current SP 6 pictorial standards of SSPC Vis 1.

687.2.1.2.2-Brush-Off Blast: Shall meet the requirements of SSPC-SP 7 prior to painting. The appearance of the steel surface after brush off blast cleaning shall correspond to the applicable and current SP 7 pictorial standards of SSPC Vis 1.

687.2.1.2.3-Near White: Shall meet the requirements of SSPC-SP 10 prior to painting. The appearance of the steel surface after blast cleaning shall correspond to the applicable and current SP 10 pictorial standards of SSPC Vis 1.

687.2.1.2.4-White Metal Blast: Shall meet the requirements of SSPC-SP 5 prior to painting. The appearance of the steel surface after blast cleaning shall correspond to the applicable and current SP 5 pictorial standards of SSPC Vis 1.

687.2.1.2.5-Blast Media: The abrasives used for all blasting shall meet the guidelines set forth in SSPC AB1 for mineral and slag abrasives, and AB3 for ferrous

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metallic abrasives. Any additive mixed with the abrasive shall be approved by the Division prior to use. The abrasives used shall produce a height of profile between 1.0 and 3.0 mils (25 µm and 75 µm). In addition, the container or bag of abrasive shall include the name of the abrasive, the name of the manufacturer, and the size of the abrasive. If any additive has been included with the abrasive, the name and the percentage of the additive shall be on the container or bag.

687.2.2-Post-Surface Preparation: Surface prep operations shall be performed in such a manner that no damage is done to partially or entirely completed portions of the work. After surface prep, any areas that are repaired by welding shall be prepped again.

Areas repaired by grinding or other means shall have the anchor pattern restored by abrasive blasting. Visible deposits of oil, grease, or other contaminants shall be removed according to SSPC-SP1"Solvent Cleaning" prior to painting. Dust, loose residues, and the removal of abrasives from pockets and corners shall be removed from prepared surfaces by brushing, blowing off with clean, dry air, vacuum cleaning. The prepped surface shall be checked for cleanliness by wiping a clean, dark cloth across the surface. If residue is present, the surface shall be cleaned again and rechecked. All blast cleaned surfaces shall be painted prior to any rust bloom or flash rust occurring or within 24 hours, whichever comes first. After blast cleaning, surface imperfections that remain (e.g., sharp fins, sharp edges, weld spatter, burning slag, scabs, slivers, etc.) shall be removed. Any damage to the surface profile resulting from the removal of surface imperfections shall be re-blasted.

687.3-PAINT APPLICATION REQUIREMENTS:

687.3.1-Weather Conditions: Painting shall not be done when the ambient temperature is below 40° F (5° C) or above 100° F (38° C), or the relative humidity above 90 percent. The temperature of the steel must be at least 5° F (3° C) above the dew point. Painting shall not be performed when the surface to be coated is sufficiently hot to cause blistering of the film or too rapid solvent release.

687.3.2-Paint Storage: Paint and thinners shall be stored in a temperature-controlled environment between 40° F (5° C) and 100° F (38° C). At no time will paint be used beyond the manufacturer's shelf life.

687.3.3-Paint Application: The blast cleaned surface shall be painted within 24 hours. In the event rust bloom or flash rusting occurs, the effected members shall be re-cleaned by blasting. The paint shall be applied by spray methods, except those areas inaccessible to spray application may be brushed. Brushes, when used, shall have sufficient body and length of bristle to spread a uniform coat. Small touch-up areas may be brushed, if approved by the Engineer.

Use of an agitated pot shall be mandatory in spray application of Zinc primer. The agitator or stirring rod shall reach within 1 inch (25 mm), of the bottom of the pot and shall be in motion at all times during paint application. Coatings shall be mixed in strict accordance with the coating manufacturer's written instructions. Under certain conditions, it may be necessary to thin or adjust the solvent balance of the paint. The type and amount of solvent to be used shall be that listed on the coating manufacturer's product data sheet for that material. Upon thinning, the dry film thickness requirement shall still be met. Application requirements and drying times between coats shall be in accordance with the manufacturer's written instructions. Dry film thickness requirements shall be specified in the

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contract documents. Exposed steel surfaces of expansion dams shall be painted as specified for structural steel. Spray guns must be equipped with the recommended size tip for the paint product being applied and shall be held perpendicular (90 degrees) to, and at, the proper distance from the receiving surface. Complete protection shall be provided by the fabricator against paint spatter, spillage, overspray, wind-blown paint, or similar releases. For the fully shop painted bridge, the entire top of the top flanges for the full length of the girders will only get primer at two mils (50 µm) dry.

For weathering steel bridges, the ends of the girders, to the length specified in the plans, are painted with the whole system, and the top of the top flange at the end of girders is primed only at two mils (50 µm) dry. The remaining lengths of the girders are left unpainted.

687.3.4-Painting Sequence: Shall be in accordance with the following:

687.3.4.1 -Materials: The primer shall meet the requirements of 711.6 or 711.20. The fabricator responsible for the largest percentage of the painting will choose a Zinc Rich, Low VOC system. Primer coat shall have a maximum VOC of 3.5 lbs/gal (420 g/l). Intermediate and top coats shall have a maximum VOC of 2.8 lbs/gal (335g/l).

687.3.4.2-Paint systems:

3 COAT: Primer, Intermediate, Top Coat
2 COAT: Primer, Top Coat
1 COAT: Epoxy Mastic only

INORGANIC PRIME COAT:

___All edges, corners, crevices, bolt heads and nuts, all rivet heads, edges of flanges and plates, welds, sharp edges, in general all edges, shall receive a dusting coat, by spray application, of the same primer as the Full Prime Coat. The dusting shall extend a minimum of one inch (2cm) from the edge. The full prime coat shall be applied immediately following the dusting coat. No dry film thickness is specified for this coat. Inorganic Zinc Primers are NOT to be tinted.

ORGANIC PRIME COAT:

___All edges, corners, crevices, bolt heads and nuts, all rivet heads, edges of flanges and plates, welds, sharp edges, in general all edges, shall receive one stripe coat, by brush application, of the same primer as the Full Prime Coat. Striping shall extend a minimum of one inch (2cm) from the edge. The prime coat shall at a minimum, be set-to-touch before the stripe coat is applied. No dry film thickness is specified for this coat. This coat shall be tinted as allowed by the manufacturer to be in contrast to the full prime coat and intermediate coat. The tinting agent shall be the paint manufacturer's approved tinting agent.

FULL PRIME COAT:

___The structure shall receive one coat of a primer meeting the requirements of Section 711 of the Standard Specifications. The primer used for the full prime coat shall be of the same type and shall be from the same manufacturer as the primer used for dusting and striping.

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INTERMEDIATE COAT:

The structure shall receive one uniform coat of a paint meeting the requirements of Section 711 of the Standard Specifications. The color shall be in contrast to the prime and top coats. If tinting is required, the tinting agent shall be the paint manufacturer's approved tinting agent.

CAULKING:

Caulking shall be applied before the application of the topcoat. This includes all seams between diaphragm connections to stiffeners and splices; and seams between any connection that is riveted or bolted. Any welded connections that are not fully sealed by the weld shall be caulked with a paste type caulk. The caulk shall be pressed into the seams between the adjoining surfaces, by wetted finger or specialty tool, to insure bond and provide a smooth uniform surface. Caulking in a 3-coat system shall be applied after the intermediate coat has cured. Caulking on a 2-coat system shall be applied after prime coat has cured. The top coat shall not be applied until the caulking has fully cured in accordance with the manufacturer's recommendations. The caulking material shall be compatible with the paint system being applied and shall be by written recommendation of the paint manufacturer. The caulking material shall be tested for compatibility with the paint system at the same time that the paint is tested for intercoat compatibility. Caulking operations shall be performed only when weather conditions are within the parameters as specified in section 687.3.1.

TOP COAT:

The structure shall receive one uniform coat of paint as designated in the plans meeting the requirements of Section 711 of the Standard Specifications. The color shall be as designated in the plans and shall be in accordance with current Federal Standard 595.

NO TOP COAT SYSTEM:

Prime coated structures that will not be top coated in the field shall meet all the requirements of section 687.3, except the dry film thickness shall be a minimum of 4 mils (100 µm). In addition, the Contractor shall provide the inspection access and surface protection required in section 688.2.4.1. The repair procedures of section 688.3.6 shall apply. In order to keep uniformity in the color of the structure, all paint applications will require the use of the same product formulation.

Erection weight and match marks shall be stenciled or painted on structural steel after the last shop coat is applied. Surfaces of steel within 2 inches (50 mm) of edges to be field welded shall not be painted in the shop.

687.3.4-Inspection of Applied Paint: If in the opinion of the Engineer the coating has flaws other than deficiencies in the prescribed dry film thickness, the material shall be repaired or shall be removed and replaced. Defects in the film, including but not limited to runs, sags, mud-cracking, lifting, overspray, dry spray, pinholes, and holidays shall be corrected until a continuous uniform film has been applied. Excessive film thickness shall be reduced and insufficient film thickness shall be increased. If the thickness of the finish coat is reduced, a thin coat of the finish shall be reapplied to seal the surface and to blend the area into the surrounding coating. Depending on the defect, total removal and replacement of the effected coating may be required. No unsightly runs or sags shall be visible. All "mud-

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cracking" and/or "dry overspray" in the paint film shall be removed. Excessive bubbles or pinholes shall not be visible in the coat after examination under a minimum of 8X magnification. Calibration of the thickness gage and dry film thickness measurements shall be in accordance with MP 708.40.00.

687.3.4.1-Access for Inspection: The Fabricator shall furnish suitable safe access and shall provide a time mutually agreed to for inspecting the structural steel prior to and after coating. The Division's inspector shall approve all repairs. When providing suitable safe access, rubber rollers or other protective devices shall be used. Metal rollers or clamps and other types of fastenings that will mar or damage freshly coated surfaces shall not be used. No temporary attachments, supports for access, or forms, shall damage the coating system (In particular, on the fascias where bracing is used, sufficient size support pads must be provided). Any damage that occurs from such devices shall be repaired.

687.3.5-Handling Coated Steel: Extreme care shall be exercised when handling the steel in the shop, during shipping, erection, and subsequent construction of the bridge. Painted steel shall not be moved or handled until sufficient cure time has elapsed to insure no damage is done to the fresh coating. The steel shall be insulated from the binding chains by softeners. Hooks and slings used to hoist steel shall be padded. To prevent damage to the coating, diaphragms and similar pieces shall be spaced in such a way that no rubbing will occur during shipment. Upon arrival at the project site, if weather conditions were such that deicing materials from the roadway were thrown onto the steel during shipment, the contractor shall be responsible for washing the entire surface of the steel with low-pressure water to remove chloride contamination. This also includes unpainted portions of weathering steel. Water shall be from an approved source of drinking water. The water is to be applied at minimum pressure of 3000 PSI (21 Mpa) to a maximum of 4500 PSI (31 Mpa) at the nozzle end, with the nozzle held at a distance of 4" (100 mm) to 8" (200 mm) from the surface. After the low-pressure wash, a minimum of one area on each piece is to be tested for chloride contamination. The testing shall be by the CHLOR*TEST (chloride test kit) method. The maximum chloride contamination shall be 5 micrograms/cm². If the degree of contamination is above the maximum level, the steel is to be re-washed, using a mixture of low-pressure water and a solution of a commercial brand of soluble salt remover, followed by additional testing for chloride contamination. The Soluble Salt Remover shall be CHLOR*RID or equal. The steel to be washed shall not be erected until it has been washed, tested and accepted. The testing also includes unpainted portions of weathering steel.

687.3.6-Shop Repair: The requirements specified herein for provisions for inspection, mixing, thinning, temperature and humidity, and application shall govern the coating of the repaired areas. All shop repairs to the coating shall be made in strict accordance with the coating manufacturer's recommendations except where the requirements listed in this specification are more stringent. The Engineer is to review and accept a repair plan before damaged areas are repainted. The repair primer shall be from the same manufacturer as the original primer. Surfaces that will be inaccessible for coating after erection shall be repaired and/or recoated prior to erection. In order to avoid abrupt changes in paint thickness, the area adjacent to repair areas shall transition from zero paint thickness to full system thickness within not less than 3 inches (75 mm) of the repair area by means of sanding the transition

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area. The requirements for the dry film thickness of the repair coats are the same as those specified for the paint system.

Blast cleaning and application of shop primer shall not be required for mechanically galvanized or zinc rich painted bolts, nuts and washers. All welds and surfaces from which the shop coat of paint has been damaged or is otherwise defective shall be blast cleaned and painted in accordance with sections 687.2.

687.4-SUBMITTALS:

Submittals shall be forwarded through the Prime Contractor and be accepted by the Engineer prior to commencement of the subject work. This is the responsibility of both the Fabricator and the Field Contractor. Electronic submittals will be accepted.

687.4.1-Quality Control Plan for Painting: Minimum requirements and document form are set forth in MP 688.02.20.

~~**687.4.2-Containment/Disposal Control Plan for Existing Steel Structures:** Minimum requirements shall be set forth in MP 688.03.20.~~

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

FOR

SECTION 615

STEEL STRUCTURES

~~**SECTION 212**~~

~~**STRUCTURE, ROCK, AND WET EXCAVATION**~~

615.1 –GENERAL:

~~**212.1 DESCRIPTION:**~~

615.1.1 – Description:

ADD THE FOLLOWING PARAGRAPH TO THE SUBSECTION~~SUBSECTION TO THE SECTION~~:

~~**212.1.1 – Temporary Falsework:**~~ This work shall consist of the design, installation, and removal of temporary falsework to support a bridge, culvert, wall, arch, or other structure as described in the plans. Temporary falsework shall include foundations, structural members, connections, and other supports as needed to adequately support the anticipated loads during construction, including, but not limited to, dead loads and construction loads.

615.2 –WORKING DRAWINGS:

ADD THE FOLLOWING SUBSECTION TO THE SECTION:

615.2.4 – Temporary Falsework: The contractor shall submit drawings illustrating full their proposed method of temporary support. The drawings shall show details of all falsework bents, bracings, guys, dead-men, and attachments to the bridge; sequence of installation; installation procedures; capacities and weights. The drawings shall be complete in detail for all anticipated phases and conditions during erection. Design calculations, sealed

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by a West Virginia Registered Professional Engineer, shall be submitted but the Contractor to the Engineer seven days prior to commencing work, unless otherwise noted in the plans. Receipt of plans, drawings and calculations does not constitute review or approval or relieve the contractor of their responsibility to satisfactorily design the temporary falsework. The design calculations shall demonstrate that member capacities for falsework and supported members are not being exceeded.

615.6 –ERECTION:

ADD THE FOLLOWING SUBSECTION TO THE SECTION:

615.6.9 – Temporary Falsework: The Contractor's attention is directed to sections 615.6.1 and 615.6.8. If the Contractor chooses not to place temporary falsework or the temporary falsework does not successfully support the loads and/or the supported structure is damaged, the Contractor is responsible for all remedies to return the supported structure to the original condition, as directed by the Engineer.

615.8~~212.12~~-BASIS OF PAYMENT:

ADD THE FOLLOWING SUBSECTION TO THE SECTION:

615.8.1 – ~~212.12.1~~ Temporary Falsework: The quantities, determined as provided above, will be paid for at the contract unit prices bid for the items listed below, which prices and payments shall be full compensation for furnishing all the material and doing the work herein prescribed in a workmanlike and acceptable manner including all design, labor, tools, equipment, supplies, excavations, foundations, submittals, and incidentals necessary to complete the work.

The Contractor will be paid 50% of the bid price for this item once all the falsework is in place. The remaining 50% will be paid once it is all removed.

~~212.13~~615.9-PAY ITEM:

ADD THE FOLLOWING ITEM:

ITEM	DESCRIPTION	UNIT
615~~212~~010-003	Temporary Falsework	Lump Sum

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

SECTION 498

ULTRA-THIN ASPHALT OVERLAY

DELETE THE ENTIRE CONTENTS AND REPLACE THE FOLLOWING.

498.1 – DESCRIPTION:

This Section covers the materials, equipment, construction, and application procedures for placing Ultra-Thin Asphalt Overlays on existing paved surfaces. Ultra-Thin, as described in this Special Provision shall be defined as a single lift ranging from 5/8" (70 psy) to 3/4" (85 psy).

498.2 – MATERIALS:

The mixture components of the asphalt mixture shall conform to the following requirements:

498.2.1 – Tack Coat: The Tack Coat shall conform to the requirements of Section 408.2.

498.2.2 - Performance Graded Binders: The PG Binders shall conform to Section 705.5. The binder grade shall be selected in accordance with Section 401.2 and Design Directive 644.

498.2.3 - Fine Aggregate: The fine aggregate used shall meet the requirements of ASTM D1073, except that the gradation requirements shall be waived. In addition, aggregates used for surface courses on projects with an ADT greater than 3000 shall be from an approved source identified as having polish-resistant aggregates and considered potential skid-resistant aggregate sources.

498.2.3.1 – Sand Equivalency - (ASTM D2419): The Sand Equivalency value of the fine aggregate shall be 60 minimum.

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498.2.3.2 – Soundness - (ASTM C88): When subjected to five cycles of the Sodium Sulfate test, the weighted percentage of loss shall not exceed twelve (12%).

498.2.3.3 – Fine Aggregate Angularity - (AASHTO T304): When using Method A, the Fine Aggregate blend shall have a Minimum uncompacted void content of 43%.

498.2.4 - Coarse Aggregate: If coarse aggregate is used, it shall meet the requirements of Sections 703.1 through 703.3, with the exception that the total shale, coal and other lightweight deleterious material and friable particles shall not exceed 3%.

498.3 – ASPHALT MIXTURE:

498.3.1 - Job Mix Formula: A Job Mix Formula (JMF) shall be developed in accordance with MP 401.02.22 procedurally, but the asphalt mixture shall conform to the requirements detailed in the following Tables. The asphalt mixture shall be identified as Wearing- III – Heavy on the T-400 Form. The asphalt mixture shall be produced at a WVDOH approved plant.

Table 498.3.1.1 – Ultra-Thin Asphalt Overlay Mixture Marshall Design Requirements

TEST PROPERTY	DESIGN CRITERIA (Marshall)
Compactive Effort (# of blows – each end of specimen)	75 Blows
Percent Air Voids	4.0 %
Percent VMA	17.0 % - Minimum
Percent VFA	73 – 80
Stability (Newtons)	10,000 - Minimum
Flow (0.25 mm)	7 – 16
Fines to Asphalt Ratio	0.5 – 1.0

Table 498.3.1.2 – Ultra-Thin Asphalt Overlay Mixture Design Gradation Requirements

SIEVE SIZE	TOTAL PERCENT PASSING BY WEIGHT
1 / 2 Inch	100
3 / 8 Inch	96 – 100
No. 4	70 – 95
No. 8	40 – 65
No. 16	20 – 45
No. 30	15 – 30
No. 50	8 – 20
No. 200	3.0 – 8.0

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498.4 – CONSTRUCTION:

498.4.1 – Tack Coat: The Tack Coat shall be applied uniformly, completely covering the entire prepared surface. An application rate of 0.03 – 0.05 gallon/square yard undiluted or 0.06 – 0.10 gallon/square yard diluted, regardless of existing surface. All requirements of Sections 408.3 through 408.10 shall be followed.

498.4.2 – Asphalt Overlay Placement: The asphalt overlay shall be produced, placed and compacted in accordance with Sections 401.9 and 401.10. It shall be placed at the application rate stated in the plans, which shall be within the rates noted in Section 498.1. Application rate shall be checked at a maximum interval of 2500 feet.

Due to the rapid cooling rate of the asphalt mixture at this application rate range, the weather restrictions as stated in Section 401.8 shall be strictly enforced. The paving operation shall be paced as to not outrun the rollers. The following number of rollers shall be required:

AVERAGE LAYDOWN RATE (Tons / Hour)	COMPACTION ROLLERS REQUIRED	FINISH ROLLERS REQUIRED
Less than 75	1	1
75 - 150	2	1

498.5 – TESTING:

The standard test methods as outlined in Section 401.5.1 shall be followed.

498.5.1 – Contractor's Quality Control: Contractor shall follow the requirements of Section 401.6 for Quality Control Testing except that samples for determination of mix properties shall be obtained at intervals of 250 tons production.. The tolerances shown in Table 498.5.1.1 below shall be used for production, and be applied for basis of payment as per Section 498.7.

Table 498.5.1.1
Ultra-Thin Asphalt Overlay Production Tolerances for Quality Control and Acceptance

PARAMETER	Range from JMF
Air Voids*	± 1.5
Binder Content	± 0.40
% Passing ½" Sieve	0
% Passing 3/8" Sieve	± 2.0
% Passing # 8 Sieve	± 5.0
% Passing # 30 Sieve	± 4.0
% Passing # 200 Sieve	± 1.5

**The limits for air voids shall apply to Quality Control testing only*

498.5.2 – Acceptance Testing: Acceptance testing is the responsibility of the Division.

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498.5.3 – Compaction Testing: Since the nuclear gauge does not accurately read densities at this specified lift thickness and the asphalt will cool rapidly, the compaction shall consist of making six (6) roller passes. A roller pass is one complete coverage over the material. The compaction needs to be completed before the mat temperature reaches 175° F.

498.5.4 – Quality Control and Verification Testing: The Contractor shall designate a person to monitor and document the number of passes and the mat temperature through the duration of the Project. This person shall be certified as either WVDOH Compaction or WVDOH Asphalt Field Technician.

498.6 – METHOD OF MEASUREMENT:

498.6.1 – Tack Coat: The tack coat shall be measured in accordance to Section 408.12.

498.6.2 – Asphalt Overlay: Depending on the items specified in Section 498.8, the asphalt overlay shall be either measured by the square yard as placed or shall be measured in accordance to Section 401.12.

498.7 – BASIS OF PAYMENT:

498.7.1 – Tack Coat: The tack coat shall be paid in accordance to Section 408.13.

498.7.2 – Ultrathin Asphalt Overlay: The completed work shall be paid for based on the measurements obtained as per Section 498.6.2 and paid at the contract unit price per the items shown in Section 498.8. Based on the results of testing performed as per 498.5, the following price adjustment schedule will be used when appropriate and applied accordingly to representative material:

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

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

(iii) One and a half percent reduction in the bid price per square yard for application rate dropping below the plan rate by more than 2 lb/sq yd. Reduction shall apply to each increment of 1lb/sq yd thereafter. If the application rate drops below the plan rate by more than 5 lb/sq yd, the material will not be accepted and measures will need to be taken by the contractor to correct for such deficiency

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

498.8 – PAY ITEMS:

ITEM	DESCRIPTION	UNIT
498000-001	Ultrathin Asphalt Overlay	SY
498001-001	Ultrathin Asphalt Overlay	TN

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 501
PORTLAND CEMENT CONCRETE PAVEMENT

DELETE THE TABLE AND REPLACE WITH THE FOLLOWING:

501.4-TESTING:

501.4.1-Test Methods:

Slump of Hydraulic Cement Concrete	AASHTO T 119
Air Content of Freshly Mixed Concrete by the Pressure Method	AASHTO T 152
Air Content of Freshly Mixed Concrete by the Volumetric Method	AASHTO T 196
Unit Weight and Yield of Concrete	AASHTO T121
Making and Curing Concrete Test Specimens in the Field	AASHTO T 23 with MP 601.04.20
Flexural Strength of Concrete	AASHTO T 97
Obtaining and Testing Drilled Cores and Sawed Beams of Concrete	AASHTO T 24
Measuring Length of Drilled Concrete Cores	AASHTO T 148
Non-Destructive Thickness Determination of Pavements Using Magnetic Imaging Tomography Technology	MP 700.10.01
Total Evaporable Moisture Content of Aggregate by Drying	AASHTO T 255
Sampling Fresh Concrete	AASHTO R 60
Sieve Analysis of Fine and Coarse Aggregates	AASHTO T 27
Materials Finer Than No. 200 Sieve in Mineral Aggregates by Washing	AASHTO T 11
Determination of Free Moisture in Fine Aggregate Using a “Speedy Moisture Tester”	MP 702.00.20
Aggregate Sampling Procedures	MP 700.00.06
Standard Method for Determination of Ā of the Total Solids in Portland Cement Concrete	MP 601.03.51

DELETE THE SECOND PARAGRAPH FROM THE SUB-SECTION AND REPLACE WITH THE FOLLOWING:

501.4.2-Contractor’s Quality Control:

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Work shall not begin until the Contractor's Quality Control Plan, in accordance with MP 601.03.50, is reviewed for conformance with the contract documents.

INSERT THE FOLLOWING PARAGRAPH AFTER THE FIRST PARAGRAPH IN THE SUB-SECTION:

501.4.3-Acceptance Testing:
Quality control sampling and testing performed by the Contractor may be used by the Division for acceptance.

DELETE THE SUB-SECTION AND REPLACE WITH THE FOLLOWING:

501.4.5-Compressive Strength Tests for Acceptance: The compressive strength of concrete will be determined by testing concrete cylinders. Concrete cylinders shall be fabricated at the frequency specified in MP 601.03.50. A compressive strength test shall consist of three test specimens. Either 6" x 12" (150 mm x 300 mm) or 4" x 8" (100 mm x 200 mm) cylinders are permitted, provided the requirements of MP 711.03.23 are met. The size of cylinders which the Contractor intends to use on each project shall be listed in the Contractor's Quality Control Plan. The test shall be the average of three test specimens, except that if one specimen shows manifest evidence of improper sampling, molding, or testing, it shall be discarded and the remaining two strengths averaged. Should more than one specimen representing a given test show definite defects due to improper sampling, molding, or testing, the entire test shall be discarded.

The maximum acceptable range of compressive strengths within a set of three cylinders is 9.5%. This range is found by multiplying 9.5% times the average compressive strength of the three cylinders. If this acceptable range is exceeded, the cylinder that varies the most from the average shall be discarded, and the remaining two cylinders shall be evaluated as outlined in the following paragraph.

The maximum acceptable range of compressive strengths within a set of two cylinders is 8.0%. This range is found by multiplying 8.0% times the average compressive strength of the two cylinders. If this acceptable range is exceeded, the entire test shall be discarded. Under no circumstances shall a compressive strength test consist of less than the average of two specimens.

Compressive strength tests shall conform to the requirements of Table 501.3.1. Statistical analysis may indicate a percentage of production to be below nominal minimum design strength. Concrete represented by compressive strengths below the nominal design strength of Table 501.3.1 may be removed and replaced by the Contractor. If the Contractor elects to leave the material in place, it will be evaluated as to adequacy for the use intended. All concrete evaluated as unsatisfactory for the use intended shall be removed and replaced or otherwise corrected by and at the expense of the Contractor as required in 105.3. When an evaluation indicates that the work may satisfactorily remain in place, a statistical analysis will be made of the material. If this statistical analysis indicates at least 93 percent of the material may be expected to have compressive strengths equal to or greater than that shown in Table 501.3.1, and 99.87 percent of the material may be expected to have compressive strengths at least one standard deviation above forty percent of the design strength ($0.4f'_c+\sigma$), the work will be accepted as substantially complying with the specification requirements. If this statistical

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analysis indicates that less than 93 percent of the material may be expected to have compressive strengths equal to or greater than that shown in Table 501.3.1 or less than 99.87 percent of the material may be expected to have compressive strengths at least one standard deviation above forty percent of the design strength ($0.4f'_c+\sigma$), the Engineer will provide for an appropriate adjustment under the provisions of 601.15.

Whenever possible, the Division's statistical analysis will be based on a minimum of 10 cylinder test results. These results may be from the concrete item being placed, the same class of concrete on the project, or the same class of concrete from the producer. All of the cylinder test results used in this evaluation, however, must be from the same mix design.

DELETE THE SUB-SECTION AND REPLACE WITH THE FOLLOWING:

501.19.1-Sampling Units and Sampling Requirements: The pavement thickness characteristics will be determined from an analysis of measurements made by non-destructive methods in accordance with MP 700.10.01. These measurements will be made by the Division with a frequency of one measurement from each sampling unit as defined. If the accuracy of a result from the non-destructive method is questioned by the Engineer, then a core shall be taken from the location at which the non-destructive measurement was taken. The subject core thickness shall then be used to verify the measurement from the non-destructive method, and if a difference of more than ¼ inch (6 mm) between the two measurements exists, the core measurement shall be used for acceptance purposes, instead of the non-destructive method measurement.

DELETE THE SUB-SECTIONS AND REPLACE WITH THE FOLLOWING:

501.19.2-Deficient Thickness (Detection and Delineation): One thickness measurement will be taken, by the method outlined in MP 700.10.01, from each sampling unit. That thickness measurement shall represent the thickness of the pavement in that unit.

When a sampling unit is represented by a measurement which is less than the specified pavement thickness (T) minus 7.8%T (T - 7.8%T = 0.922T), the sampling unit will be evaluated as set forth in 501.19.2.1.

501.19.2.1-When a thickness measurement, which represents a sampling unit, has a value of 0.922T or less, the area of deficient thickness in that sampling unit will be delineated by taking exploratory cores at approximately 20 ft. (6 m) intervals, parallel to the centerline, in each direction from the measurement taken in 501.19.2, until a core is obtained, in both directions, which is greater than 0.922T in thickness (length). Areas thus defined shall be removed and replaced at no additional cost to the Division. These exploratory cores will not be used in the analysis of the remainder of the unit. The balance of the sampling unit will be treated as a separate sampling unit.

One additional core will be obtained from another random location in that sampling unit and shall represent the thickness of the remainder of that sampling unit. The thickness of the sampling unit represented by this core, when greater than 0.922T, will be included in the measurements specified in 501.23.1.1.

DELETE THE SUB-SECTION AND REPLACE WITH THE FOLLOWING:

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501.23.1.1-The measurements which represent the thickness of the sampling units shall be analyzed to determine the average value of the pavement thickness. This value will be used to determine the degree of compliance with the provisions set forth in 501.19 and to develop certain factors to be used in the derivation of equitable deductions as set forth in 501.23.1.2 and 501.23.1.3, in the event the provisions of this Specification are not met.

No payment will be made for pavement areas that are 0.922T or less in thickness, the area being defined in the manner set forth in 501.19.2. Any area of pavement which is deficient in thickness by more than 0.7 inches (18 mm) and is considered by the Engineer to be inadequate to perform satisfactorily 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 501.23.1.2 or 501.23.1.3.

DELETE THE SUB-SECTION AND REPLACE WITH THE FOLLOWING:

501.23.1.3-When the average value of the pavement thickness is less than the specified thickness, the fraction of pavement having a thickness greater than 0.922T will be paid for at a unit price as set forth in the following schedule, and no payment will be made for the remainder of the pavement being considered.

SCHEDULE OF UNIT PRICES	
Average Value of Pavement Thickness	**Unit Price as Percent of Contract Unit Price**
0.01 to 0.10 inches (0.25 to 2.66 mm) Less Than Specified Thickness	98.0
0.11 to 0.20 inches (2.67 to 5.20 mm) Less Than Specified Thickness	96.0
0.21 to 0.30 inches (5.21 to 7.74 mm) Less Than Specified Thickness	94.0
0.31 to 0.40 inches (7.75 to 10.28 mm) Less Than Specified Thickness	92.2
0.41 to 0.50 inches (10.29 to 12.82 mm) Less Than Specified Thickness	90.3
0.51 to 0.60 inches (12.83 to 15.36 mm) Less Than Specified Thickness	88.4
0.61 to 0.70 inches (15.37 to 17.78 mm) Less Than Specified Thickness	86.5
More than 0.70 inches (17.78 mm) Less Than Specified Thickness	0.0

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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:

Concrete Patching Repair in Preparation for Structural FRP Wrap Application: This work will consist of removing deteriorated concrete, cleaning and sealing the reinforcing steel with a corrosion inhibitor, applying a concrete repair material, and cleaning of area to be wrapped with water.

601.2-MATERIALS:

ADD THE FOLLOWING SECTIONS

601.2.1-Rapid Set Cementitious Patching Material:

601.2.1.1: Rapid Set Cementitious Patching Material shall be selected from the WVDOH Materials Division list of approved repair materials for Portland cement concrete meeting requirements of section 715.4.1 of the standard specifications capable of patching deep holes, shallow feathering, and being trowelled vertically or overhead. The material shall not shrink on cure, be self-priming, and be capable of providing a strong bond to concrete and steel reinforcing bars. It shall be a nontoxic product and clean up with water. It shall conform to ASTM C928-13 type R2, including having a minimum 1 day compressive strength of 3000 psi.

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601.2.1.2: All concrete components and primer materials shall be shipped in strong containers sealed in a manner acceptable to the Engineer. Each container shall be plainly marked with the following:

1. Product name
2. Component part
3. Batch number
4. Date of manufacture
5. Date of expiration of acceptance
6. Name and address of manufacturer
7. Material safety data sheet
8. Temp and time of storage

601.2.1.3: Clean, dry aggregates may be allowed in order to increase yield on deep placements per the Manufacturer's recommendations.

601.2.1.4: A retarder may be allowed in high temperature environments to improve workability per the Manufacturer's recommendations.

601.3-PROPORTIONING:

ADD THE FOLLOWING SUBSECTION:

601.3.3-Preparation of Concrete Repair Bonding Surface: The contractor shall remove all loose, soft, honeycombed, and disintegrated concrete. The extent of deterioration has been shown in the plans, and removal of material beyond this extent is at the discretion of the Engineer. Sound concrete must NOT be removed 3" beyond damage. The surface of the existing concrete (to remain) is free of all loose or foreign matter, dirt, grime, oil, grease, or any other materials that would diminish the bonding surface via washing with 1000 to 2000 psi pressure washing.

The existing exposed reinforcing steel bars shall be cleaned by sandblasting to a SSPC-SP6 finish. After sandblasting, a rust inhibitor compatible with the concrete patching material shall be applied to all exposed steel bars.

The Contractor shall protect from damage all materials which are to remain in place. Materials damaged due to the Contractor's operations, as determined by the Engineer, shall be repaired or replaced at no additional cost to the Department and to the satisfaction of the Engineer.

601.10-PLACING CONCRETE:

ADD THE FOLLOWING SUBSECTION:

601.10.5-Rapid Set Cementitious Patching Installation: The Contractor shall notify the Engineer a minimum of seven days prior to installation of the Rapid Set Cementitious Material. Notification will include the contract number, concrete product name, manufacturer's instructions and approximate date of installation. At no time should installation occur if

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temperatures during installation are below 40°F or are expected to fall below 32°F during the next 24 hours.

Fill all voids over 0.5 inches wide and 0.125 inches deep. Grind away all irregularities and protrusions to provide less than 1/8 inch surface profile deviation over a 12" length. The finished surface of the repair should be troweled to a smooth finish. The repaired area shall be allowed to cure for a minimum 24 hours before FRP wrap installation or per manufacturer's material specifications.

Area to be wrapped with FRP (as shown on the plans) shall be cleaned with water at pressures of 1000 to 2000 psi starting at the top and working down no more than 72 hours prior to wrapping.

601.10.5.1-Rapid Set Cementitious Patching Acceptance Criteria: Representatives from the West Virginia University – Constructed Facilities Center (WVU-CFC) shall be present during material installation. The Engineer shall be responsible for contact Dr. Hota GangaRao from WVU-CFC at (304) 293-9986. The material shall be installed in accordance with the manufacturer's instructions. In the event of a conflict, the Engineer's final decision will be binding.

The Engineer shall accept the Contractor's work if, in his judgment, the following criteria are met:

1. The Contractor stores, handles, mixes, and installs the materials according to the Manufacturer's recommendations and as specified herein.
2. No degradation of material properties under field conditions is detected. The Contractor shall replace any material showing degradation.
3. Loose, soft, honeycombed, and disintegrated concrete is removed with no damage to adjacent sound concrete to limits set by the discretion of the Engineer.
4. The surface of the existing concrete to remain is free of loose or foreign matter, dirt, grime, oil, grease, or any other materials that would diminish the bonding surface.
5. Existing exposed reinforcing steel bars are free of dirt, grime, oil, grease, corrosion, or any other foreign matter that would prevent a good bonding surface or allow future corrosion of the reinforcing steel bars.
6. The finished surface is troweled smooth, with no deviations over 1/8 inch over 12 inches and no concave areas remain.
7. The entire area to be repaired with FRP is cleaned with water at pressures of 1000 to 2000 psi.

All work done as a result of the acceptance criteria shall be done at no additional cost to the Department.

601.14-METHOD OF MEASUREMENT:

ADD THE FOLLOWING SUBSECTION:

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601.14.1-Rapid Set Cementitious Patching: Rapid Set Cementitious Patching Materials will be measured in place per square foot (SF).

601.15-BASIS OF PAYMENT:

ADD THE FOLLOWING SUBSECTION:

601.15.1.1-Rapid Set Cementitious Patching: The removal of existing concrete, to the limits shown in the plans or as directed by the Engineer, cleaning and sealing of exposed reinforcing bars, placement of specified materials to make the necessary repairs, and cleaning area to be wrapped with water shall be included in the payment for the items below. The quantities, determined above, will be paid for at the contract unit price bid for the items below, which price and payment shall be full compensation for furnishing all materials and doing all the work herein prescribed, including all the Manufacturer's cost, labor, tools, equipment, supplies and incidentals necessary to complete the work.

601.16-PAY ITEM:

ADD THE FOLLOWING TO THE TABLE:

ITEM	DESCRIPTION	UNIT
601030-000	Patching Concrete Structures	SF

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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 and corrosion protection of concrete with a Fiber Reinforced Polymer (FRP) wrap system in accordance with these specifications and in reasonably close conformity with the lines, grades, dimensions and locations as shown on the plans or as established by the Engineer.

601.2–MATERIALS:

ADD THE FOLLOWING TO THE END OF THE SECTION:

Fiber Reinforced Polymer (FRP): All materials of the FRP system (fabric, 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 WVDOH.

The FRP repair system must meet the following minimum properties for the laminate:

Property	
Fabric Type	Carbon
Fabric Configuration bi-directional, equal weight in both directions	0°/90°
Minimum Tensile Strength (ASTM D3039)	100,000 psi
Modulus of Elasticity (ASTM D3039)	9,400 ksi
Minimum Thickness inches/ply for the laminate	0.04
Minimum dry fabric weight per square yard	18 oz. Carbon
Resin type	Epoxy

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The Engineer shall notify Dr. Hota GangaRao of West Virginia University-Constructed Facilities Center (WVU-CFC) at (304) 293-9986 at least seven days prior to the start of wrapping.

601.4–TESTINGS:

ADD THE FOLLOWING TO THE END OF THE SECTION:

601.4.6–FRP Approvals: Material specifications, installation-construction procedures, and quality control plan must be submitted to the Engineer and approved by WVDOH prior to securing materials and beginning of installation.

601.4.7–FRP Quality Control: Quality 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) Certification that the contractor has been trained to apply the specific FRP wrap material
2) Storage requirements
3) Procedures to inspect wrap during installation to ensure that it meets the manufacturer's instructions and those in these provisions

This plan shall also include field inspection of the FRP wrap by WVU-CFC personnel with InfraRed Thermography (IRT) and/or Digital Tap Hammer (DTH) to detect voids between the FRP wrap and the underlying concrete.

Test sections shall be made during FRP repair to permit tensile testing of the cured laminate to verify the material properties. The test section should be a section of the FRP wrap applied to a sheet of plastic to produce a laminate that is 18"x18" and the same thickness as the laminate installed on the structure. The test section should be made during the installation of the wrap on the structure and under the same application and environmental conditions. ASTM 3039 tensile tests will be conducted on this test section to verify the as-built laminate matches the minimum material specifications. Samples will be tested by WVDOT or WVU-CFC within 5 business days. If tested samples do not meet the minimum specifications listed above, additional layers of FRP wrap must be applied to bring the total laminate up to the minimum specifications at no additional cost to the Department.

601.10–PLACING CONCRETE:

DELETE THE SECTION AND REPLACE WITH THE FOLLOWING:

601.10–FRP CONSTRUCITON REQUIREMENTS:

Unless otherwise dictated by the FRP manufacturer's instructions, the following installation guidelines shall be followed for the entire FRP wrap system (primer, resin, fabric, etc.):

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1) Area to be wrapped with FRP (as shown on the plans) shall be cleaned with water at pressures of 1000 to 2000 psi starting at the top and working down no more than 72 hours prior to wrapping.
2) The ambient temperature and the temperature of the resin shall be between 55oF and 95oF at the time of mixing. The composite shall be applied when the relative humidity is less than 85% and the surface temperature is more than 5oF above the dew point. Contractor should provide verification of the temperature and humidity at the application location prior to use. The concrete surface should be dry prior to wrapping.
3) A compatible primer as recommended shall be applied to the concrete surface.
4) The FRP wrap system (fabric/resin) shall be applied to the concrete surface using methods that ensure that the entire width of the fabric is in intimate contact with the underlying.
5) Minimum of four mutually orthogonal layers of glass FRP fabric are required.

    a. For round column wrapping, a minimum of four layers of FRP fabric wrapped in a spiral form around the column circumference and along the column height with a minimum overlap specified by the manufacturer.
    b. Wrapping details for other cross sections are detailed in the plans.
    c. New rolls should overlap the previous roll by 6 inches along the length of the roll.
    d. The wrap should be installed so that vertical seams do not allow for water intrusion (i.e. lower wraps shall not overlap upper wraps).
    e. Successive layers of wet composite materials shall be placed before curing begins (polymerization) on the previous layer.

6) Adequate ventilation of the project area shall be maintained at all times.

    a. Containment shall be provided by the Contractor to prevent the spread of fibers and/or resin residue during construction. All contained or waste material shall be properly disposed of by the Contractor.
    b. Contractor shall read and apply all safety precautions for all FRP wrap system components.

After the wrap is installed but before protective coatings are applied, the wrap will be inspected by WVU-CFC personnel using IRT or DTH within 24 hours following wrapping. Any voids over 2 square inches between the wrap and concrete must be filled with an injectable epoxy as per ACI 440.2R-08. Filling of voids is required for completion of the work and will be at no additional cost to the WVDOH.

After applying the FRP system, cracks in the underlying concrete over 0.125 inches wide shall be filled with epoxy-resin-base crack filler that meets ASTM C881 Type IV, Grade 1 criteria. The class should be chosen based on the temperatures expected during application. Any ports or holes made in the FRP or concrete to allow for crack filling will be repaired at no additional cost to the WVDOH.

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601.10.1-Coating System Application Notes: After the final wrap layer is completely polymerized and cracks in the concrete filled, an acrylic paint or equivalent should be applied to the entire FRP wrap area (color to be chosen by WVDOH).

601.14–METHOD OF MEASURMENT:

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. The quantities, shall include all labor, tools, materials, equipment, supplies and incidentals necessary to complete the FRP installation as identified in this special provision and the contract documents. Cost shall include multiple wraps and all means required to place material (lifts, etc.) and provide inspection access to WVDOH and WVU-CFC.

601.16–PAY ITEM:

ADD THE FOLLOWING ITEM TO THE TABLE:

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

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 603
STRUCTURAL CONCRETE

603.10-WORKMANSHIP:

603.10.2-Defects and Breakage:

ADD THE FOLLOWING SECTIONS.

603.10.2.1-Epoxy Injection of Cracks: The work shall consist of repairing cracks with a width greater than 4 mils and up to and including 16 mils on prestressed concrete bridge beams.

603.10.2.1.1-Materials: The epoxy material used for epoxy injection crack repair shall meet the requirements specified for epoxy resin adhesives in ASTM C 881, Type IV, Grade 1, and Classes B or C. For the epoxy paste or material used to bond and cover the injection ports to the substrate, use the epoxy resin manufacturer's recommendation.

603.10.2.1.2-Equipment: The equipment to be used to inject the epoxy shall meet the recommendations of the epoxy injection material manufacturer and/or the following requirements:

1. Use equipment that has the ability to automatically proportion the material components within the mix ratio tolerances set by the epoxy materials manufacturer.
2. Use equipment that has the ability to automatically mix the epoxy component materials within the pump and injection apparatus.

603.10.2.1.3-Crack Surface Preparation and Cleaning Requirements: After the concrete beam has achieved 28 day shipping strength, clean the concrete surface along the crack of all deteriorated concrete, efflorescence and other contaminants which would be detrimental to the adhesion of the surface sealing epoxy compound. The substrate must be sound, dry on the surface, and free from oil and grease. Blow out the crack with oil free and dry compressed air.

603.10.2.1.4-Epoxy Injection: Place the base of the injection ports directly over the crack and bond to the substrate with an epoxy paste or the recommended product by the

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epoxy resin manufacturer. The injection ports should be spaced over the length of the crack at a spacing that will allow the epoxy resin to seal the entire crack traveling from one port to another. The ports spacing is dependent upon the viscosity of the resin.

Use an epoxy adhesive to seal over the surface ports and exposed cracks. The entire exposed crack is to be covered with the epoxy adhesive leaving only the port holes uncovered. The cure time for the epoxy will be based upon concrete temperature.

The temperature requirements of the concrete for the injected resin must be satisfied before the process can begin. Begin injecting at the lowest port on the beam and continue until the epoxy resin begins to "ooze" out of the port above it. The "ooze" out of the port above it is a sign that the crack has been filled to that level. Plug the first port with a cap and move up to the next port, repeating this procedure until the entire crack has been filled with epoxy. Use slow, constant pressure to inject the epoxy into the crack which will reduce the possibility of leaks or blow-outs and allow time for the repair material to fully penetrate the crack.

603.10.2.1.5-Post Epoxy Injection: After a minimum of 24 hours, the injection ports can be removed from the beam. Clean the concrete surface areas of excess epoxy injection work. Clean so as to not damage the concrete by scraping, light sand blasting, grinding, use of solvents, or any other appropriate method approved by the engineer. Clean the excess materials so that no epoxy material or injection ports extend beyond the plane surface of the concrete.

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

FOR

SECTION 616

PILING
DRILLED AND GROUTED MICROPILES

DELETE THE ENTIRE SECTION AND SUBSTITUTE THE FOLLOWING:

616.1-DESCRIPTION:

This work is for the furnishing of all materials, products, accessories, tools, equipment, services, transportation, labor and supervision and manufacturing techniques required for testing and installing drilled and grouted micropiles.

The Contractor shall select installation means and methods and shall install a system of micropiles as shown on the Plans. The Engineer has already established the minimum diameters and bond zone length, locations and required load capacities and tolerable deflections of the micropiles. The micropile load capacities and deflections shall be verified by testing as specified herein.

In selecting the micropile installation means and methods, the Contractor is advised that the casing must extend a minimum of 1'-0" into bedrock unless otherwise noted. The estimated top of bond zone is shown on the contract plans for each substructure location, and will be determined in the field by the Engineer. The bond zone is to be in competent rock to the lengths shown on the drawings.

Production mic~~-~~r~~-~~o pile installation, except reaction piles if used~~-~~, shall not begin prior to the completion of pre-production verification load test, the results are known, the report of the test submitted to the Engineer and accepted.

The ~~Engineer~~ Contractor will monitor and record the installation of all micropiles, will record the load test data, and interpret the results of all load tests.

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616.2-MATERIALS:

616.2.1-Water: Water for mixing grout will be potable, clean and free of substances that may be in any way deleterious to the grout or steel. Water shall be from a non-variable source and shall be in accordance with AASHTO T26.

616.2.2-Admixtures: Admixtures shall conform to the requirements of Section 707. Admixtures, which control bleed, improve flowability, reduce water content and retard set may be used in the grout subject to the review and acceptance by the Engineer. Accelerators will not be permitted. Admixtures with chlorides will not be permitted. Admixtures shall be compatible with the grout and mixed in accordance with the Manufacturer's recommendations. Their use will only be permitted after appropriate field tests on fluid and set grout properties.

616.2.3-Cement: All cement shall be Portland cement conforming to Subsection 701.1, AASHTO M85 Type I, Type II, Type III or Type V and shall be the product of one manufacturer. The Contractor shall develop a mix design for the concrete grout and determine the maximum amount of water that can be added to achieve the specified grout strength. If the brand or type of cement is changed during a project, additional grout mix tests are to be conducted to ensure consistency of quality and performance in situ.

616.2.4-Fine Aggregate: Inert fillers such as sand may be used in the grout in special situations with prior approval of the Engineer. If sand is used as a Fine Aggregate it shall meet the requirements of Section 702.1.

616.2.5-Reinforcement: Reinforcing steel shall be as detailed in the Contract Plans shall be either:

1. Solid deformed bars conforming to AASHTO M31, Grade 60 or Grade 75, or AASHTO M275, Grade 150; or
2. Continuous-thread, hollow core steel bars (hollow injection rods) conforming to the quality, ductility and deformation requirements of AASHTO M31, Grade 60, Grade 75, Grade 85, Grade 95, or Grade 150.

Bar couplers, if required shall meet the requirements specified in Article 5.11.3 of the *AASHTO LRFD Bridge Design Specifications* and shall develop the ultimate tensile strength of the bars without failure.

616.2.6-Pipe/Casing: If pipe or casing is required to support loads or reduce deflection, the permanent steel pipe/casing shall meet the tensile requirements. Permanent steel casing/pipe shall meet the requirements of API 5L Grade X52 or better or API CT Grade N80 or better.

~~1.~~ Pipe/Casing shall be ~~either:~~
~~2. New "Mill Secondary" steel pipe/casing without Mill Certification, provided it is free from defects (dents, cracks, tears) and has a minimum of two unique coupon tests per truckload, or~~
~~3.~~ "Prime" steel pipe/casing meeting the requirements of meeting the requirements of API 5L, Grade X52 or better or API 5CT Grade N80 or better (API, 1998). Coupon testing shall meet the requirements of ASTM A370 REV A. Do not join steel pipe sections by shop or field welding. Drill casing shall be of the flush joint type.

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Pipe/casing splices or threads shall develop the required nominal strength (both in compression and in tension) of the pipe cross section and shall provide proper alignment so that no eccentricity or angle occurs between the axes of the two lengths spliced.

Refer to Standard Specification Section 106.1.1.5 in regard to the "Use of Domestic Steel Products" which therein references "Buy America Requirements" that are applicable for this material.

Certified mill test reports shall provide sufficient information to satisfy the requirements of the Standard Specifications Section 106.1.1.5 in regard to providing domestic steel.

616.2.7-Centralizers: Centralizers shall be fabricated from plastic, steel or material that is non-detrimental to the inner reinforcing steel. Wood or aluminum shall not be used.

Centralizers shall provide for the grout cover specified in Article 616.5.1 and shall permit the free flow of grout without misalignment of the reinforcement.

616.2.8-Grout: The minimum grout strength required will be as specified in the Contract Plans. Expansion additives in grout will not be allowed. Grout shall not be re-tempered or used after it has begun to set. Quality control and testing of grout shall conform to the applicable provisions of Subsections 601.3 and 601.4. The Contractor shall develop a mix design for the concrete grout and determine the maximum amount of water that can be added to achieve the specified grout strength. If the brand or type of cement is changed during a project, additional grout mix tests are to be conducted to ensure consistency of quality and performance in situ.

616.2.9-Plates and Shapes: Structural steel plates and shapes for pile top attachments shall conform to AASHTO M270, Grade 36 or Grade 50 as specified in the Contract Plans.

616.2.10-Corrosion Protection: Coating requirements shall be as specified in the Contract Plans.

If epoxy coating is used, the minimum thickness of coating shall be 0.007 in. Epoxy coating shall be in accordance with AASHTO M 284 and Section 709.1 of the Standard Specifications. Bend test requirements shall be waived. Epoxy coating shall be factory applied only; on site epoxy coating shall not be permitted, except for minor field touch up. Any field touch up shall be completed per manufacturer's specifications.

Galvanization shall not be allowed as a means of corrosion protection for bars with yield strengths higher than Grade 75.

616.3-CONSTRUCTION METHODS

The Engineer has designed the micropiles. The estimated top of the bond zone is shown on the drawings. The actual top of bond zone elevation is expected to differ from the estimated elevation. The governing criterion for installation is the minimum bond zone length as shown on the drawings.

616.3.1-Allowable Tolerances: Centerline of piling shall not be more than 3 in. from indicated plan location.

Pile-hole alignment of vertical piles shall be within 2% of design alignment.

Pile-hole alignment of piles inclined up to 1:6 shall be within 4% of design alignment.

Pile-hole alignment of piles inclined greater than 1:6 shall be within 7% of design alignment.

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Top elevation of pile shall be within + 1 in. to – 2 in. of the design vertical elevation. Centerline of core reinforcement shall not be more than ¾ in. from centerline of piling.

616.3.2-Ground Conditions: The locations of test borings and logs of borings are provided in the Contract plans. Ground water levels are anticipated to be at the level of the river.

616.4-SUBMITTALS:

616.4.1-Pre-Construction Submittals: At least four weeks prior to the start of micropile installation, the Contractor shall submit four copies of a project reference list to the Engineer for approval, verifying the successful completion by the Contractor of at least five projects in the last five years involving construction totaling at least 100 micropiles of similar capacity to those required in these Plans and Specifications. The Contractor must have previous micropile drilling and grouting experience in soil/rock similar to these project conditions.

At least two weeks prior to the start of micropile construction, the Contractor shall submit four copies of a list identifying the on-site supervisors and drill rig operators and load testers assigned to the project to the Engineer for approval. The list shall contain a detailed summary of each individual's experience in micropile construction and testing.

1. On-site supervisors shall have a minimum of two years' experience in supervising construction of micropile installations of similar size and difficulty to those shown in the Plans and with similar geotechnical conditions to those described in the geotechnical report. The work experience shall be direct supervisory responsibility for the on-site micropile construction operations. Project management level positions indirectly supervising on-site micropile construction operations shall not be considered to be acceptable for this experience requirement.
2. Drill rig operators shall have a minimum one year experience in construction of micropile foundations.
3. Load testers shall have a minimum one year experience in testing of micropile foundations.

The Engineer shall approve or reject the Contractor's qualifications and field personnel within ten working days after receipt of the submission. Work shall not be started on any micropile installation until the Contractor's qualifications and field personnel are approved by the Engineer. The Engineer may suspend the micropile installation if the Contractor substitutes unapproved field personnel without prior approval by the Engineer. The Contractor shall be fully liable for the additional costs resulting from the suspension of work and no adjustments in contract time resulting from such suspension shall be allowed.

At least two weeks prior to the start of any micropile construction the Contractor shall submit their proposed schedule, construction methods and equipment prior to the placement of the pre- production micropile. The same crew which places the pre-production micropile shall also place the production micropiles. The Contractor shall allow seven days for acceptance.

Additional submittal(s) shall include:

1. Grout mix designs, and the procedure for placing the grout.
2. Detail for centralizer clips between the inner reinforcement and outer steel casings.
3. Detailed description of the drilling methods, construction procedure and sequence, and the proposed method for establishing and stabilizing the position of piles. Information on the headroom and space requirements for the installation equipment

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shall be provided in order to verify that the proposed installation equipment can perform at the site.

4. Detailed plans for the method proposed for the testing of the micropiles shall be provided prior to beginning the tests. This shall include all necessary drawings and details to clearly describe the method and the procedure to be used.

616.4.2-Construction Records Submittals: The Contractor shall submit the following information two weeks prior to construction:

1. Certified mill test reports, properly marked, for the inner reinforcement steel and permanent casing showing the ultimate strength, yield strength, elongation, dimensions and material properties.
2. Calibration reports for each load cell, test jack, pressure gauge and master pressure gauge to be used. The calibration tests shall have been performed within six months of the date submitted.
3. Grout compression test results.
4. The working drawings shall include micropile installation details giving:
   a. Micropile type, number, location and pattern
   b. Micropile batter and orientation
   c. Micropile factored design load
   d. Maximum deflection of piles at factored design load
   e. Type and size of reinforcing steel
   f. Details of central reinforcing steel centralizers
   g. Minimum total bond length
   h. Total micropile length
   i. Tip elevation
   j. The proposed mix design for the cement grout.
   k. Grouting volumes and maximum pressures
   l. Micropile top connection details
   m. Micropile cut-off elevation
   n. Anticipated ground conditions

Shop drawings shall be submitted for review and approval for all structural steel, including micropile components, and corrosion protection system and shall be signed and sealed by a West Virginia Registered Professional Engineer.

For steel pipe used as permanent pipe/casing, or core steel, a minimum of two representative coupon tests or mill certifications shall be submitted on each truckload delivered to the project. A truckload is considered 40 tons or less. Certified mill test reports for the reinforcing steel shall be submitted for record purposes as the materials are delivered. The ultimate strength, yield strength, elongation, and chemical analyses shall be included.

For steel pipe/casing that is in tension and requires threaded joints, data demonstrating the adequacy of the joint under tensile loads shall be submitted.

The Contractor shall submit the grout mix designs, including details of all materials to be incorporated, and the procedure for mixing and placing the grout for approval. The submittal shall include certified test results verifying the acceptability of the proposed grout mix designs.

The Contractor shall submit for review and approval, detailed plans for the method proposed for testing of micropiles prior to any testing. The plans shall include all necessary drawings and details to clearly describe the test method and equipment proposed.

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The Contractor shall submit for review and acceptance the proposed micropile load testing procedure. The testing procedure shall be provided in accordance with project specified schedules and shall be signed and sealed by a West Virginia Registered Professional Engineer.

The micropile verification load testing procedure shall be in general conformance with the latest versions of ASTM D1143 for compression or ASTM D3689 for tension as applicable~~)~~, and shall indicate the minimum following information:

1. Type and accuracy of apparatus for measuring load
2. Type and accuracy of apparatus for applying the load
3. Type and accuracy of apparatus for measuring the pile deformation
4. Type and capacity of reaction load system, including sealed design drawings
5. Calibration reports for hydraulic jack and load and deformation devices

The Contractor shall submit calibration reports for each test jack, pressure gauge, load cell and master pressure gauge to be used. The calibration tests shall be performed by an independent testing laboratory. Calibration of pressure gauges shall be within six months prior to the date submitted. Testing shall not commence until these calibrations have been approved.

All Contractor construction submittals shall be submitted at least two (2) weeks prior to the start of micropile construction. The Contractor shall submit the number of copies required by the contract documents of the required construction submittals for acceptance by the Engineer. Work shall not begin until the appropriate submittals have been approved in writing.

616.4.3-Installation Records: The Contractor will prepare an installation record during construction for each micropile and provide to the Engineer. The records will include the following minimum information:

1. Pile Identification using the micropile designation shown in the plans, including inspector name, drill method and drill operator
2. Pile drilling start and finish times
3. Existing ground surface elevation
4. Top of Rock Elevation
5. Bottom of Casing Elevation
6. Material Type within bond zone
7. Final tip elevation
8. Cut-off elevation
9. Description of unusual installation behavior or conditions including deviations from planned parameters
10. Grout pressures attained, if applicable
11. Grout quantities pumped, including start and finish times
12. Pile materials and dimensions
13. Characteristics of all materials encountered during the drilling process, and their specific location(s) within the holes
14. The location of special features such as mud seams, open cracks, broken rock, etc.
15. Points where abnormal loss or gain of drill water has occurred
16. Groundwater levels or other items of interest for grouting
17. All significant actions of the bit
18. 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

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weak material

19. In addition, as-built drawings showing the locations of micropiles, their depths and inclination, and the details of their composition shall be submitted.

616.5-INSTALLATION:

The Contractor shall select the drilling method, the grouting procedure and the grouting pressure used for the installation of the micropiles. The procedures shall not damage adjacent facilities or newly installed piles.

The drilling equipment and methods shall provide an open borehole to the defined nominal diameter and full-length, as shown on Drawings, prior to placing grout and reinforcement. The micropile installation technique and sequence shall be consistent with the geotechnical, logistical, environmental, and load carrying conditions of the project.

The drilling equipment, methods and sequence shall be suitable for drilling through the conditions to be encountered, with minimal disturbance to these conditions or any overlying or adjacent structure or service.

The borehole must remain open to the defined nominal diameter, full length prior to placing grout and reinforcement~~ unless the installation is completed by grouting through hollow injection rods~~.

The inner reinforcement steel with centralizers shall be lowered, not dropped, into the stabilized drill holes to the desired depth. Partially inserted inner reinforcement bars shall not be driven or forced into the hole such that there will be no interconnection or damage to piles in which the grout has not achieved final set.

Centralizers shall be provided at 10 ft. maximum spacing on central reinforcement. The uppermost and lowermost centralizers hall be located a maximum of 5 ft. from the ends of the micropile. Centralizers shall permit the free flow of grout without misalignment of the reinforcement.

The grout shall be injected by tremie beginning at the bottom of the drilled borehole. The pipe casing shall be filled with a grout with a 28 day compressive strength as indicated on the Contract drawings and shall be without voids from bottom to top of micropile. The entire bond zone shall be completely filled with grout.

During construction, the Contractor shall observe the conditions in the vicinity of the micropile construction site on a daily basis for signs of ground heave or subsidence. If such signs of movement are observed, the Contractor will notify the Engineer immediately. T h e Contractor shall immediately suspend or modify drilling or grouting operations if ground heave or subsidence is observed, if the micropile structure is adversely affected, or if adjacent structures are damaged from the drilling or grouting. If the Engineer determines that the movements require corrective action, the Contractor shall take the corrective actions necessary to stop the movement or perform repairs. If the Engineer determines that problem encountered is the result of the Contractor's methods or operations or due to the failure to follow the specified/approved construction sequence, the costs of providing corrective actions will be borne by the Contractor.

The Contractor shall verify pile top elevations and adjust all installed micropiles to the specified elevations.

Grout shall be injected in accordance with Article 616.5.1.

616.5.1-Grouting: The Contractor shall provide calibrated systems and equipment to measure the grout quality including, at a minimum, compressive strength according to AASHTO T106/ASTM C109 and grout density, quantity, and pumping pressure during the

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grouting operations. The Contractor shall keep and provide records showing the quantities, test data and grout pressures for inspection by the Engineer.

Grouting of the entire length of bond zone shall occur in the same day as drilling when installing micropiles in materials such as consolidated clays and weak rock, which can deteriorate and soften from exposure.

After drilling, the hole shall be flushed with water and/or air to remove drill cuttings and/or other loose debris.

The Contractor shall provide a stable, homogenous neat cement grout or a sand-cement grout with a minimum 28-day unconfined compressive strength as specified in the Contract Plans. The grouting equipment shall produce a collodially mixed grout free of lumps, undispersed cement or any other evidence of poor or incomplete mixing. Admixtures, if used, shall be mixed in accordance with manufacturer's recommendations. The pump shall be equipped with a pressure gauge to monitor grout pressures. The pressure gauge shall be capable of measuring pressures of at least 150 psi or twice the actual grout pressures used by the Contractor, whichever is greater. The grouting equipment shall be sized to enable the grout to be pumped in one continuous operation. The grout shall be kept in constant agitation prior to pumping. A second pressure gauge shall be paced at the point of injection.

~~Install a suitable packer inside the pipe at the final top of grout elevation, connect a grout supply hose to the packer and pressure grout until the pressure gage of the top of the pile registers 100 psi or other approved termination pressure.~~ If pressure grouting is required, the pile should be pressure grouted through the casing. When the pressure reaches 100 ksi, the casing shall be extracted a minimum of 2-ft increments until the entire bond zone is pressure grouted. Once the bond zone is grouted, the remaining casing can be tremie filled. Do not pump at a rate greater than one cubic foot per minute. Gravity method shall be used in lieu of pressure grouting if so noted in the contract plans.

Control the grout pressure and grout takes to prevent heave or damage.

The grout shall be placed within 1 hour or less after mixing the grout, or within the time recommended by the manufacturer, if admixtures are used. Grout not placed within the allowed time limit will be rejected.

The grout shall be injected from the lowest point of the drill hole (by tremie methods) until clean, pure grout flows from the top of the micropile. The entire bond zone shall be completely filled with grout. The tremie grout may be pumped through grout tubes, hollow stem augers, or drill rods. Subsequent to tremie grouting, all grouting operations associated with, for example, extraction of drill pipe/casing and pressure grouting, must ensure complete continuity of the grout column. The use of compressed air to directly pressurize the fluid grout is not permissible.

The entire pile shall be grouted to the design cut-off level. Minimum grout cover shall be:

Condition	Minimum Cover on Bar (in)	Minimum Cover on Coupler (in)
Micropiles in Soil	1	1/4
Micropiles in Rock	1/2	1/4
Coated or Encapsulated Bars	1/2	1/4

Upon completion of grouting, the grout tube may remain in the hole, but it shall be filled with grout. Grout within the micropiles shall be allowed to attain the minimum design strength prior to being loaded.

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If the Contractor uses a post-grouting system, all relevant details including grouting pressure, volume, location and mix design, shall be submitted as part of Article 616.4.2.

The Contractor shall make two sets of six two-inch cubes for each day of grouting one set near the beginning of the day and one set near the end of the day) and shall test two cubes after seven days cure, two cubes after 28 days of cure, and keep two in reserve. Cubes shall be cured and tested according to ASTM C109.

616.5.2-Pile Splices: If used, pile splices shall be constructed to develop the required factored design strength of the pile cross section and shall be without eccentricity or kink angle between the axes of the two lengths spliced. No welding will be permitted in a pile splice. The Contractor must provide a detail and receive approval of the proposed micropile splice prior to its use.

616.5.3-Pile Damage: If a micropile is deemed unacceptable by the Engineer due to improper or inadequate construction or to damage caused by the Contractor, that micropile shall be replaced unless otherwise approved by the Engineer. Replacement shall be at the Contractor's expense. Any modification, which requires changes to the structure, shall have prior review by and the acceptance of the Engineer.

616.6-Pile Load Tests:

Pile load tests shall be performed to verify the adequacy of the design and construction of the micropile system. Piles shall be tested under tension loads prior to testing under compression loads.

616.6.1-Pre-Production Verification Load Test: Perform one pre-production verification load test (on sacrificial pile) on land in an area acceptable to the Engineer. This pile load test shall be performed according to ASTM D1143 for compression or ASTM D3689 for tension as applicable~~ASTM D 3689~~, except as modified herein. The test pile with reaction/support piles or anchors shall be constructed prior to the commencement of the installation of production micropiles to confirm the Contractor's installation methods.

The micropile load test results shall verify the suitability of the design and installation methods, and shall be reviewed and accepted by the Engineer prior to the Contractor's initiation of production micropile installation.

The drilling and grouting methods, pipe/casing and other reinforcement details, and depth of embedment for test the test pile shall be identical to the production piles, except where approved otherwise by the Engineer.

~~Observe a waiting period of at least seven calendar days between installing the last test/reaction pile in the load test system and commencing the load test.~~Commence the load test once the grout reaches the required design strength, and a minimum waiting period of 72 hours. The load test system may be setup during this period. The primary and auxiliary systems of measurement may also be setup during this period.

For sacrificial test piles, further load cycles may be conducted to failure.

The micropile load verification test results will be reviewed and accepted by the Engineer within seven days prior to installing the production micropiles.

1. The load testing program submittal shall be furnished to the Engineer prior to the start of load testing. This submittal shall provide the following information as a minimum: Sketch of the Load Test Set-up:
    a. Type and Accuracy of apparatus for measuring load
    b. Type and Accuracy of apparatus for applying load

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c. Type and Accuracy of apparatus for measuring the pile deformation
d. Type and capacity of reaction load system
e. Hydraulic jack and load cell calibration reports (both are required)

2. The drilling and grouting methods, casing diameter and depth of bond zone of the test pile shall be identical to the production piles.
3. The jack shall be positioned at the beginning of the test such that the unloading and repositioning of the jack during the test will not be required.

Incrementally load the test micropile in accordance with the following table. The pile top-movements will be measured and recorded at the end of the hold time for each load increment. Start measuring the hold time as soon as each test load increment is applied. Hold the 0.975 FDL for 10 minutes. Measure and record pile top-movement during this 0.975 FDL hold-period at 1, 2, 3, 4, 5, 6, 10, 20, 30, 50 and 60 minutes:

TABLE 616.6.1-1
LOAD STEPS FOR VERIFICATION TESTING

INT.	LOAD	HOLD TIME (min)
1	AL	----
2	0.075 FDL	4
3	0.15 FDL	4
4	0.225 FDL	4
5	0.30 FDL	4
5	0.375 FDL	4
6	0.375 FDL	4
7	AL	1
8	0.15 FDL	1
9	0.30 FDL	1
10	0.375 FDL	1
11	0.45 FDL	4
12	0.525 FDL	4
13	0.60 FDL	4
14	0.675 FDL	4
15	0.75 FDL	4
16	AL	1
17	0.30 FDL	1
18	0.60 FDL	1
19	0.675 FDL	1
20	0.75 FDL	1
21	0.825 FDL	4
22	0.90 FDL	4
23	0.975 FDL	60 (Creep Test)
24	AL	1
25	0.30 FDL	1
26	0.60 FDL	1
27	0.90 FDL	1
28	0.975 FDL	1
29	1.05 FDL	4
30	1.125 FDL	4

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31	1.20 FDL	4
32	1.275 FDL	4
33	1.35 FDL	4
34	1.425 FDL	4
35	1.50 FDL	4
36	1.20 FDL	4
37	0.90 FDL	4
38	0.60 FDL	4
39	0.30 FDL	4
40	AL	15

The Contractor shall submit a written report providing micropile geometry and construction details within 7 working days after the completion of the verification test.

The acceptance criteria for micropile verification load tests shall be:

1. The pile shall sustain the compression and tension design loads (0.75 FDL) with no more than the specified permissible total vertical movement at the top of the pile as measured relative to the top of the pile prior to the start of testing. If an Alignment Load is used, then the allowable movement will be reduced by multiplying by a factor of (0.75 FDL – AL)/0.75 FDL).
2. Test piles shall have a creep rate at the end of the 0.975 FDL increment that is not greater than 0.04 in./log cycle time (1 to 10 minutes) or 0.08 in./log cycle time (6 to 60 minutes) and has a linear or decreasing creep rate.
3. Failure does not occur by 1.50 FDL. Failure is defined as a slope of the load versus deflection curve (at end of increment) exceeding 0.025 in./kip.

616.6.2-Proof Load Tests During Construction: One production micropile at Abutment 1 and one production pile at Abutment 2 will be Proof Load Tested. Axial Pile load tests shall be performed according to ASTM D 3689, except as modified herein. The production piles are tested after pile installation to confirm the installation procedure has remained constant and to assure adequate uplift capacity.

Commence the load test once the grout reaches the required design strength, and a minimum waiting period of 72 hours. ~~Observe a waiting period of at least seven calendar days between installing the last pile in the foundation and commencing the load test.~~ Neighboring production micropiles may be used as reaction piles. The load test system may be setup during this period. The primary and auxiliary systems of measurement may also be setup during this period.

The micropile load test results will be reviewed and accepted by the Engineer within seven days.

1. The load testing program submittal shall be furnished to the Engineer prior to the start of load testing. This submittal shall provide the following information as a minimum:
   Sketch of the Load Test Set-up
   Type and Accuracy of apparatus for measuring load
   Type and Accuracy of apparatus for applying load
   Type and Accuracy of apparatus for measuring the pile deformation
   Type and capacity of reaction load system
   Hydraulic jack and load cell calibration reports (both are required).

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2. The jack shall be positioned at the beginning of the test such that the unloading and repositioning of the jack during the test will not be required.

Incrementally load the designated micropiles to be tested in accordance with the following schedule. The pile top-movement will be measured and recorded at the end of the hold time for each load increment. Start measuring the hold time as soon as each test load increment is applied. Hold the 1.00 FDL for 10 minutes. Measure and record pile top-movement during this 1.00 FDL hold-period at 1, 2, 3, 4, 5, 6, 10, 20, 30, 50 and 60 minutes:

TABLE 616.6.2-1
LOAD STEPS FOR PROOF

INT.	LOAD	HOLD TIME (min)
1	AL	-
2	0.10 FDL	4
3	0.20 FDL	4
4	0.30 FDL	4
5	0.40 FDL	4
6	0.50 FDL	4
7	0.60 FDL	1
8	0.70 FDL	1
9	0.80 FDL	1
10	0.90 FDL	1
11	1.00 FDL	4
15	0.75 FDL	4
16	0.50 FDL	1
17	0.25 FDL	1
18	AL	1

The acceptance criteria for micropile proof load tests shall be:

1. The pile shall sustain the tension design loads (0.75 FDL) with no more than the specified minimum permissible total vertical movement at the top of the pile as measured relative to the pile prior to the start of testing. If an Alignment Load is used, then the allowable movement will be reduced by multiplying by a factor of [(0.75 FDL- AL)/0.75 FDL].
2. Test piles shall have a creep rate at the end of the 1.00 FDL increment that is not greater than 0.04 in./log cycle time (1 to 10 minutes) or 0.08 in./log cycle time (6 to 60 minutes) and has a linear or decreasing creep rate.
3. Failure does not occur by 1.00 FDL test load.

If a production micropile fails to meet the acceptance criteria, modifications shall be made to the design, the construction procedures, or both.

Any modification that requires changes to the structure shall have prior review and acceptance of the Engineer. The cause for any modifications of design or construction procedures shall be decided in order to appropriately determine any additional cost implications.

616.7-METHOD OF MEASUREMENT:

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The number of linear feet of piles of the type specified to be paid for will be the actual length of piles remaining in the finished structure. All cut-offs remain the property of the Contractor for disposition.

The Contractor will be paid for grout used that is in excess of two times the theoretical amount required to fill an empty core hole from the bottom of the rock socket to the finished pile top elevation. The excess grout will be paid for by Force Account per Section 109.4 of the standard specifications.

616.8-BASIS OF PAYMENT:

The quantities, determined as provided above, will be paid for at the contract unit prices bid for the items listed below, which prices and payments shall be full compensation for furnishing all materials and doing all the work prescribed in a workmanlike and acceptable manner, including all labor, materials, tools, equipment, supplies and incidentals necessary to complete the work. The cost of preboring, filling of voids and splicing, except as noted in this special provision, shall be included in the price bid for the micropiles.

Loading tests will be paid for at the contract unit price for "Pile Loading Test", or, in the absence of such a price bid, they will be paid for as extra work.

616.9-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
616006-001	Micropile, "size"	Linear Feet
616007-001	Pile Loading Test, "Static"	Each

"size" shall be the size of the Micropile
"type" shall be the type of loading test.

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

FOR

SECTION 630

MASONRY WALL, STONE FACING

630.1-DESCRIPTION:

This work shall consist of furnishing all materials, labor, and equipment necessary to provide acceptable stone facing as described by the plans and these provisions.

630.2-MATERIALS:

Materials shall be as follows:

Mortar:

ASTM C270, Type S. Mortar shall match the existing historic mortar in color, texture and finish.

Joint Sealant:

Multi-component polyurethane or polysulfide sealant as per Federal Specification TT-S-00227e, Type II. The color shall match the mortar color to the satisfaction of the Engineer.

Dovetail Anchors and Slots:

ASTM A167, Type 304 stainless steel. Slots shall be 1-inch wide (maximum) by 1-inch deep and a minimum of 26 gage. Dovetail anchors shall be corrugated, 12-gage minimum, and shall extend 4 inches beyond the face of finished concrete (5 inches total length). Vertical slots shall be spaced at 1-1/2 feet on centers (maximum). Dovetail anchors shall be placed at each horizontal joint in the stonework.

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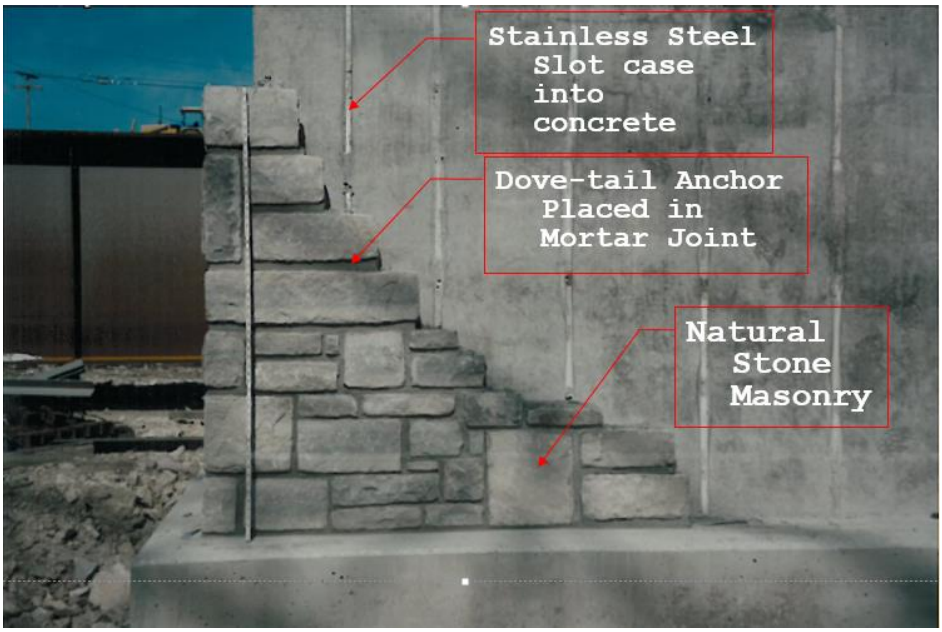
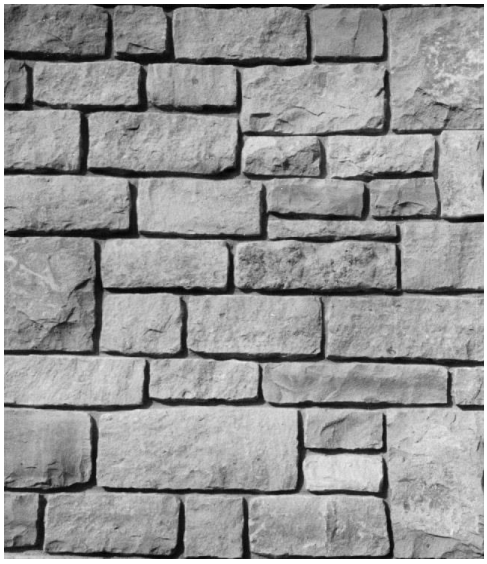


Stone and Brick:

1. Stone and brick shall match the existing historic stones and brick in type, quality, color, texture and finish. Stone shall be reasonably fine grained and uniform in color, durable, and free of seams, cracks, inclusions, or other structural defects. The stone shall come from a quarry, the product of which is known to be of satisfactory quality. Stone shall be of such character that it can be brought to such lines and surfaces, whether curved or plane, as may be required. A sufficiently large stock of the specified stone shall be kept on site during masonry work to permit adequate selection of stone by the masons.



Representative Lay-up of Random Ashlar Bond
(Note: Written provisions shall govern over this illustration where discrepancies exist.)

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2. The stone size for random ashlar veneer shall be 4 to 5-inches deep (normal to face) and the face areas shall be between 16 and 250 square inches. Stone heights shall range from 4 to 8 inches except that not more than 20 percent of stones shall be less than 6 inches in height and approximately 10 percent of stones shall be risers (jumpers) with heights between 12 and 16 inches. Stone lengths shall be random and shall generally range from 8 to 24 inches. The length of risers (jumpers) shall be at least 10 inches and not less than 75 percent of their height.

630.3-PRE-CONSTRUCTION SUBMITTALS:

At least four weeks prior to the start of any stone facing installation or masonry restoration, the Contractor shall submit four copies of a project reference list to the Engineer for approval, verifying the successful completion by the Contractor of at least five projects in the last ten years involving construction totaling at least 10,000 square feet of masonry work similar to that required in these Plans and Specifications. The Contractor must have previous stone facing and masonry restoration experience for stone and brick similar to these project conditions. At this time, the location of the stone quarry and samples of the proposed masonry units shall be submitted for approval.

At least two weeks prior to the start of any stone facing installation or masonry restoration, the Contractor shall submit four copies of a list identifying the on-site supervisors and masons assigned to the project to the Engineer for approval. The list shall contain a detailed summary of each individual's experience in stone facing and masonry restoration.

On-site supervisors shall have a minimum of two years' experience in supervising construction of stone facing and masonry restoration projects of similar size and difficulty to those shown in the Plans. The work experience shall be direct supervisory responsibility for the on-site work. Project management level positions indirectly supervising on-site work shall not be considered to be acceptable for this experience requirement.

The Engineer shall approve or reject the Contractor's qualifications and field personnel within ten working days after receipt of the submission. Work shall not be started on any stone facing and masonry restoration until the Contractor's qualifications and field personnel are approved by the Engineer. The Engineer may suspend the stone facing and masonry restoration if the Contractor substitutes unapproved field personnel without prior approval by the Engineer. The Contractor shall be fully liable for the additional costs resulting from the suspension of work and no adjustments in contract time resulting from such suspension shall be allowed.

The same crew which perform the masonry restoration shall also place the stone facing. The Contractor shall allow seven days for acceptance.

630.4-INSTALLATION:

Stone Dressing:

All joints shall be dressed for full depth of facing sufficiently accurate for the joint thickness called for on the plans. Stones shall be dressed before being laid and shall be cut to lie on their natural beds with top and bottom truly parallel. Risers (jumpers) may lie on other than their natural beds except that colored veins showing on exposed face(s) shall lie horizontally. Hollow beds will not be permitted. The bottom bed shall be the full size of the stone and no stone shall have an over-hanging top. In rock-face construction the face side of any stone shall not present an undercut contour adjacent to its bottom axis giving a top-heavy, unstable appearance when laid.

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Exposed surfaces of the face stone shall be given the surface finish indicated on the plans, with edges pitched to true lines and exact batter. (The plane of the stone facing shall be 6 inches from the plane of the concrete surface.)

Mixing Mortar:

The mortar shall be hand or machine mixed, as may be required by the Engineer. In the preparation of hand mixed mortar, the sand and cement shall be thoroughly mixed together in a clean, tight mortar box until the mixture is of uniform color, after which clean water shall be added in such quantity as to form a stiff plastic mass. Machine mixed mortar shall be prepared in an approved mixer and shall be mixed not less than 3 minutes or more than 10 minutes. Mortar shall be used within 1-1/2 hours after mixing and before final set begins. Retempering of mortar shall be done as necessary to maintain proper consistency during placement.

Stonework:

The bearing surface of the foundation masonry shall be cleaned thoroughly and in a saturated-surface dry condition when the mortar bed is spread. Masons having at least five (5) years of experience laying stone shall construct all masonry. Face stones shall be set in random ashlar bond to meet the following requirements.

Placement of stone shall be done so as to prevent the bunching of small stones or stones of the same size. When weathered or colored stones, or stones of varying texture, are being used, the various kinds of stones shall be uniformly distributed throughout the exposed faces of the work. When vein colors are present, they shall run horizontally. No horizontal bed shall run more than 6-feet long except that where a wall face (between corners) is 6 feet or less, not more than 25 percent of horizontal beds shall extend the full length of the face. This requirement shall not apply to return faces less than 3 feet in length. No vertical joint (except at expansion joints in wall) shall run higher than three stones without interruption. All bed joints shall be truly horizontal and no more than 5 percent of the up and down joints shall be splayed, with the remainder vertical. Unless shown otherwise, beds and joints shall be 1/2 to 3/4-inches wide. **A sample 5 feet by 10 feet lay-up shall be constructed by the Contractor for approval by the Engineer prior to any stone work being done on the structure.** If rejected, the Contractor shall make additional sample lay-ups until approved at no additional cost to the Owner. Stonework on the structure shall closely conform to the approved sample lay-up and be in strict accordance with these provisions.

Each stone shall be cleaned and thoroughly saturated with water before being set and the bed, which is to receive it, shall be clean and well moistened. All stones shall be well bedded and backed in freshly made mortar. The mortar joints and backing shall be full and the stones carefully settled in place before the mortar has set. Completely fill all anchor slots and dowel holes. No spalls will be permitted in the beds. No pinning up of stones with spalls will be permitted in beds. Stone shall not be dropped upon, or slid over the wall, nor will hammering, rolling, or turning of stones on the wall be allowed. They shall be carefully set without jarring the stone already laid and they shall be handled with appliances that will not cause disfigurement.

In case any stone is moved or the joint broken, the stone shall be taken up, the mortar thoroughly cleaned from bed and joints, and the stone reset in fresh mortar.

Lead or plastic setting pads shall be placed under heavy stones, column drums, etc., in same thickness as joint and in sufficient quantity to avoid squeezing mortar out. Heavy

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stones or projecting courses shall not be set until mortar in courses below has hardened sufficiently to avoid squeezing.

Take adequate precautions to prevent the mortar from freezing. Do not set stones having a temperature of 40 degrees Fahrenheit or less with mortar until heated. When required, heat to ensure that a temperature of 50 to 80 degrees Fahrenheit is obtained throughout the entire stone units.

Special care shall be taken in placing stone adjacent to expansion joints to insure clear openings as shown. If necessary, these stones shall be cut, ground, or bush-hammered to effect the required clearances. Stonework shall progress over contraction joints in the wall without interrupting normal horizontal bed and vertical joint provisions given herein.

Ties or braces that would project through or otherwise deface stone work will not be permitted.

All cornice, copings, projecting belt courses, other projecting courses, steps, and platforms (in general, all stone areas either partially or totally horizontal) should be set with flush vertical mortar joints unless a sealant joint is noted. If a sealant joint is called for, the stone should be set with unfilled vertical joints. After setting, insert properly sized back-up material or backer rod to proper depth, and gun in sealant.

Pointing:

Pointing shall not be done in freezing weather or when the stone contains frost. The face joints shall be properly pointed by raking to depth of 1/4-inch, preferably before the mortar becomes set. Joints that cannot be so pointed shall be prepared for pointing by raking them out to a depth of 1-1/2 inch before the mortar has set. The face surfaces of stones shall not be smeared with the mortar forced out of the joints or that used in pointing. Joints not pointed at the time the stone is laid shall be thoroughly wet with clean water and filled with mortar using all masonry Type S cement. The mortar shall be well driven into the joints and finished with an approved pointing tool. The wall shall be kept wet while pointing is being done and in hot or dry weather the pointed masonry shall be protected from the sun and kept wet for a period of at least 3 days after completion.

Joint Sealing:

Primer, when required, shall be nonstaining and nonacidic and shall be used as recommended by manufacturer of sealant, having been tested before for staining and durability on samples of actual surfaces to be sealed.

(If primers are required, they should be applied to the confines of joint surfaces after stone is installed into the wall. In some instances it may be advisable to apply primer to the stone before the stone is installed into the wall. Application procedures should be as recommended by manufacturer of the sealant.)

Back-up materials and preformed joint fillers shall be nonstaining, compatible with sealant and primer, and of a resilient nature, such as closed cell resilient foam, sponge rubber, or of a supporting type such as closed cell rigid foam, cork, or non-impregnated fiberboard. Materials impregnated with oil, bitumen, or similar materials shall not be used. Size and shape shall be as indicated by joint detail in drawings.

Sealant shall not adhere to back up material and shall be as recommended by sealant manufacturer.

Bond Breakers, when required, shall be as recommended by manufacturer of sealant.

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Solvents, cleaning agents, and other accessory materials shall be nonstaining to the stone and shall be recommended by sealant manufacturer.

Protection of Finished Work:

Receipt, storage, and protection of cut stone work prior to, during, and subsequent to installation shall be the responsibility of the mason contractor.

During construction, tops of walls shall be carefully covered at night and especially during any precipitation or other inclement weather.

At all times, walls shall be adequately protected from mortar droppings.

Cleaning:

Finished stonework shall be washed clean and free of dirt, mortar, and other objectionable accumulations. Mortar droppings and smears shall be removed as work progresses. Final clean down shall include brushing with fiber brushes and mild soap or detergent, and rinsing with clear water. No acids shall be used without prior approval. Stonework shall be protected from rundown or splash when using acid on adjacent materials.

630.5-METHOD OF MEASUREMENT:

The area to be paid for shall be the actual area in square feet of all exposed vertical faces of stone facing, completed, and accepted.

630.6-BASIS OF PAYMENT:

The area of stone facing, measured as provided above, shall be paid for at the contract unit price bid for the items listed below, which prices shall constitute full compensation for pre-construction submittals, furnishing and preparing all materials, placing, including all Dovetail anchors and slots, finishing and cleaning, and all labor, equipment, tools, and incidentals necessary to complete this item.

630.7-PAY ITEM:

ITEM	DESCRIPTION	UNIT
630006-001	Masonry Wall, Stone Facing	Square Foot

September 15, 2106

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

FOR

SECTION 679
OVERLAYING OF PORTLAND CEMENT CONCRETE BRIDGE DECKS

679.1 – DESCRIPTION:

ADD THE FOLLOWING AS THE PARAGRAPH ONE TO THE SUBSECTION:

All specialized concrete overlay work to be performed on the project shall utilize Latex Modified Concrete in accordance with Section 679. Microsilica overlays shall not be used. All applicable references to Microsilica in Section 679 & Section 707.4.3 are to be voided from the specifications.

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

SECTION 105

CONTROL OF WORK

105.2 – PLANS AND WORKING DRAWINGS:

ADD THE FOLLOWING:

105.2.1 – Dates of Governing Specifications and Standard Details: This guidance is to provide the overriding dates for the Standard Specifications and Volume I and II Standard Details Books for the attached project.

105.2.1.1 – Standard Specifications Date - The West Virginia Department of Transportation, Division of Highways, Standard Specifications Roads and Bridges, adopted 2017, shall apply for this project

105.2.1.2 – Standard Details Volume I Date - The West Virginia Department of Transportation, Division of Highways, Standard Details Volume I, dated May 2016 shall apply for this project.

105.2.1.3 – Standard Details Volume II Date - The West Virginia Department of Transportation, Division of Highways, Standard Details Volume II, dated January 1, 1994 shall apply for this project.

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

SECTION 109

MEASUREMENT AND PAYMENT

ADD THE FOLLOWING SUBSECTION TO THE SECTION:

109.11 – FEMA REIMBURSEMENT:

The Contractor is advised that this project is located within a Federal Emergency Management Agency (FEMA) Public Assistance area, which require audits be performed to ensure that aid went to only those who were eligible and that disaster aid funds were used only for their intended purposes.

109.11.1 – Documentation: The Contractor shall maintain material invoices and provide a breakdown which clearly delineates the location and amount used on the project. As a minimum, the following information shall be submitted to the Engineer in writing within 15 calendar days after the project is substantially complete.

1. Individual Disaster Site Number (MFF#, NFF#, PFF#, SFF#, TFF#, or RFF#)
2. Station/GPS coordinates
3. Line Number
4. Item Number
5. Description
6. Quantities (to hundredth decimal point)
7. Material Invoice – including site location number & quantity for that site

109.11.2 – Change in Quantities and/or Scope of Work: No adjustment of Quantities and/or additional Work that requires greater quantities than specified in the Contract without prior written approval by the WVDOH Disaster Coordinator.

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109.11.3 – Waste Outside of WVDOH Right-of-Way: Material wasted off of WVDOH Right-of-Way shall meet the requirements of 207.6.3.2. The Contractor shall provide the Engineer the following information for each location.

1. Signed right-of-entry
2. GPS Coordinates
3. Cubic yard wasted

Material Invoices - Location and Usage Chart						
Disaster Site Number (MFF#, NFF#, PFF#, SFF#, TFF# or RFF#)	Station and/or GPS Coords.	Proposal			Quantity (to hundredth decimal point)	Units
		Line Number	Item Number	Description		
Also Include:						
Material Invoice - including Site Location # and Quantity for that site						

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

SECTION 604

PIPE CULVERTS

604.1 – DESCRIPTION:

ADD THE FOLLOWING TO THE SECTION:

604.1.1 – High Density Polyethylene (HDPE) Pipe Liner: The purpose of this special provision is to describe the work and material required to line an existing pipe with a new high density polyethylene (HDPE) pipe liner.

604.2 – MATERIALS:

ADD THE FOLLOWING TO THE SECTION:

604.2.1 – Materials: The new liner pipe shall be solid wall HDPE in accordance with AASHTO M 326-08 or ASTM F894. The pipe shall have a Standard Dimension Ratio (SDR) of 32.5.

604.6 – LAYING AND JOINING:

ADD THE FOLLOWING TO THE SECTION:

604.6.4 – High Density Polyethylene (HDPE) Pipe Liner: Installation for a new high density polyethylene (HDPE) pipe liner shall meet the following requirements.

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604.6.4.1 – Installation: The Contractor shall adhere to the manufacture and ASTM F585 installation requirements. The work covered under this section includes furnishing all labor, materials and equipment required for installing a new HDPE liner within an existing pipe. Minor work may be required to prepare the existing pipe for insertion of the new HDPE liner pipe. Remove all objects from the existing pipe that could damage the new pipe or obstruct the flow of grout within the annular space between the existing and new pipes. Such objects could include sediment, debris, or failed edges of the existing pipe which intrude into the opening of the pipe. Measures must be taken to ensure that the new liner pipe is centered within the existing pipe.

604.14 – PAY ITEMS:

ADD THE FOLLOWING TO THE TABLE:

ITEM	DESCRIPTION	UNIT
604055-*	”size”, Lining Pipe Culverts	Linear Foot (Meter)

* Sequence number

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

FOR

SECTION 627

FINGER EXPANSION DAM & DRAINAGE ASSEMBLY

627.1-DESCRIPTION:

The work shall consist of removing the existing finger expansion dam assembly, and of furnishing and placing the new finger expansion dam and drainage assembly at the locations indicated on the plans. The construction shall be in accordance with this Specification and in reasonably close conformity with the Plans or as established by the Engineer.

627.2-MATERIALS:

627.2.1-Steel Products: All steel components of the finger dam and drainage assembly shall meet AASHTO Designation M270, 36 ksi or 50 ksi, and the requirements of Section 615 of the Specifications unless otherwise noted herein or in the plans.

627.2.2 - Reinforcing Steel: Reinforcing steel bars shall be epoxy coated and shall be in accordance with Section 602 of the Specifications.

627.2.2-Finger Dam Drain Trough: The finger dam drain trough shall be fabricated using a continuous synthetic fabric reinforced elastomer that is resistant to abrasion, sunlight, oils, and saltwater and shall comply with the requirements listed below:

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Description	Requirement	ASTM Method
Thickness (inches)	0.25	
Durometer Hardness (Shore A)	50 or 60	D2240
Low Temperature Brittleness (wrapped around a 3" dia. mandrel)	No Cracking (22 hrs. @ -20°F)	
Tensile Strength (minimum, both directions)	800 lbs./in.	D412
Elongation (maximum)	30%	D412
Tear (Die C)	120 lbs./in.	D624
Ozone Resistance	No cracks for 100 hours of exposure of 20% elongated samples @ 100°F and 100 PPHM ozone.	D1149

The finger dam drain trough shall not be spliced unless indicated on the approved shop drawings. When splices are indicated, they shall be vulcanized by the manufacturer. Longitudinal splices are not permitted.

The maximum depth of the finger dam drain trough shall be controlled so that it does not come into contact with the existing bridge substructure.

627.3-SHOP DRAWINGS:

The Contractor shall field verify all plan dimensions to insure accuracy of expansion joint fabrication prior to submission of shop drawings.

The Contractor shall design and develop the sequencing of all work as required by the plans and prepare shop drawings of sufficient detail to fabricate all structural steel components necessary for completion of the contract. Sequencing details and shop drawings shall be certified by the Contractor and submitted to the Engineer.

627.4-PREPARATION OF JOINT:

The Contractor shall remove the existing expansion joint assembly to the limits shown in the plans. The opening left by the removal of the joint shall meet the dimensional requirements shown in the plans. If additional concrete is needed to extend the deck to obtain the required joint opening, this work and material shall be included in this item.

The Contractor to the satisfaction of the Engineer shall inspect the portion of the existing expansion joint assembly to remain in place as shown in the plans. If, in the opinion of the Engineer, the remaining steel assembly has been separated from the anchor studs or the anchor studs are no longer bonded to sound concrete, the Contractor shall cut the deck, remove those portions of the existing steel and studs, and fill the void with Class K Concrete to the limits shown for placing the new joint. The repair material shall be fully cured prior to pouring the concrete headers. These repairs, if required, shall be included in this item unless otherwise shown in the plans.

Care shall be taken to not damage the reinforcing bars or their bond to the existing concrete. Any bars missing or damaged beyond repair, in the opinion of the Engineer, shall be replaced with new epoxy coated bars of comparable size. These bars shall be coupled to sound rebars once the

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damaged portions have been removed. These repairs, if required, shall be done in accordance with Sections 104.3 and 109.4 of the Specifications unless otherwise shown in the plans.

The Contractor shall protect from damage all materials, which are to remain in place. Materials damaged due to the Contractor's operations, as determined by the Engineer, shall be repaired or replaced at no additional cost to the Department and to the satisfaction of the Engineer.

627.5-INSTALLATION:

Field splices, when approved, are to be placed at crown breaks or transverse breaks in deck. Welding shall meet the requirements of Section 615.5.7 of the Specifications.

The steel retainers must be placed and aligned to the correct "grades" and elevations. The temporary support method used to achieve this alignment is subject to the Engineer's approval.

Remove all loose and unsound concrete from the surface within the joint area. Blast clean the joint area, steel retainer and anchorage in accordance with the Structural Steel Painting Council Specification SP10 immediately prior to placement of the concrete.

After installation is completed, the manufacturer's representative shall certify to the Engineer, in writing, that the expansion dam assembly was installed in accordance with the Manufacturer's requirements.

627.6-WATERTIGHT INTEGRITY TEST:

The Contractor shall test the entire (full-length) joint system for watertight integrity. He shall employ a method satisfactory to the Engineer. The entire joint system shall be covered with water for a minimum duration of 15 minutes. The concrete surfaces under the joint shall be inspected, during this 15 minute period and also for a minimum of 45 minutes after the supply of water has stopped, for any evidence of dripping water or moisture outside of the expansion dam drainage system.

Should the joint system exhibit evidence of water leakage at any place whatsoever outside of the expansion dam drainage system, the Contractor shall locate the place(s) of leakage and he shall take any and all measures necessary to stop the leakage. The Engineer will approve measures deemed necessary by the Contractor.

In the event that measures to eliminate leakage have to be taken, a subsequent water integrity test shall be performed subject to the same conditions as the original test.

627.7-ACCEPTANCE CRITERIA:

The Engineer shall not accept the Contractor's work if, in his judgment, the following criteria are not met:

1. The Contractor fails to store, handle, mix, or install the materials according to the Manufacturer's recommendations and as specified herein.
2. Degradation of material properties under field conditions is detected. The Contractor shall replace any material showing degradation.
3. The joint fails the "watertight integrity test". If failure occurs, repairs shall be conducted in accordance with the test requirements.
4. If the neoprene trough needs to be resealed for whatever reason, the Contractor will do it.

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5. If the finished joint system contains shrinkage cracks sufficient to cause debonding, or if the system became damaged during construction or by traffic prior to final acceptance, the joint system shall be removed and replaced by the Contractor.
6. All work done as a result of the acceptance criteria shall be done at no additional cost to the Department.

627.8- METHOD OF MEASUREMENT:

Finger expansion dam assembly will be measured in place along the centerline of the joint in linear feet.

627.9-BASIS OF PAYMENT:

The removal of existing concrete and the old expansion device, to the limits shown in the plans, and the placement of specified materials to rebuild the expansion device and drainage system shall be included in the payment for the items below. The quantities, determined above, will be paid for at the contract unit price bid for the items below, which price and payment shall be full compensation for furnishing all materials and doing all the work herein prescribed, including all the Manufacturer's cost, labor, tools, equipment, supplies and incidentals necessary to complete the work.

627.10-PAY ITEM:

ITEM	DESCRIPTION	UNIT
627016-001	Remove and Rebuild Expansion Joint	Linear Foot

September 15, 2016

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 651

FURNISHING AND PLACING TOPSOIL

651.2-MATERIALS:

DELETE THE 651.2 SECTION AND REPLACE WITH THE FOLLOWING:

651.2-MATERIALS:

Topsoil shall consist of the uppermost layers of fertile and friable soil that contains humus material. This material varies in thickness in accordance with soil groups and usually possesses a darker color than the subsoil. The texture of the topsoil may vary within the range of natural loam, silty clay loam, and sandy loam. Acceptable topsoil shall contain organic matter in the range of ~~1.5~~2% to 20%~~.~~ and be sampled at least once per source using AASHTOT267-86 method.

September 7, 2016

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 703

COARSE AGGREGATE

703.4-GRADING OF COARSE AGGREGATES:

DELETE TABLE 703.4 AND REPLACE WITH THE FOLLOWING:

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TABLE 703.4 STANDARD SIZES OF COARSE AGGREGATES (AASHTO M 43)												
		Amounts finer than each laboratory sieve (square openings), percentage by weight										
Size #	Nominal size square openings ①	4 (100)	3 ½ (90)	3 (75)	2 ½ (63)	2 (50)	1 ½ (37.5)	1 (25)	¾ (19)	½ (12.5)	3/8 (9.5)	No.4 (4.75)
1	3 ½ to 1 ½ (90 to 37.5)	100	90 to 100		25 to 60		0 to 15		0 to 5			
2	2 ½ to 1 ½ (63 to 37.5)			100	90 to 100	35 to 70	0 to 15		0 to 5			
24	2 ½ to ¾ (63 to 19.0)			100	90 to 100		25 to 60		0 to 10	0 to 5		
3	2 to 1 (50 to 25.0)				100	90 to 100	35 to 70	0 to 15		0 to 5		
357	2 to No. 4 (50 to 4.75)				100	95 to 100		35 to 70		10 to 30		0 to 5
4	1 ½ to ¾ (37.5 19.0)					100	90 to 100	20 to 55	0 to 15		0 to 5	
467	1 ½ to No. 4 (37.5 to 4.75)					100	95 to 100		35 to 70		10 to 30	0 to 5
5	1 to ½ (25.0 to 12.5)						100	90 to 100	20 to 55	0 to 10	0 to 5	
56	1 to ⅜ (25.0 to 9.5)						100	90 to 100	40 to 85	10 to 40	0 to 15	0 to 5

Size #	Nominal size square openings ①	1 ½ (37.5)	1 (25)	¾ (19)	½ (12.5)	3/8 (9.5)	No.4 (4.75)	No.8 (2.36)	No.16 (1.18)	No.50 (300 µm)	No.100 (150 µm)
57	1 to No. 4 (25.0 to 4.75)	100	95 to 100		25 to 60		0 to 10	0 to 5			
6	¾ to ⅜ (19 to 9.5)		100	90 to 100	20 to 55	0 to 15	0 to 5				
67	¾ to No. 4 (19 to 4.75)		100	90 to 100		20 to 55	0 to 10	0 to 5			
68	¾ to No. 8 (19 to 2.36)		100	90 to 100		30 to 65	5 to 25	0 to 10	0 to 5		
7	½ to No. 4 (12.5 to 4.75)			100	90 to 100	40 to 70	0 to 15	0 to 5			
78	½ to No. 8 (12.5 to 2.36)			100	90 to 100	40 to 75	5 to 25	0 to 10	0 to 5		
8	3/8 to No. 8 (9.5 to 2.36)				100	85 to 100	10 to 30	0 to 10	0 to 5		
89	3/8 to No. 16 (9.5 to 1.18)				100	90 to 100	20 to 55	5 to 30	0 to 10	0 to 5	
9	No. 4 to No. 16 (4.75 to 1.18)					100	85 to 100	10 to 40	0 to 10	0 to 5	
10	No. 4 to 0 ② (4.75 to 0)					100	85 to 100				10 to 30

① In inches (millimeters), except where otherwise indicated. Numbered sieves are those of the United States Standard Sieve Series.

② Screenings

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TABLE 703.4
STANDARD SIZES OF COARSE AGGREGATES (AASHTO M 43)

Size No.	Nominal Size Square Openings [1]	Amounts Finer Than Each Laboratory Sieve (Square Openings), Percent By Weight														
		4 in --- 100 mm	**3½ in** --- 90 mm	**3 in** --- 75 mm	**2½ in** --- 63 mm	**2 in.** --- 50 mm	**1½ in** --- 37.5 mm	**1 in** --- 25.0 mm	**3/4 in** --- 19.0 mm	**1/2 in** --- 12.5 mm	**3/8 in** --- 9.5 mm	**No. 4** --- 4.75 mm	**No. 8** --- 2.36 mm	**No. 16** --- 1.18 mm	**No. 50** --- 300 µm	**No. 100** --- 150 µm
1	**3½ to 1½ in** ------ 90 to 37.5 mm	100	90 to 100		25 to 60		0 to 15		0 to 5							
2	**2½ to 1½ in** ------ 63 to 37.5 mm			100	90 to 100	35 to 70	0 to 15		0 to 5							
24	**2½ to ¾ in** ------ 63 to 19.0 mm			100	90 to 100		25 to 60		0 to 10	0 to 5						
3	**2 to 1 in** ------ 50 to 25.0 mm				100	90 to 100	35 to 70	0 to 15		0 to 5						
357	**2 in to No. 4** ------ 50 to 4.75 mm				100	95 to 100		35 to 70		10 to 30		0 to 5				
4	**1½ to 3/4 in** ------ 37.5 to 19.0 mm					100	90 to 100	20 to 55	0 to 15		0 to 5					
467	**1½ in to No 4** ------ 37.5 to 4.75 mm					100	95 to 100		35 to 70		10 to 30	0 to 5				
5	**1 to 1/2 in** ------ 25.0 to 12.5 mm						100	90 to 100	20 to 55	0 to 10	0 to 5					
56	**1 to 3/8 in** ------ 25.0 to 9.5 mm						100	90 to 100	40 to 85	10 to 40	0 to 15	0 to 5				
57	**1 in. to No 4** ------ 25.0 to 4.75 mm						100	95 to 100		25 to 60		0 to 10	0 to 5			
6	**3/4 to 3/8 in** ------ 19.0 to 9.5 mm							100	90 to 100	20 to 55	0 to 15	0 to 5				
67	**3/4 in to No 4** ------ 19.0 to 4.75 mm							100	90 to 100		20 to 55	0 to 10	0 to 5			
68	**3/4 in to No 8** ------ 19.0 to 2.36 mm							100	90 to 100		30 to 65	5 to 25	0 to 10	0 to 5		
7	**1/2 in to No 4** ------ 12.5 to 4.75 mm								100	90 to 100	40 to 70	0 to 15	0 to 5			
78	**1/2 in to No 8** ------ 12.5 to 2.36 mm								100	90 to 100	40 to 75	5 to 25	0 to 10	0 to 5		
8	**3/8 in to No 8** ------ 9.5 to 2.36 mm									100	85 to 100	10 to 30	0 to 10	0 to 5		
89	**3/8 in to No 16** ------ 9.5 to 1.18 mm									100	90 to 100	20 to 55	5 to 30	0 to 10	0 to 5	
9	**No. 4 to No. 16** ------ 4.75 to 1.18 mm										100	85 to 100	10 to 40	0 to 10	0 to 5	
10	**No. 4 to 0 [2]** ------ 4.75 mm to 0 [2]										100	85 to 100				10 to 30

[1] In inches, except where otherwise indicated. Numbered sieves are those of the United States Standard Sieve Series
[2] Screenings

Where standard size of coarse aggregate designated by two or three digit numbers are specified, obtain the specified gradation by combining the appropriate single digit standard size aggregates by a suitable proportioning device where has a separate compartment for each coarse aggregate combined. Performed the blending as directed by the Laboratory.

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 715

MISCELLANEOUS MATERIALS

715.72-TRAFFIC SIGNAL MATERIALS AND EQUIPMENT

715.42.8-Cabinets:

DELETE SECTION 715.42.8 AND REPLACE WITH THE FOLLOWING:

715.42.8-Cabinets: The following are minimum design requirements for a TS2 Type 1 traffic control cabinet assembly. As a minimum, the cabinet assembly shall meet all applicable sections of the NEMA Standard publication No.TS2-2003 or most recent version. Where differences occur, this specification shall govern.

715.42.8.1-Cabinet Design and Construction: The cabinet shall be constructed from type 5052-H32 aluminum with a minimum thickness of 0.090 to 0.125 inches. The cabinet shall be designed and manufactured with materials that will allow rigid mounting, whether intended for pole, base or pedestal mounting. The cabinet must not flex on its mount. A rain channel shall be incorporated into the design of the main door opening to prevent liquids from entering the enclosure. The cabinet door opening must be a minimum of 80 percent of the front surface of the cabinet. A stiffener plate shall be welded across the inside of the main door to prevent flexing. Top of the cabinet shall incorporate a slope toward the rear to prevent rain accumulation.

Unless otherwise specified, the cabinet shall be supplied with a natural aluminum finish. Sufficient care shall be taken in handling to ensure that scratches are minimized. All surfaces shall be free from weld flash. Welds shall be smooth, neatly formed, free from cracks, blowholes and other irregularities. All sharp edges shall be ground smooth. Where painted cabinets are specified, the exterior shall be degreased and primed with a spray applied iron phosphate coat- equivalent to a four-stage iron phosphate coat prior to painting. The final coat shall consist of a powder coat paint (TGIC or equivalent) applied with a minimum thickness of 2 mils.

All seams that are not welded shall be sealed with RTV sealant or equivalent material on the interior of the cabinet. All cabinets shall be supplied with a minimum of two (2)

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removable shelves manufactured from 5052-H32aluminum. Shelf shall be a minimum of 10 inches deep. Shelves to be designed to accommodate a minimum 50 pound loading.

The shelf shall have horizontal slots at the rear and vertical slots at the front of the turned down side flange. The shelf shall be installed securely the rear edge of the shelf on the cabinet rear sidewall mounting studs, then lowering the shelf on the front sidewall mounting studs. The front edge of the shelf shall have holes punched every 6 inches to accommodate tie-wrapping of cables/harnesses. A minimum of two (2) sets of vertical "C" channels shall be mounted on each interior wall of the cabinet for the purpose of mounting the cabinet components. The channels shall accommodate spring mounted nuts or studs. All mounting rails shall extend to within 7 inches of the top and bottom of the cabinet. Sidewall rail spacing shall be no more than 9.0 inches center-to-center. Rear wall rail spacing shall be 19.0 inches center-to-center.

The main door and police door-in-door shall close against a weatherproof and dust-proof, closed-cell neoprene gasket seal. The gasket material for the main door shall be a minimum of 0.250 inches thick by 1.00 inch wide. The gasket material for the police door shall be a minimum of 0.250 inches thick by 0.500 inches wide. The gaskets shall be permanently bonded to the cabinet. The cabinet shall be equipped with a louvered air entrance. The air inlet shall be large enough to allow sufficient air flow per the rated fan capacity. Louvers must satisfy the NEMA rod entry test for 3R ventilated enclosures. A non-corrosive, vermin- and insect-proof, removable air filter shall be secured to the air entrance. The filter shall fit snugly against the cabinet door wall. The roof of the cabinet shall incorporate an exhaust plenum with a vent screen. Perforations in the vent screen shall not exceed 0.125 inches in diameter.

The main door cabinet shall be equipped with a three-point latching mechanism. The handle on the main door of the cabinet shall be manufactured from cast aluminum or stainless steel. The handle shall include a hasp for the attachment of an optional padlock. The cabinet door handle shall rotate counter-clockwise to open. The handle shall not extend beyond the perimeter of the main door at any time. The lock assembly shall be positioned so that the handle shall not cause any interference with the key when opening the cabinet door. The main door hinge shall be a one-piece, continuous piano hinge with a stainless steel pin running the entire length of the door. The hinge shall be attached in such a manner that no rivets or bolts are exposed. The main door shall include a mechanism capable of holding the door open at approximately 90, and/or (165 or 180) degrees under windy conditions. The main door shall be equipped with a standard Corbin #2 or exact equivalent. Minimum of two keys shall be supplied.

The police door-in-door shall be provided with a treasury type lock Corbin No. R357SGS or exact equivalent and have a minimum of one key. All base mounted cabinets require anchor bolts to properly secure the cabinet to its base. The cabinet flange for securing the anchor bolts shall not protrude outward from the bottom of the cabinet. Four anchor bolts shall be required for proper installation.

Each cabinet shall be of sufficient size to accommodate all equipment. At a minimum, the cabinet sizes are as follows:

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POLE MOUNTED CABINETS	GROUND MOUNTED CABINETS
Height - 50 Inches	Height – 55 Inches
Width – 36 Inches	Width – 44 Inches
Depth – 17 Inches	Depth – 26 Inches
Dimensions shall not exceed these minimum dimensions by more than 2 inches.	

Main door shall incorporate a shroud to cover the filtered louvered openings as appropriate for the design. The assembly is secured on the interior of the door over the filtered Louvers. The Shroud is louvered downward and matches the door louvers. All enclosures must be constructed, approved and marked in accordance with the requirements for Type 1 Industrial Control Panel Enclosures contained in UL 508A, the Standard for Industrial Control Panels. Enclosure must meet NEMA 3R rating requirements and be marked with UL approval sticker.

715.42.8.2-Terminals and Facilities/Main panel Design and Construction: The main panel shall be constructed from 5052-H32 brushed aluminum of 0.125 inches minimum thickness and installed so as to minimize flexing when plug-in components are installed. All main panels are provided with a mounting mechanism which allows easy access to all wiring on the rear of the panel without the removal of any cabinet shelves. Lowering of the main panel can be accomplished. Complete removal can be accomplished by the use of simple hand tools.

The terminals and facilities shall be available as a minimum in the following configuration:

- Sixteen load switch sockets, six flash transfer relay sockets, one flasher socket, 2- BIU sockets (expandable to 4), one 16-channel detector rack (expandable to 4) with one BIU, and one Type-16 MMU.

All load switch and flash transfer relay socket reference designators shall be silk-screen labeled on the front and rear of the main panel to match drawing designations. Socket pins shall be marked for reference on the rear of the panel. A maximum of eight load switch sockets may be positioned horizontally or stacked in two rows on the main panel. Main panels requiring more than eight load switch sockets shall be mounted in one horizontal or two vertical rows. All load switches shall be supported by a bracket, extending at least half the length of the load switch. The 16 load switch position main panels shall have all field wires contained on two rows of horizontally mounted terminal blocks. The upper row shall be wired for the pedestrian and overlap field terminations. The lower row shall be reserved for phase one through phase eight vehicle field terminations.

All field output circuits shall be terminated on a non-fused barrier type terminal block with a minimum rating of 10 amps. All field input/output (I/O) terminals shall be identified by permanent alphanumerical labels. All labels shall use standard nomenclature per the NEMA TS2 specification. It shall be possible to flash either the yellow or red indication on any vehicle movement and to change from one color indication to the other by use of a screwdriver. Field terminal blocks shall be wired to use four positions per vehicle or overlap phase (green, yellow, and red, flash). It shall not be necessary to de-buss field terminal blocks for flash programming.

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The main panel shall contain at least one flasher socket (silk screen labeled) capable of operating a 15-amp, 2-pole, NEMA solid-state flasher. The flasher shall be supported by a bracket, extending at least half its length. One RC network shall be wired in parallel with each group of three flash-transfer relays and any other relay coils. All logic-level, NEMA-controller and Malfunction Management Unit input and output terminations on the main panel shall be permanently labeled. Cabinet prints shall identify the function of each terminal position. At a minimum, three 20-position terminal blocks shall be provided at the top of the main panel to provide access to the controller unit's programmable and non-programmable I/O. Terminal blocks for DC signal interfacing shall have a number 6-32 x 7/32 inch screw as minimum.

All main panel wiring shall conform to the following wire size and color:

- Green/Walk load switch output - brown wire - 14 gauge
- Yellow load switch output - yellow wire - 14 gauge
- Red/Don't Walk load switch - red wire output - 14 gauge
- MMU (other than AC power) - violet wire - 22 gauge
- Controller I/O - blue wire - 22 gauge
- AC Line (power panel to - black wire main panel) - 8 gauge
- AC Line (main panel) - black wire - 10 gauge
- AC Neutral (power panel to - white wire main panel) - 8 gauge
- AC Neutral (main panel) - white wire - 10 gauge
- Earth ground (power panel) - green wire - 8 gauge
- Logic ground - gray wire - 22 gauge
- Flash programming - Orange wire
- Flasher terminal - Black wire red or yellow field terminal - 14 gauge

All wiring, 14 AWG and smaller, shall conform to MIL-W-16878/1, type B/N, 600V, 19-strand tinned copper. The wire shall have a minimum of 0.010 inches thick PVC insulation with clear nylon jacket and rated to 105 degrees Celsius. All 12 AWG and larger wire shall have UL listed THHN/THWN 90 degrees Celsius, 600V, 0.020 inches thick PVC insulation and clear nylon jacketed. Connecting cables shall be sleeved in a braided nylon mesh or poly-jacketed. The use of exposed tie wraps or interwoven cables is unacceptable. All Terminals and Facilities configurations shall be provided with BIU wiring assignments consistent with NEMA TS2-2003 specifications. All Terminals and Facilities configurations shall be provided with sufficient RS-485 Port 1 communication cables to allow for the intended operation of that cabinet. Each SDLC communication cable connector shall be a 15-pin metal shell D subminiature type. The cable shall be a shielded cable suitable for RS-485 communications. All main panels shall be pre-wired for a Type-16 Malfunction Management Unit.

All wiring shall be neat in appearance. All cabinet wiring shall be continuous from its point of origin to its termination point. Butt type connections or splices are not acceptable. All connecting cables and wire runs shall be secured by mechanical clamps. Stick-on type clamps are not acceptable. The grounding system in the cabinet shall be divided into three separate circuits (AC Neutral, Earth Ground, and Logic Ground). These ground circuits shall be connected together at a single point as outlined in the NEMA TS2 Standard.

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The main panel shall incorporate a relay, to be designed as K1, to remove +24 VDC from the common side of the load switches when the intersection is placed into mechanical flash. The relay shall have a momentary pushbutton located on the relay to apply power to the load switch inputs for ease of troubleshooting. All pedestrian push button inputs from the field to the controller shall be opto-isolated through the BIU and operate at 12 VAC. All wire (size 16 AWG or smaller) at solder joints shall be hooked or looped around the eyelet or terminal block post prior to soldering to ensure circuit integrity. Lap joint soldering is not acceptable.

715.42.8.3-Power Panel Design and Construction: The power panel shall integrated into the main panel and be located on the lower right portion of the cabinet. The power panel shall be wired to provide the necessary filtered power to the load switches, flasher(s), and power bus assembly. The power components shall be equipped with a removable plastic front cover for protection. The design will allow a technician to access the main and auxiliary breakers without removing the protective front cover.

The power panel portion of the main panel shall include the following components:

a. A minimum of one (1) 40-amp main breaker for 16 position cabinets. This breaker shall supply power to the controller, MMU, signals, cabinet power supply and auxiliary panels. Breakers shall be at minimum, a thermal magnetic type, UL listed for HACR service, with a minimum of 10,000 amp interrupting capacity.
b. A minimum of one (1) 15-amp auxiliary breaker. This breaker shall supply power to the fan, light and GFI utility outlet.
c. An EDCO model SHP-300-10 or exact approved equivalent surge arrester.
d. A 50 amp, 125 VAC radio interference line filter.
e. A normally-open, 50-amp, Solid State Relay (SSR). Shall be Crydom Model Number HA4875H or approved equal.
f. A minimum of one (1) 8-position neutral bus bar is capable of connecting three #12 wires per position.
g. A minimum of one (1) 6-position ground bus bar capable of connecting three #12 wires per position.
h. A minimum of one (1) NEMA type 5-15R GFI utility outlet.
i. The cabinet shall have a roll-out/swing-out concealable shelf/platform that can be used as platform for a laptop computer or other tools when the cabinet door is opened.

715.42.8.4-Power and SDLC Bus Panel: The Power and SDLC BUS Panel shall be manufactured from 0.090 - 0.125", 5052-H32 aluminum. It shall provide a central location to supply filtered power for the controller, malfunction management unit, cabinet power supply, and all auxiliary equipment. It shall include the SDLC Bus connecting cables wired to a barrier type terminal block. As an alternate, SDLC Bus connections may be made via an SDLC Hub Assembly. All cabinet equipment requiring filtered power to operate shall be hardwired directly to the supplied barrier type terminal blocks on the Power and SDLC BUS Panel. All AC+ power sources shall be protected with a removable plastic cover plate. The SDLC Hub Assembly shall accommodate all D-Subminiature Female 15 (DB15) connectors as required, and a minimum of five (5) SLDC connections shall be provided.

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715.42.8.5-Auxiliary Cabinet Equipment: The cabinet shall be provided with a thermostatically controlled (adjustable between 55-160 degrees Fahrenheit) ventilation fan in the top of the cabinet plenum. The fan plate shall be removable with the use of simple hand tools for serviceability. A minimum of one, maximum of two, exhaust fans shall be provided. The fan shall be a ball bearing type fan and shall be capable of drawing a minimum of 100 cubic feet of air per minute (CFM). The Fan/Thermostat assembly shall be connected to the Power panel by means of a 4 position plug-in cable or hardwired to an appropriate circuit breaker.

A LED cabinet lighting system may be used to illuminate the internal structure of the cabinet assembly. The LED cabinet lighting shall be a Luxem Bright LED module Model #772-Woo13 and approved power supply, or approved equivalent. This lighting system shall be wired directly to a door active switch mounted near the top of the door. Alternately, a fluorescent lighting fixture shall be mounted on the inside top of the cabinet near the front edge. The fixture shall be rated to accommodate at minimum a F15T8 lamp operated from a normal power factor UL or ETL listed ballast. The lamp shall be wired on the power panel or to a door activated switch mounted near the top of the door.

A re-sealable print pouch shall be mounted to the door of the cabinet. The pouch shall be of sufficient size to accommodate one complete set of folded cabinet prints. A minimum of two sets of complete and accurate cabinet drawings shall be supplied with each cabinet.

715.42.8.6-Vehicle Detection: A minimum of one Loop Detector rack shall be provided in each cabinet.

- Shall support up to 16 channels of loop detection (either eight 2 channel detectors or four 4 channel detectors), two 2-channel preemption devices and one BIU.

All connections to the back of the detector racks to the detector cards shall be soldered to a 44 terminal, double row, 3.962 mm (0.156 in.) contact spacing, Cinch Jones card edge connector 50-44A-30M, or equivalent centered vertically for each detector module. All designations shall correspond to the requirements of the TS2-2003 specification. Card Guides shall be provided on the top and bottom of the card rack for each connector position. Each cabinet shall contain a detector interface panel per each detector rack for the purpose of connecting field loops and vehicle detector amplifiers. The panels shall be manufactured from 0.090 or 0.125” thick 5052- H32 Aluminum and use barrier type terminal blocks.

One 16-position interface panel shall be provided for a 16-channel rack cabinet. The interface panel shall be secured to the left wall of the cabinet. Each interface panel shall allow for the connection of eight or sixteen independent field loops. A ground bus terminal shall be provided between each loop pair terminal to provide a termination for the loop lead-in cable ground wire. Each interface panel shall provide a barrier style terminal block to terminate the field wires for up to two 2-channel preemption devices.

Lightning protection device mounting holes shall be provided to accommodate the potential usage of an EDCO LCA-6, lightning protection device. A cable consisting of 20 AWG twisted pair wires shall be wired directly from the interface panel to the detector

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rack. The twisted pair wires shall be color coded red and white wire. No connectors shall be used to connect the interface panel to the detector rack.

All termination points shall be identified by a unique number and silk screened on the panel. Each detector rack shall accommodate rack mountable preemption devices such as EMTRAC or Opticom.

715.42.8.7-Cabinet Test Switches and Police Panel: A test switch panel shall be mounted on the inside of the main door. The test switch panel shall provide as a minimum the following**:**

a. SIGNALS ON/OFF SWITCH - In the OFF position, power shall be removed from signal heads in the intersection. The controller shall continue to operate. When in the OFF position, the MMU shall not conflict or require reset.
b. AUTO/FLASH SWITCH - When in the flash position, power shall be maintained to the controller and the intersection shall be placed in flash. The controller shall not be stop timed when in flash. Wired according to NEMA-TS2-2003 the MMU forces the controller to initiate the start-up sequence when existing flash.
c. STOP TIME SWITCH - When applied, the controller shall be stop timed in the current interval.
d. CONTROL EQUIPMENT POWER ON/OFF - This switch shall control the controller, MMU, and cabinet power supply AC power. The TS2 controller to be provided with the cabinet assembly shall provide vehicular and pedestrian call inputs from its keyboard while in the standard status display.

The police door switch panel shall contain the following:

a. SIGNALS ON/OFF SWITCH - In the OFF position, power shall be removed from signal heads within the intersection. The controller shall continue to operate. When in the OFF position, the MMU shall not conflict or require reset.
b. AUTO/FLASH SWITCH – When in the flash position, power shall be maintained to the controller and the intersection shall be placed in flash. The controller shall be stop timed when in flash. Wired according to NEMA-TS2-1998 the MMU forces the controller to initiate the start-up sequence when exiting flash.
c. AUTO/MANUAL SWITCH - Cabinet wiring shall include provisions for an AUTO/MANUAL switch and a momentary push button or hand cord. The AUTO/MANUAL switch and push button or hand cord shall not be provided unless it is called for in the CUSTOMER SPECIFICATION.

All toggle type switches shall be heavy duty and rated 15 amps minimum. Single- or double-pole switches may be provided, as required. Any exposed terminals or switch solder points shall be covered with a non-flexible shield to prevent accidental contact. All switch functions must be permanently and clearly labeled. All wire routed to the police door-in-door and test switch push button panel shall be adequately protected against damage from repetitive opening and closing of the main door.

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715.42.8.8-Auxiliary Devices:

715.42.8.8.1 - Load Switches: Load switches shall be solid state and shall conform to the requirements of Section 6.2 of the NEMA TS2 Standard. Signal load switches shall have a minimum rating of 10 amperes at 120 VAC for an incandescent lamp load. The front of the load switch shall be provided with three indicators to show the input signal from the controller to the load switch. Load switches shall be dedicated per phase. The use of load switches for other partial phases is not acceptable. The full complement of load switches shall be supplied with each cabinet to allow for maximum phase utilization for which the cabinet is designed.

715.42.8.8.2 – Flashers: The flasher shall be solid state and shall conform to the requirements of section 6.3 of the NEMA TS2 Standard. Flashing of field circuits for the purpose of intersection flash shall be accomplished by a separate flasher. The flasher shall be rated at 15 amperes, double pole with a nominal flash rate of 60 FPM. A full compliment of flasher shall be provided.

715.42.8.8.3-Flash Transfer Relays: All flash transfer relays shall meet the requirements of Section 6.4 of the NEMA TS2 Standard. The coil of the flash transfer relay must be de-energized for flash operation. The full complement of relays shall be supplied with each cabinet to allow for maximum phase utilization for which the cabinet is designed.

715.42.8.8.4-Malfunction Management Units (MMU): Each cabinet assembly shall be supplied with one MMU as defined by the requirements of Section 4 of the NEMA TS2 Standard.

Malfunction Management Units shall be a Type 16. The MMU shall be Model MMU-16 (EDI Model MMU-16) or approved equal.

715.42.8.8.5-Bus Interface Units (BIU): All BIUs shall meet the requirements of Section 8 of the NEMA TS2 Standard. A full complement of BIUs meeting Section 5.3.1.4 if the NEMA Publication No. TS2-2003 shall be supplied per cabinet. Bus Interface Units shall be supplied with each cabinet to allow for maximum phase and function utilization for which the cabinet is designed. A minimum of 3 BIUs shall be provided for each cabinet. Each Bus Interface Unit shall include power on, transmit and valid data indicators - all indicators shall be LEDs. A Type 1 Interface shall be defined as defined by Section 5.3, the controller interface shall conform to the Standard Publication NO. TS2-2003.

715.42.8.8.6-Cabinet Power Supply: The Cabinet power supply shall meet the requirements of Section 5.3.5 of the NEMA TS2 Standard. The Cabinet Power supply shall provide LED indicators for the line frequency, 12 VDC, 12 VAC, and 24 VDC outputs. The cabinet power supply shall provide (on the front panel) jack plugs for access to the +24 VDC for test purposes. Cabinet power supply shall be provide with each cabinet assembly per manufacturer's specifications. And be wired directly to the Power Bus Assembly via a 12-pin Molex Robotic type connector Model# 54332-1270or exact equivalent.

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715.42.8.9-Testing: Each controller and cabinet assembly shall be tested as a complete entity under signal load for a minimum of 48 hours. Each assembly shall be delivered with a signed document detailing the cabinet final tests performed. The cabinet shall be assembled and tested by the controller manufacturer or authorized local distributor to ensure proper component integration and operation.

715.42.8.10-Warranty: The controller and Malfunction Management Unit shall be warranted by the manufacturer against mechanical and electrical defects for a period of two years from date of shipment. The manufacturer's warranty shall be supplied in writing with each cabinet and controller. Second party extended warranties are not acceptable. The cabinet assembly and all other components shall be warranted for a period of one year from date of shipment. Any defects shall be corrected by the manufacturer at no cost to the owner.

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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

FOR

SECTION 715
MISCELLANEOUS MATERIALS

715.42.10 – Electrical Conduit:

ADD THE FOLLOWING SUBSECTION:

715.42.10.4-Type H (High Density Polyethylene "HDPE"): Type H conduit shall be extruded from virgin HDPE resin, in accordance with the requirements of ASTM D3350 with cell classification 345440C.

a. Stabilized against thermal and UV degradation
b. Conduit to be of a continuous length, smooth walled with a low friction internal surface containing no welds or joints and coiled on a reel.
c. Dimensions: Schedule 40 for under roadways, driveways, or sidewalks.
d. Suitable for the following installation methods: Directional Bore.
e. Where 3" HDPE conduit is indicated in the Drawings, the Contractor may elect to use pre-installed cable-in-conduit. Cable type and quantity is indicated on the drawings.
f. Conduit color: Black.
g. Standards: ASTM D2447, ASTM D3350, ASTM D3485, UL 651B.
h. This item shall be bid under Item 662004-001, HDPE Conduit and paid for on a per linear foot basis.