

March 2026 Specifications Committee Meeting

SPECIFICATIONS COMMITTEE MEETING AGENDA

Meeting Date

Tuesday, March 17, 2025 @ 10:00AM

Meeting Location: 190 Dry Branch Drive, Library, MCS&T Division, Charleston, WV

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

Approved Supplemental Specification changes from last Committee meeting (01/27/26)

- **None.**

Approved Special Provisions (SP) from last Committee meeting (01/27/26)

- **SP 697-Safety Inspection of In-Service Bridges During Construction:** The revision updates names for NBI inspection and reduces the time to submit reports to align better with Consultant Inspection Contracts.
- **SP Electronic Submission of Payrolls and Subcontractor Payments:** The revision clarifies language and use while removing all references to Disadvantaged Business Enterprises (DBE's).

Items Removed from the Agenda:

To bring back with more updates in the future:

- **642.6-Silt Fence and 642.7-Method of Measurement:**
- **Section 601.1–Description, 601.2– Materials, 601.3- Proportioning, 601.4- Testing, 601.8-Forms, 601.9-Adverse Weather Conditions, 601.10-Placing Concrete, 601.12-Curing and Protecting Concrete:** WVU was contracted to research and develop a specification for mass concrete. More updates to come later this year.
- **Section 720-Smoothness Testing:** The item was withdrawn following the February Joint Asphalt Subcommittee meeting. It will be reintroduced in May with updated information.

Important Announcements:

The **2026 Supplemental Specifications** are available on the MCS&T webpage:

<https://transportation.wv.gov/highways/mcst/Pages/specifications.aspx>

- Physical copies of the 2026 Supplemental Specifications will be available for purchase once production is complete. We are currently reviewing the proofs. An announcement will be made when printed copies are ready.

March 2026 Specifications Committee Meeting

Old Business Items

SECTION	TITLE	DESCRIPTION
<u>SP601</u>	Special Provision 601 “Class S Concrete”	2nd time to Committee. (January, & March) Special Provision 601 for Class S Concrete, proposing changes to subsection 601.3-Proportioning. The revision expands upon the section referring to shrinkage and updates reference section numbers.
	A. Thaxton	<i>Approval is expected in March</i>
<u>651</u>	Section 651-Furnishing and Placing Soil	7th time to Committee. (January, March, May, July, September, December 2025, and March 2026)
<u>652</u>	Section 652-Seeding and Mulching	Three specification changes updating the requirements for seeding and mulching.
<u>715</u>	Section 715.25-715.32 (Ground Agricultural Limestone, Fertilizers, Mulch Material, Seed, Inoculating Bacteria, Biological Growth Stimulants, and Hydraulic Growth Material)	<ol style="list-style-type: none"> 1. Section 651-Furnishing and Placing Soil 2. Section 652-Seeding and Mulching a. Updated from the last meeting. 3. Section 715.25-715.32 <ol style="list-style-type: none"> a. (Ground Agricultural Limestone, Fertilizers, Mulch Material, Seed, Inoculating Bacteria, Biological Growth Stimulants, and Hydraulic Growth Material) b. Updated from the last meeting. <p>Specifications have been updated and are redlined show the revisions. A “Clean” version of Section 652 is shown, due to the amount of changes.</p> <p>A meeting outside of Committee was held in February to review and discuss seeding and mulching specifications.</p>
	D. Kirk	

New Business Items

<u>SP 106</u>	SP 106.1.4-Use of Domestic Construction Materials (De Minimis Standard)	1st time to Committee. Special Provision for Section 106-Control of Materials, Subsection 106.1.4- Use of Domestic Construction Materials. The revision adds language to Subsection 106.1.4 incorporating the FHWA Build America, Buy America (BABA) De Minimis standard.
	D. Brayack	

March 2026 Specifications Committee Meeting

<p><u>SP106</u> <u>&</u> <u>106</u></p>	<p>SP 106-Build America Buy America (2026)</p> <p>Subsections 106.1.1-Definitions & 106.1.5-State and/or Federal Use of Manufactured Products</p> <p>D. Brayack</p>	<p>1st time to Committee. Special Provision and Supplemental Specification for Section 106-Control of Materials, Subsection 106.1.1-Definitions and 106.1.5- State and/or Federal Use of Manufactured Products.</p> <ul style="list-style-type: none"> • Subsection 106.1.1: The revision adds the definition of Fifty-Five Percent (55%) Requirement. • Subsection 106.1.5: The revision reflects changes to 23 CFR 635.410. All Manufactured Products and Final Assembly shall occur in America. Manufactured products shall meet the 55% Requirement. <p style="color: red;">*****THIS WILL NEED TO BE ADDED TO PROPOSALS WHEN THE PROJECT IS AUTHORIZED BY THE FEDS ON 10/1/2026 OR LATER.*****</p>
<p><u>SP 115</u> <u>&</u> <u>SP 614</u></p>	<p>SP 115-Job Order Contracting (JOC)</p> <p>SP 614-Piling Walls</p> <p>S. Boggs</p>	<p>1st time to Committee. Two Special Provisions:</p> <ol style="list-style-type: none"> 1. SP 115-Job Order Contracting (JOC). This Special Provisions establishes JOC as a contracting method for the WVDOH. Under this method: <ul style="list-style-type: none"> • WVDOH competitively awards a master agreement. • Individual Job Orders are then issued under that Master Agreement. • Each Job Order functions as its own separate construction contract, defining scope, locations, quantities, schedule, and requirements. <p>Initially, this Special Provision will be used for piling wall projects, but WVDOH may expand it to other types of work in the future.</p> 2. SP 614-Piling Walls. <ul style="list-style-type: none"> • Requires steel piles to be classified and paid by HCSI, as determined by the Division’s Geotechnical Engineer. For SP 115 projects, the highest HCSI shown in the Abbreviated PS&E applies to all piling.

March 2026 Specifications Committee Meeting

<p><u>SP 645</u></p>	<p>SP 645-Reinforced Soil Slopes (EPS)</p> <p>S. Lewis</p>	<p>1st time to Committee. This Special Provision (SP) defines the physical properties, testing methods, and performance requirements for Standard Expanded Polystyrene (S-EPS). It also establishes specifications for geotextile separation fabric and incorporates the requirements of SP 708 – Neoprene Sheet for Semi-Integral Abutments, where applicable.</p>
<p><u>660</u></p>	<p>660.9-Loop Traffic Detectors</p> <p>T. Nichols</p>	<p>1st time to Committee. Specification update to Section 660.9-Loop Traffic Detectors. This revision adds the new section 660.9.1-Loop Traffic Sealant, which overhauls an existing paragraph within 660.9. This specification update ensures loop sealants are properly tested to ASTM D2240 and correctly applied to the road surface.</p>
<p><u>SP 636</u></p>	<p>SP 636-Temporary Pavement Markings-Orange</p> <p>T. Whitmore</p>	<p>1st time to Committee. This Special Provision covers the furnishing, application, maintenance, and removal of temporary orange pavement markings used for traffic control within active work zones. The provision is to be used on an experimental project.</p>
<p><u>PSSP 636</u></p>	<p>PSSP 636.22-Portable Queue Detection System</p> <p>D. Ahmad</p>	<p>1st time to Committee. This is a Project Specific Special Provision 636.22-Portable Queue Detection Systems which will be used only on the Eugene Carter +3 Project. This Project Specific Special Provision establishes requirements for providing a fully automated, trailer-mounted system to monitor work zone traffic conditions and deliver real time queue and travel time information.</p>
<p><u>662</u></p>	<p>662.2.3.5-Electrical Conduit & 662.17-Pay Items</p> <p>R. Tabassum</p>	<p>1st time to Committee. An approved Special Provision from March 2025, now to be a supplemental specification. The proposed supplemental specification adds Subsection 662.2.3.5 – Type PR (PVC-Coated Rigid Galvanized Steel Conduit “PVC-RGS”) and adds a pay item.</p>
<p><u>715</u></p>	<p>715.42.10-Electrical Conduit</p> <p>R. Tabassum</p>	<p>1st time to Committee. An approved Special Provision from March 2025, now to be a supplemental specification. The revision will replace the current subsection.</p>

March 2026 Specifications Committee Meeting

Deadline for new items & updates for the May 5, 2026 Meeting are **due April 10, 2026.**

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/revise your items in a timely manner per Specification Committee Guidelines.

NOTE: Failure to submit updates may result in removal of item and/or delays.

Comments

Comments are requested for Specifications Changes and Project Specific Special Provisions as they help in the decision-making process. Please send comments by Friday prior to the meeting!

Please Send Comments to: Jacinda.n.Chapman@WV.gov

File Format Structure and Progression of items through Specifications Committee

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

NEW BUSINESS ITEMS:

New items should be setup & submitted in the following format along with a brief overview of the item or reason for the change:

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

NOTE: Red-line copy is a form of editing which indicates removal or addition of text. You can redline a Microsoft Word document by using the built-in “Track Changes” feature.

OLD BUSINESS ITEMS:

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

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

PROGRESSION OF ITEMS THRU COMMITTEE AND APPROVAL:

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

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

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

SECTION 601
STRUCTURAL CONCRETE

601.1-DESCRIPTION:

ADD THE FOLLOWING AFTER THE TENTH PARAGRAPH IN THE SUBSECTION:

Class S concrete shall be used for bridge decks and other bridge elements when designated in the plans. This mix shall be used to produce a concrete of high durability with low shrinkage potential.

601.2-MATERIALS:

ADD THE FOLLOWING TO THE TABLE:

MATERIAL	SECTION OR SUBSECTION
Expansive Hydraulic Cement	701.5

601.3-PROPORTIONING:

ADD THE FOLLOWING AFTER THE FIFTH PARAGRAPH:

Design mixture testing for Class S concrete shall be in accordance with MP 711.03.23 and shall include air content, slump, compressive strength, surface resistivity, sequential air method (SAM) number, and shrinkage tests. The Contractor shall complete the following tests for mix design acceptance of Class S concrete before mix design submittal and approval:

- **Surface Resistivity-** For establishment of the mixture proportions, specimens for surface resistivity tests shall be made on representative samples prepared and tested in accordance with AASHTO T 358. A set of three 4-inch x 8-inch

cylinders shall be fabricated and moist cured from both of the batches at the minimum cement factor as outlined in Section ~~4.3.1 3.3~~ of MP 711.03.23, as specified in AASHTO R 39, for 28 days prior to testing, and the results of this test shall not be less than 40 kΩ-cm.

- **SAM number-** For establishment of the mixture proportions, SAM number tests shall be performed on a representative sample from both of the batches at the minimum cement factor as outlined in Section ~~3.34.3.1~~ of MP 711.03.23. These samples shall be prepared and tested in accordance with AASHTO T 395. The SAM number for both of these samples shall be less than or equal to 0.20.
- **Shrinkage-** For establishment of the mixture proportions with Portland cement, the 28-day drying shrinkage shall not exceed 0.035% based on average of three specimens from a representative sample from one of the batches at the minimum cement factor as outlined in Section ~~4.3.1 3.3~~ of MP 711.03.23. ~~This sample shall be tested in accordance with ASTM C157. Specimens shall be moist cured for 7 days before beginning the 28-drying shrinkage testing. The time that the specimens are stored in lime-saturated water, specified in Section 10.3 of ASTM C157, shall be 7 days instead of 28 days, including the time in the molds. At the end of that 7 day water storage period, the specimens shall be removed from the lime-saturated water and stored in air, at the conditions specified in Section 5.4.1 of ASTM C157, for an additional 28 days. At the completion of that air storage period, a second comparator reading shall be taken.~~

For establishment of the mixture proportions with Expansive hydraulic cement, the 28-day drying shrinkage shall not exceed 0.035% based on average of three specimens from a representative sample one of the batches at the minimum cement factor as outlined in Section ~~4.3.1 3.3~~ of MP 711.03.23. This sample shall be tested in accordance with ASTM C878. The initial 7-day expansion shall range from 0.03% to 0.06%. Specimens shall be moist cured for 7 days before beginning the 28-drying shrinkage testing.

The cost of all test mix requirements shall be considered incidental to the cost of Class S concrete.

601.3.1-Mix Design Requirements:

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

Prior to the start of construction, the Contractor shall design and submit to the Engineer for approval the proportion of materials, including admixtures, to be used which will result in a workable concrete having the applicable properties enumerated below, including those of Table 601.3.1A. A mix design prepared in accordance with MP 711.03.23, shall be required for each class of concrete to be used in the work. The mix design shall be accompanied by a statement giving 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 the work, since such change may necessitate a new mix design. The Contractor shall also state the \bar{A} value of the fine aggregate and the \bar{A} value of the combined grading of

the coarse aggregate, fine aggregate, and cement used in the mix design. Each mix design shall remain approved for a period of three years from the date of approval, after which the mix design may be re-approved for an additional time period. The guidelines for this re-approval process are set forth in MP 711.03.23.

Approved Hydration Control Stabilizing Admixtures, as defined in subsection 707.15, which are designed to stop the hydration of cement in a concrete mix, enabling an extension to the allowable discharge time from a truck mixer as outlined in subsection 601.7, may be added to an existing approved concrete mix design in accordance with the procedures outlined in MP 711.03.23.

TABLE 601.3.1A

Class of Concrete	Design 28 Day Compressive Strength	Target Cement Factor	Maximum Water Content	Standard Size of Coarse Aggregate***	Entrained Air
	Pounds per Square inch	lbs./c.y.*	lb. of water / lb. of cement **	Number	Percent
A	3500	682	0.51	7, 78, or 8	7.5
K	4000	658	0.44	57, 67	7.0
B	3000	564	0.49	57, 67	7.0
C	2500	494	0.58	57, 67	6.0
D	2000	400	0.62	57, 67	5.5
H	4000	See Table 601.3.1C	0.40	57, 67	6.5
DC	4500	705	0.44	7, 78, 8	6.0

* An equal mass of a SCM may be substituted for Portland cement up to the maximum amount in Table 601.3.1B. Only one SCM is permitted in a mix design, except for Class H concrete. The target cement factor of Class H concrete shall consist of Option 1 or Option 2 from Table 601.3.1C. The Contractor may choose either option.

** When using a SCM, masses of these materials shall be considered as cement for purposes of establishing maximum water content.

*** A number 67 coarse aggregate may be used in Class DC concrete, provided the Engineer approves the use of that size aggregate for the specific project on which it is to be used. That approval will depend on the minimum spacing of the reinforcing steel in the drilled shaft foundation.

TABLE 601.3.1B

Material	Class of Concrete	Quantity
Fly Ash	All Classes Except H	20%
Slag Cement	All Classes Except H	50%
Silica Fume	All Classes Except H	8%

TABLE 601.3.1C

Option	Cement	Fly Ash	Slag Cement	Silica Fume
1	470 lbs.	132 lbs.		30 lbs.
2	423 lbs.		195 lbs.	30 lbs.

MP 711.03.26 shall be used to control the cement factor in all classes of concrete except Class H and Class S.

The Contractor may develop mix designs with a reduced target cement factor as indicated in Table 601.3.1D in lieu of Table 601.3.1A, provided the aggregates used in those mix designs meet the requirements for optimized aggregate gradation in subsection 601.3.2.4.1. The \bar{A} requirements will not apply for mix designs that use optimized aggregate gradation.

The Contractor shall develop Class S mix designs according to the requirements of Table 601.3.1D. The aggregates used in Class S mix designs shall meet the requirements for optimized aggregate gradation in subsection 601.3.2.4.1. The \bar{A} requirements will not apply to Class S concrete.

TABLE 601.3.1D

Class of concrete	Design 28 Day Compressive Strength	Target Cement Factor	Maximum Water Content	Nominal Maximum Aggregate Size	Entrained Air
	Pounds per Square inch	lbs./c.y. ^{Note 1}	lb. of water/lb. of cement ^{Note 2}	Inches	Percent
A	3,500	642	0.51	½ or ¾	7.5
K	4,000	618	0.44	1 or ¾	7.0
B	3,000	524	0.49	1 or ¾	7.0
C	2,500	454	0.58	1 or ¾	6.0
D	2,000	360	0.62	1 or ¾	5.5
H	4,000	See Table 601.3.1E	0.40	1 or ¾	6.5
S	4,000	600	0.42 ^{Note 4}	1 or ¾	6.5
DC ^{Note 3}	4,500	665	0.44	½ or ¾	6.0

^{Note 1} An equal mass of a SCM may be substituted for Portland cement up to the maximum amount in Table 601.3.1B. Only one SCM is permitted in a mix design, except for Class H concrete. The target cement factor of Class H concrete shall consist of Option 1 or Option 2 from Table 601.3.1E. The Contractor may choose either option. This footnote does not apply to Class S concrete for the substitution of a SCM for cement. The substitution of a SCM for cement is specified in the last paragraph of this subsection.

^{Note 2} When using a SCM, masses of these materials shall be considered as cement for purposes of establishing maximum water content.

^{Note 3} Nominal maximum aggregate size of ¾ inches may be used in Class DC concrete, provided the Engineer approves the use of that size aggregate for the specific project on which it is to be used. That approval will depend on the minimum spacing of the reinforcing steel in the drilled shaft foundation.

^{Note 4} The maximum water content for a mix design with Expansive hydraulic cement may be increased to 0.45.

TABLE 601.3.1E

Option	Cement	Fly Ash	Slag Cement	Silica Fume
1	440 lbs.	127 lbs.		25 lbs.
2	397 lbs.		186 lbs.	25 lbs.

The target cement factor for Class S concrete shall include at least one of the SCMs from Table 601.3.1F as a replacement portion by equal mass. The SCM(s) shall be limited to not more than two of the SCMs listed in Table in 601.3.1F. However, the maximum replacement percentage for

any individual SCM shall not be exceeded, and the total replacement percentage of any combination of SCMs shall not exceed 50%.

TABLE 601.3.1F

Material	Quantity	
	Minimum %	Maximum %
Fly Ash	15	25
Slag Cement	25	50
Silica Fume	6	10

601.3.1.1-Mix Design Using Potentially Reactive Aggregate:
601.3.1.1.1-Selecting Preventive Measures For ASR:
601.3.1.1.1.3-Level of Prevention:

DELETE THE TABLE AND REPLACE WITH FOLLOWING:

TABLE 601.3.1.1.1.3
Determining the Level of Prevention

Level of ASR Risk	Classes of Concrete		Precast Concrete Member	Prestressed Concrete Member
	D	A, B, C, K, H, S, DC		
Risk Level 0	V	V		V
Risk Level 1	W	X		Y
Risk Level 2	X	Y		Z
Risk Level 3	Y	Z		See footnote**

** It is not permitted to construct prestressed concrete members (Section 603) with Aggregate Reactivity Class of R3. Measures must be taken to reduce the level of risk in these circumstances by selecting the aggregates only from the Reactivity Classes of R0, R1, or R2.

601.3.1.1-Mix Design Using Potentially Reactive Aggregate:
601.3.1.1.1-Selecting Preventive Measures For ASR:
601.3.1.1.1.4-Requirements for Various Prevention Levels:

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

These requirements shall apply to all classes of concrete except Class H and Class S. The prevention levels for Class H and Class S concrete is specified in subsection 601.3.1.1.1.5.

601.3.1.1-Mix Design Using Potentially Reactive Aggregate:
601.3.1.1.1-Selecting Preventive Measures For ASR:
601.3.1.1.1.4-Requirements for Various Prevention Levels:
601.3.1.1.1.4.2-Preventions Level W, X and Y:

DELETE AND REPLACE THE CONTENTS OF TABLE 601.3.1.1.1.4.2b WITH THE FOLLOWING:

**TABLE 601.3.1.1.1.4.2b
Minimum Replacement Level of SCM (percentage by mass of cementitious material)**

Type of SCM*****	Alkali Content of SCM* (Na ₂ O _e)	Level W	Level X	Level Y
Fly ash** (Cao ≤18%)	≤3.0	15	20	25*****
	>3.0, ≤4.5	20	25*****	Not Allowed
Slag Cement	≤1.0	25	35	50
Silica Fume***	≤1.0	1.2 x LBA or 2.0 x KGA	1.5 x LBA or 2.5 x KGA	1.8 x LBA or 3.0 x KGA

* The alkali content of all approved SCM sources is listed on the WVDOH approved list of SCMs (APL). If the alkali content of an SCM source is not listed on the APL, the Division will test the SCM from the source to determine the alkali content prior to its use on any WVDOH project.

** The CaO content of approved fly ash sources is listed on the WVDOH approved list of fly ash (APL). If the CaO content of a fly ash source is not listed on the APL, the Division will test the fly ash from the source to determine the CaO content prior to its use on any WVDOH project.

***The minimum level of silica fume (as a percentage by mass of cementitious material) is calculated on the basis of the alkali (Na₂O_e) content of the concrete contributed by the Portland cement and expressed in lb/yd³ (LBA in Table 601.3.1.1.1.4.2b). LBA is calculated by multiplying the cement content of the concrete in lb/yd³ by the alkali content of cement divided by 100. For example, for a concrete containing 500 lb/yd³ of cement with an equivalent alkali content of 0.81 percent of Na₂O_e, the value of LBA = 500 x 0.81/100 = 4.05 lb/yd³. For this concrete, the minimum replacement level of silica fume for Level Y is 1.8 x 4.05 = 7.3 percent. Regardless of the calculated value, the minimum level of silica fume shall not be less than 7 percent when it is only method of prevention. Mix design with silica fume > 8% shall be reviewed and approved by the Engineer.

**** Mix designs with minimum 25% of fly ash shall be reviewed and approved by the Engineer.

***** If two SCMs are used in Class S concrete in combination, the minimum mass replacement levels given in Table 601.3.1.1.1.4.2b for the individual SCMs may be reduced, provided the sum of the parts of each SCM is greater than or equal to one. For example, if silica fume and slag cement are used together, the silica fume level may be reduced to one-third of the minimum silica fume level in the Table 601.3.1.1.1.4.2b provided the slag cement is at least two-thirds of the minimum slag level required.

Note: The minimum replacement levels in Table 601.3.1.1.1.4.2b are appropriate for use with Portland cements of moderate to high alkali contents (0.71 to 1.00 percent Na₂O_e). Table 601.3.1.1.1.4.2c provides recommendations for adjusting the level of SCM when the equivalent alkali content of the Portland cement is above or below this range. The replacement levels should not be below those given in Table 601.3.1.1.1.4.2b for prevention level W, regardless of the equivalent alkali content of the Portland cement.

DELETE AND REPLACE THE CONTENTS OF OPTION 3 WITH THE FOLLOWING:

Option 3: Using the Lithium Nitrate Admixture: The 30 percent (30%) aqueous solution of Lithium Nitrate Admixture meeting the requirements of subsection 707.17 shall be used for all level of prevention including “Level Z” given in Table 601.3.1.1.1.3 except for Class H and Class S concrete. The dosage rate of Lithium Nitrate Admixture shall be based upon the alkali content of cement used in a concrete mix.

Calculation of lithium nitrate (LiNO₃) admixture dosage (100 percent) for mitigation without use of SCMs with a 30 percent (30%) aqueous solution of lithium nitrate.

$$\text{Gallons of LiNO}_3/\text{yd}^3 = (A \times B \times 0.55)/100$$

Where:

A = Pound of Portland cement per cubic yard in a concrete mix

B = Percentage of Alkali content of cement used in a concrete mix

Example: If the cement content of concrete is 550 lbs/yd³ and the total alkali content of the cement is 0.82 percent (0.82%), the dosage of lithium nitrate admixture is: $(550 \times 0.82 \times 0.55)/100 = 2.48 \text{ Gal/yd}^3$.

The water content of the mix shall be adjusted by removing 0.85 gallons of water per gallon of lithium nitrate solution.

Example: Amount of water to be reduced (using the value from above example) $\text{Gal/yd}^3 = 0.85 \times 2.48 = 2.11$

Any concrete mix using a 100 percent (100%) lithium nitrate admixture dosage will be accepted without evaluation. The contractor shall evaluate the effectiveness of less than 100 percent (100%) lithium nitrate admixture in a concrete mix, alone or in combination with fly ash or slag cement or silica fume, in the reduction of expansion in accordance with ASTM C1567*, when a reactive aggregate(s) is (are) used in a concrete mix, at a Division approved lab (an AASHTO accredited Lab, accredited for ASTM C1567) at the contractor's expense. The dosage rate shall not be less than 50 percent (50 %) when only a lithium nitrate admixture is using for evaluation and no SCMs are included in the concrete mix. The sampling and shipping of all aggregate shall be witnessed by a representative of the Division. The ASTM C1567 test results will be considered valid for 5 years from the date of testing.

If both of the aggregates (coarse and fine) used in a concrete mix are reactive (R1, R2 or R3), the contractor shall evaluate the effectiveness of the lithium nitrate admixture, alone or in combination with fly ash or slag cement or silica fume for both of the aggregates separately. When the same source material** is proposed for the use both as coarse and as fine aggregate, test only a selection of the reactive fine aggregate or reactive coarse aggregate, unless there is reason to expect that the coarse aggregate has a different composition than the fine aggregate or vice-versa. The combination of cement, lithium nitrate admixture, alone or in combination with fly ash or slag cement or silica fume, and aggregate that expands less than 0.10% at 16 days after casting will be considered as meeting the "Requirements for Various Prevention Levels (subsection 601.3.1.1.1.4)" except for Class H and Class S concrete.

The approved lithium nitrate admixture shall meet the requirements of subsection 707.17 and will be listed as "Type S" admixture with footnote of approved admixture for ASR mitigation on the MCS&T web page under Division Approved Source/Product Listing (APL) for Type S: Special Performance. The alkali level of fly ash used in the subject mix shall not exceed 4.5%. The alkali level of slag cement used in the subject mix shall not exceed 1.00%. The alkali level of silica fume used in the subject mix shall not exceed 1.00%. Mix design shall be reviewed and approved by the Engineer.

- * Modify the w/c ratio of the mortar used in the ASTM C1567 test to 0.50.
- Replace Section 5.3 (Sodium Hydroxide Solution) of ASTM C1567 with the

following: Sodium Hydroxide Solution - Each liter of solution shall contain 40.0 g of NaOH dissolved in 800 ml of water. Add 71 ml of the lithium nitrate admixture multiplied by the decimal equivalent of the lithium nitrate admixture dosage. (For example, to test a 75% lithium nitrate admixture dosage, each liter of solution will contain 0.75 times 71 ml of lithium nitrate admixture.) This mixture shall be diluted with additional distilled or deionized water to obtain 1.0 liter of solution. The volume proportion of soaking solution to mortar bars in a storage container shall be 4 ± 0.5 volumes of solution to 1 volume of mortar bars. The volume of a mortar bar may be taken as 184 ml. Include sufficient test solution to ensure complete immersion of the mortar bars.

** Same source material applies to same Limestone, Diabase, Quartzite and Basalt source.

601.3.1.1-Mix Design Using Potentially Reactive Aggregate:

601.3.1.1.1-Selecting Preventive Measures For ASR:

601.3.1.1.1.5-Requirements for Various Prevention Levels for Class H Concrete:

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

601.3.1.1.1.5-Requirements for Various Prevention Levels for Class H and Class S Concrete:

601.3.1.1-Mix Design Using Potentially Reactive Aggregate:

601.3.1.1.1-Selecting Preventive Measures For ASR:

601.3.1.1.1.6-Evaluation of the effectiveness of SCM to prevent deleterious expansion:

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

The contractor may evaluate the effectiveness of an SCM in the reduction of expansion in accordance with ASTM C1567*, when a reactive aggregate(s) is (are) used in a concrete mix, at a Division approved lab (an AASHTO accredited Lab, accredited for ASTM C1567) at the contractor’s expense. The sampling and shipping of all aggregate shall be witnessed by a representative of the Division. ASTM C1567 test will be considered valid for 5 years from the date of testing.

If both of the aggregates (coarse and fine) used in a concrete mix are reactive (R1, R2 or R3), the contractor shall evaluate the effectiveness of SCM for both of the aggregates separately. When the same source material** is proposed for the use both as coarse and as fine aggregate, test only a selection of the reactive fine aggregate or reactive coarse aggregate, unless there is reason to expect that the coarse aggregate has a different composition than the fine aggregate or vice-versa. The combination of cement, SCM and aggregate that expand less than 0.10% at 16 days after casting will be considered as meeting the “Requirements for Various Prevention Levels (subsection 601.3.1.1.4)” except for Class H and Class S concrete. The evaluation with the higher percentage of SCM

replacement shall be selected for the minimum replacement level of SCM for prevention level in a mix design using potentially reactive aggregate.

When more than one mix design, for the same Producer/Supplier, is submitted for evaluation, only one evaluation of the effectiveness of an SCM in the reduction of expansion in accordance with ASTM C1567 testing data, as outlined in paragraphs first through four of this subsection, will be required for that entire group of mix designs (except Class H and Class S) if all of the mix design in that entire group of mix designs have the same combination of cement, SCM and aggregate sources.

The alkali level of fly ash shall not exceed 4.5%. The alkali level of slag cement shall not exceed 1.00%. The alkali level of silica fume shall not exceed 1.00%. Mix designs with minimum 25% of fly ash shall be reviewed and approved by the Engineer. Mix design with silica fume > 8% shall be reviewed and approved by the Engineer.

- * Modify the w/c ratio of the mortar used in the ASTM C1567 test to 0.50.
- ** Same source material applies to same Limestone, Diabase, Quartzite and Basalt source.

601.3.2-Field Tolerances and Adjustments:

601.3.2.1-Consistency:

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

Upon addition of a superplasticizer at the job site, the mixing drum shall be turned for a minimum of 60 revolutions or 5 minutes at mixing speed to establish a workable mixture of uniform composition and consistency. If a second job site addition of superplasticizer is used; the mixing drum shall be turned a minimum of 30 additional revolutions at mixing speed. All additions and mixing of the superplasticizer shall be completed before placement of the concrete is started. The total number of revolutions shall not exceed 300, and the concrete shall be discharged within the time limits in subsection 601.7. The slump of Class H and Class S concrete shall not exceed seven (7) inches under any circumstances.

601.3.2.2-Air Content:

DELETE THE SECTION AND REPLACE WITH THE FOLLOWING:

The target value of the entrained air at the point of placement shall be as shown in Tables 601.3.1A and D. However, when pumping concrete, the air content shall be measured before the concrete pump, and the target value of the entrained air shall be as shown in Tables 601.3.1A and D at that point. If the entrained air does not conform with the target value within plus or minus 2.5 percentage points, the Contractor shall take immediate steps to adjust the air content of succeeding loads by making necessary adjustments in the mixture. The air content shall be measured on loads already batched and enroute, as well as the first load to which any adjustments were made in batching procedures. If the air content exceeds the target value plus 3.0 percentage points the concrete shall be rejected. When the concrete is delivered in a truck mixer and the air content is less than the target value minus 2.5 percentage points the concrete shall be rejected, or the Contractor may use additional air entraining agent in an amount that is

intended to achieve the target value specified. The addition is permitted under the conditions listed below. The target of the entrained air content of Class H and Class S concrete at the time of placement shall be as shown in Tables 601.3.1A and D. If the entrained air does not conform with the target value within plus or minus 1.5 percentage points, the Contractor shall take immediate steps to adjust the air content of succeeding loads by making necessary adjustments in the mixture. If the entrained air content of Class H and Class S concrete does not conform to the target value plus 2.0 percentage points, the concrete shall be rejected. When Class H or Class S concrete is delivered in a truck mixer and the air content is less than the target value minus 2.0 percentage points, the concrete shall be rejected, or the Contractor may use additional air-entraining agent in an amount that is intended to achieve the target value specified. The addition is permitted under the conditions listed below.

- i. The air entraining agent is the same as used in the approved mix design and is thoroughly mixed with a minimum of 2 gallons of water. The solution will be directed to the front of the mixer.
- ii. The mixer is turned a minimum of 30 revolutions, at mixing speed, or the number of revolutions established in tests to comply with uniformity requirements, whichever is more.

Immediately after mixing, the air content and slump shall be measured by a certified inspector.

An air adjustment may be attempted twice per truck. If after the second addition the specified air content is not achieved, the concrete shall be rejected. These procedures do not alter the limits placed on time to discharge, the total revolutions of the mixing drum, or the specified slump.

601.4-TESTING:

601.4.1-Sampling and Testing Methods:

ADD THE FOLLOWING TO THE TABLE:

Surface Resistivity Test	AASHTO T 358
--------------------------	--------------

ADD THE FOLLOWING SUBSECTION:

601.4.6-Surface Resistivity Tests for Acceptance of Class S Concrete: The Contractor shall also be required to fabricate and test three (3) Surface Resistivity test specimens, in accordance with AASHTO R 100 and AASHTO T 358, every time that a set of compressive strength specimens for Class S concrete is fabricated. These test specimens shall be 4-inch x 8-inch, and they shall be tested at an age of 28-days. These test specimens shall be moist cured until as close to the time of testing as possible and the results of this test shall not be less than 30 kΩ-cm. If the testing result is less than 30 kΩ-cm, then the concrete represented by resistivity value may be removed and replaced by the Contractor. If the Contractor elects to leave the material in place, the Engineer shall evaluate it as to the adequacy for the use intended. All concrete evaluated as unsatisfactory for the use intended shall be removed and replaced by the Contractor. When the Engineer’s evaluation indicates that the work may satisfactorily remain in place, the subject material shall be paid for at a reduced unit price based on Table 601.4.6.

Table 601.4.6

Resistivity result obtained (values expressed in kΩ-cm)	Percent of unit bid price paid for material in question
28-29	95%
26-27	90%
24-25	85%
22-23	80%
20-21	70%
<20	Remove and replace

601.6-HANDLING, MEASURING, AND BATCHING OF MATERIALS:

ADD THE FOLLOWING PARAGRAPH AFTER THE FOURTH PARAGRAPH

When Expansive hydraulic cement is used, to avoid potential localized volcanic expansions, it is recommended to use pre-blended Type K expansive cement. Alternatively, the Expansive component can be added by a pre-mixed slurry at the plant or by slurry pump at the jobsite, instead of pre-blended cement, to prevent potential localized volcanic expansions.

601.7-MIXING:

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

For all classes of concrete except Class H, Class S, and concrete for specialized overlays, the total amount of water in a concrete mix, including any water added at the job site, shall not be more than the amount which would cause the water-cement ratio (w/c) of that concrete mix to exceed the w/c which corresponds to the Mix Design Approved Strength, as outlined in Section 5.4 of MP 711.03.23. The maximum water amount shall also be shown in Attachment 4 or 5 of MP 711.03.23 for all approved concrete mix designs. However, under no circumstances shall the w/c in Table 601.3.1A be exceeded.

601.9-ADVERSE WEATHER CONDITIONS:

601.9.1-Cold Weather Concreting:

DELETE AND REPLACE THE FOLLOWING CONTENTS IN THE LAST PARAGRAPH:

Class H, Class S, and Class K Concrete Cold Weather Provisions: Cold weather periods shall be defined as those periods when temperatures above 50° F do not occur for more than half of any 24-hour duration. The temperature of the surface on which the concrete is to be placed shall not be less than 45° F immediately prior to placement of the concrete. During the cold weather periods, as defined above, the temperature of the concrete immediately after placement shall be

between 55 and 75° F.

601.10-PLACING CONCRETE:

601.10.1-General:

601.10.1.2-Concrete Placement Limitations:

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

Immediately prior to, and during, placement of Class H and Class S concrete, if the evaporation rate exceeds 0.10 lb./sq. ft. per hour (see Figure 1), the Contractor shall make provisions (i.e. wind breaks, fogging, etc.) to reduce the rate prior to placing concrete. These provisions shall be maintained during the placement of the concrete. If the evaporation rate obtained from Figure 1 is close enough to the maximum allowable value of 0.10 lb./sq. ft. per hour that there may a discrepancy in the exact numerical value, the following equation shall be used to obtain a more accurate value.

601.10.4-Placing Concrete Bridge Decks:

601.10.4.1-Fogging Equipment:

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

When Class H and Class S concrete is used, fogging equipment shall be available for use in accordance with these specifications. The fogging nozzles shall produce an atomized mist. Fogging nozzles shall incorporate compressed air to create the mist. Handheld or hand operated equipment shall be permitted when the Contractor has demonstrated that his operator has been trained in its use.

601.11-FINISHING CONCRETE SURFACES:

601.11.4-Finishing Concrete Bridge Decks:

601.11.4.2-Class H Bridge Decks:

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

601.11.4.2-Class H and Class S Bridge Decks: The surface of the Class H and Class S concrete shall be uniformly smooth, dense and even. The surface shall then be given a suitable texture with an approved burlap drag.

The Contractor shall texture in a transverse or longitudinal direction. Once begun, the direction of texturing shall not change. All texturing shall be performed prior to the beginning of curing operations. Only one pass of the drag over the finished area will be permitted. Texturing shall be in strict accordance with the time requirements of 601.12.4 for applying wet burlap.

If texturing is done in the transverse direction, the Contractor shall texture by hand

methods as soon as practicable after finishing machine passage, without any additional finishing operations between the machine passage and texturing operations.

If texturing is done in the longitudinal direction, the burlap drag shall be a seamless strip and shall be attached to the work bridge such that the surface of the concrete is textured as soon as practicable after finishing machine passage, without any additional finishing operations between the machine passage and texturing operations. Small areas, inaccessible to the attached drag, may be textured by hand methods.

The finishing movement and resulting progress of the burlap drag shall be done in a manner so as to prevent ridges or gouges from forming in the concrete surface. The drag shall be weighted, and the contact area changed as required to produce a texture acceptable to the Engineer. The drag shall be cleaned as required; to remove all hardened concrete particles and shall be replaced after each day's operation.

Texture resulting from the drag shall stop within one foot of curbs or parapets.

Any hand finishing operations shall be kept to a minimum for Class H and Class S bridge decks.

601.11.4.4-Class H Concrete Finished Deck Grooving:

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

601.11.4.4-Class H and Class S Concrete Finished Deck Grooving:

601.12-CURING AND PROTECTING CONCRETE:

601.12.1-Curing Under Normal Conditions:

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

Concrete surfaces shall be kept completely and continuously moist. Curing shall be continued for a period of at least 7 days. This curing period may be reduced if the contractor presents evidence that the in-place concrete has attained 70% of the specified strength for the class of concrete under cure. Under no circumstances, shall the period of cure be less than 3 days. The reduced curing period option is not applicable to Class H, Class S, or Class K concrete. When placing concrete elements with a minimum dimension greater than two (2) feet, the contractor shall not be permitted to add additional cement to the target cement factor in the approved mix design in order to obtain high-early strength and/or reduce curing time. Surfaces may have coverings temporarily removed for finishing, but the covering shall be restored as soon as possible.

601.12.2-Curing Under Cold Weather Conditions:

DELETE THE FOURTH PARAGRAPH AND REPLACE WITH THE FOLLOWING:

Class H, Class S, and Class K Concrete Provisions: The surface temperature of the concrete shall be maintained between 55 and 75°F for 72 continuous curing hours immediately after placement. After this 72 hour period, a minimum concrete surface temperature of at least

50°F shall be maintained for an additional 96 continuous curing hours.

601.12.4-Curing Class H Concrete:

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

601.12.4-Curing Class H and Class S Concrete: It is the nature of Class H and Class S concrete material to quickly form a plastic film at the surface upon drying. This film is to be protected from drying and cracking by prompt covering with wet burlap. Regardless of the type of concrete placed, the use of membrane curing compounds will not be allowed. Floor drains shall be immediately unplugged to permit the deck to drain.

The concrete surface shall be completely covered with clean, wet burlap. The burlap shall be thoroughly saturated over its entire area, but shall be drained of excess water before application. Burlap shall be lapped a minimum of one foot and shall lay flat. Failure to apply wet burlap within 30 minutes after discharge of the concrete from the truck and within 10 minutes of the completion of finishing operations shall be cause for rejection of the work as determined by the Engineer. Care shall be exercised to ensure that the burlap is well drained. Burlap shall be continuously wet for a period of seven days by means of automatic intermittent sprinkling or a continuous wetting system.

601.13-PROTECTIVE SURFACE TREATMENT:

601.13.1-Silane Treatment for Bridge Superstructure:

REMOVE AND REPLACE THE SECOND PARAGRAPH OF THE SUBSECTION WITH THE FOLLOWING:

The application of this silane protective surface treatment is not required for elements constructed from Class H and Class S concrete.

601.14-METHOD OF MEASUREMENT:

REMOVE AND REPLACE THE FIRST AND SECOND PARAPGRAPH OF THE SUBSECTION WITH THE FOLLOWING:

The quantity of work done for Classes A, B, C, D, H, K, M, and S concrete will be measured in cubic yards, complete in place and accepted as determined by the dimensions on the Plans or Contract Documents, subject to adjustments provided for in subsections 104.2 and 109.2.

The quantity of work done for Class H, Class S, and Class K concrete will be measured in cubic yards, complete in place and accepted, as measured from one end of the bridge to the other, fascia to fascia, and from the top of the forms to the finished elevation of the proposed deck surface. The volume of concrete required to fill the flutes of stay-in-place forms shall be calculated by taking the Contractor's approved *SIP_{adj}* factor and multiplying by the square yardage of SIP area minus beam widths, expansion dam widths, etc. as applicable.

601.16-PAY ITEMS:

ADD THE FOLLOWING TO THE TABLE:

ITEM	DESCRIPTION	UNIT
601010-*	Class S Concrete	Cubic Yard
601025-009	Modified Concrete, Class S	Cubic Yard
601026-005	Modified Architectural Concrete, Class S	Cubic Yard

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 651

FURNISHING AND PLACING TOPSOIL

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

651.1-DESCRIPTION:

This work shall consist of acquiring sites outside the right-of-way from which topsoil can be obtained and the hauling and placing of such material, or hauling and placing of topsoil from stockpiles within the right-of-way, all in accordance with these Specifications and at locations indicated on the Plans or designated by the Engineer.

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 at least 3% organic matter ~~in the range of 2% to 20%~~ and be sampled at least once per project using AASHTO T 267 method; multiple sources or change of sources shall also be sampled.

Topsoil containing less than 3% organic matter shall be conditioned with biological growth stimulants. The requirements for these amendments shall conform to 715.30.

CONSTRUCTION METHODS

651.3-STRIPPING TOPSOIL:

Prior to removal from the site, the soil will be tested by the Division to determine the humus and nutrient value. Care shall be exercised as to the depth of stripping, and any loads with an excess of subsoil shall be discarded. The Contractor shall ~~mow or otherwise remove~~ remove all heavy grass, weeds, or other vegetation, including root mass, in ~~over~~ the areas before stripping.

Topsoil shall be stored on the stripping site out of construction limits, if feasible. Any topsoil that cannot be stored on the construction site must acquire approval by the Engineer ~~must be obtained prior to transporting~~ any material from the stripping site.

651.4-TRANSPORTING:

Topsoil material shall not be placed until the entire roadway (including surfacing) has been completed, unless otherwise provided for on the Plans or approved in writing. During hauling operations, the surface of the highway shall be kept reasonably clean to avoid creating a traffic hazard.

651.5-PLACING AND MANIPULATING:

Areas to be topsoiled shall be brought reasonably close to the lines and grades shown on the Plans or established by the Engineer. Topsoil may not be applied to slopes steeper than 2H:1V. All slopes less than or equal to 2H:1V that do not meet an organic matter of at least 3% require the application of topsoil. An approved hydraulic growth medium may be used in replace of topsoil if designated by the Engineer and must meet all requirements in 715.31.

Prior to application, fertilizer lime or sulfur, and other soil amendments shall be added to the topsoil according to the soil analysis, in accordance with section 652.4.1. The Contractor shall ~~scarify~~ track the surface of the subsoil before the topsoil is placed, unless otherwise permitted, for bonding the topsoil layer with the subsoil.

Topsoil shall be applied at a minimum depth of ~~6~~two (2) to three (3) inches. For Type B and C seed mixtures, the topsoil must be tracked again to compact to a minimum thickness of two (2) inches. For Type A seeding (lawn type seeding), compact the topsoil and then finely graded to provide a smooth surface. All sites must then be scarified ~~shall be accomplished~~ by disking, harrowing, raking, or other approved methods. Depressions and ridges formed by construction equipment, during final grading or scarifying, shall be parallel to the contours.

~~Topsoil shall not be spread to a greater depth than that required to make the work conform to the natural terrain after shrinkage and settlement have taken place.~~ After spreading the soil, all deleterious materials (large lumps or clods, brush, litter, or other foreign material, and stones exceeding two (2) inches approximately in any dimension) shall be raked up and removed from the site. For Type A seeding (lawn type seeding), remove all material over one (1) inch in any dimension.

The Contractor shall take all reasonable precautions to avoid injury to existing plant growth, structures, and roadway surface.

651.6-METHOD OF MEASUREMENT:

The quantity of work done will be measured in cubic yards of "Furnishing and Placing Topsoil" or "Placing Stockpiled Topsoil", which shall be the material actually removed from previously selected site or sites outside the right-of-way of from stockpiles within the right-of-way, and acceptably placed and spread on the areas designated to receive it, as determined from the net total of load tickets of vehicles.

651.7-BASIS OF PAYMENT:

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

No separate payment will be made for stripping topsoil within the right-of-way limits and transporting or stockpiling of such material.

651.8-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
651001-*	Furnishing and Placing Topsoil	Cubic Yard
651002-*	Placing Stockpiled Topsoil	Cubic Yard

* Sequence number

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 652
SEEDING AND MULCHING

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

652.1-DESCRIPTION:

This work shall cover all operations incidental to the establishment and maintenance of grass, forb, and leguminous vegetation, including the furnishing and sowing of seed; furnishing and applying fertilizer, ~~agricultural~~-limestone, other soil amendments, and mulch material, all in accordance with these Specifications and at locations indicated on the Plans or designated by the Engineer.

652.2-MATERIALS:

Materials shall meet the requirements in the following Subsections of ~~Division 700~~ Section 715:

MATERIAL	SUBSECTION
<u>Biological Growth Stimulants</u>	<u>715.30</u>
Fertilizers	715.26
Ground Agricultural Limestone	<u>715.25</u>
<u>Hydraulic Growth Mediums</u>	<u>715.31</u>
Inoculating Bacteria	715.29
<u>Limestone</u>	<u>715.25</u>
Matting for Erosion Control	715.24
Mulch Materials	715.27
<u>Seed</u>	<u>715.28</u>
Water	*

* Water shall be reasonably free from injurious chemicals and other toxic substances harmful to plant life. The source of water used is subject to the approval of the Engineer.

Temporary seed, such as ~~annual ryegrass (Italian ryegrass) and weeping lovegrass common~~ oats and cereal rye, used in the seed mixtures ~~B, C, or D~~, shall be of a commercial grade meeting the requirements of the State Seed Law. Temporary seed labeled with the notation "germination

below standard" shall not be used. Temporary seed shall not be used after one year from date of germination test shown on the label. Seed other than that specified above shall meet the requirements of subsection 715.28.

Tackifier or chemical mulch binders shall be of commercial grade and conform to the requirements in subsection 715.27.1. Topsoil, if called for, shall conform to the requirements in section 651. All materials will be subject to approval or rejection, in part or in whole.

CONSTRUCTION METHODS

652.3-SEASON OF WORK:

Permanent seeding or ~~second and third seeding re-application and spot application,~~ following the original seeding, under section 652, shall be performed between the dates of ~~March 1~~ February 15th to ~~June 15 20th~~ May 31st and August 1st to October ~~15 31st~~. Specific seeding dates are made for each seed mixture and can be found in 652.5.

Temporary seeding outside the above planting dates shall fall under section 642. Seed shall be applied following construction at any time the weather will allow seeding equipment to operate, under 642, without regard to seasons.

652.4-AREA PREPARATION FOR SEEDING AND MULCHING:

Seeding, fertilizing, liming, applying soil treatments, and mulching shall not be applied conducted until the specified areas have been brought to lines and grades shown on the Plans. Topsoil, when called for, or hydraulic growth media shall be spread to the depths indicated on the Plans. In accordance to section 651.

~~The application rate for agricultural limestone will be determined by a pH test after cuts and embankments are completed just prior to seeding. The Plans will show the estimated tons of lime needed for the job based on general knowledge of the soils in the area. The final application rate will be determined by the Engineer based on the pH test, conducted in accordance with MP 700.04.10.~~

652.4.1-Soil Tests and Analysis: A soil test is required on all areas greater than one (1) acre when the area has reached final grade and permanent seeding is the next step. A soil test is optional for areas less than one (1) acre and will be determined by the Engineer if required. The area shall be evaluated by the Engineer to determine where the distinguishable representative areas are located. A distinguishable representative area is defined as where visible changes, such as a change in color or texture, in soil occur. All representative areas of the site shall be divided into maximum of five (5) acre increments and tested individually.

On each representative soil type, a composite sample is needed. A minimum of ten (10) subsamples of soil from the top ~~four (4) to six (6) inches~~ two (2) to three (3) will be collected. The subsamples should be taken randomly throughout the area. The subsamples should be thoroughly mixed and the composite sample should be sent to a certified soil testing laboratory for analysis. The laboratory, at a minimum, should report: pH, buffer pH, fertilizer requirements and recommendations, and lime requirements and recommendations.

652.4.2-Seedbed Preparation: Interchanges, medians and similar Areas with ~~3 to 2~~ Horizontal : 1 Vertical (H:V) slope or flatter, excluding areas involving subsurface drainage from base course material, shall be scarified sufficiently to produce a seed bed ~~as directed by~~

~~the Engineer. For slopes 3H:1V and flatter, scarify soil to a depth of 2-4 inches. For slopes 3H:1V to 2H:1V, scarify subsoil to a depth of 0.5-1 inches. Remediation of the pH should be made to the subsoil at the time of soil scarification, whether lime or sulfur is required based on soil test. See Table 653.4.3 for recommended bulk densities. All large sticks, brush, loose roots, stones exceeding two (2) inches approximately in any dimension, and other debris shall be removed prior to seeding operations. The area shall be back dragged to eliminate depressions, ruts, or equipment track marks on slopes. Before topsoil application, use a bulldozer to track the soil perpendicular to the slope making track indentations to reduce potential for topsoil slippage. Once check slots are in place, apply and track with a dozer to a minimum thickness of four (4) inches. The area shall be free of depressions, ruts, or excessive equipment track marks, other than check slots, on slopes. Seed bed preparation will not be necessary on slopes steeper than 3 to 1 2H:1V.~~

~~652.4.1-652.4.3-Preparation of Lawn Type Area for Seeding: All areas to be seeded to "Type C-2" lawn mixture, and "Type C-1" mixture in rest areas. Lawn type areas will use "Type A" mixture in rest areas, medians, shoulders, and lawns. The seedbed shall be fine graded. The finished grade shall be uniform and free of irregularities or water pockets depressions. The finished grade shall be free of weed and plant growth, stones over one (1) inches in diameter, or other debris. This debris will be disposed of as directed by the Engineer. Immediately prior to seeding, all areas shall be cultivated to provide a reasonably firm but friable seedbed. The depth of tillage shall be three (3) inches or as directed by the Engineer. Limestone as required and fertilizer as specified shall be worked into the upper three (3) inches of the seedbed before seeding.~~

TABLE 652.4.3

Recommended Lime Bulk Densities			
Soil Texture	Ideal Bulk Densities	Bulk Densities that May Affect Root Growth	Bulk Densities that Restrict Root Growth
	(lb/ft³)	(lb/ft³)	(lb/ft³)
<u>Sands, loamy sands</u>	<u>< 99.9</u>	<u>105.5</u>	<u>> 112.4</u>
<u>Sandy loam, loams</u>	<u>< 87.4</u>	<u>101.8</u>	<u>> 112.4</u>
<u>Sandy clay loams, loams, clay loams</u>	<u>< 87.4</u>	<u>99.9</u>	<u>> 109.2</u>
<u>Silts, silt loams</u>	<u>< 81.2</u>	<u>99.9</u>	<u>> 109.2</u>
<u>Silt loams, silty clay loams</u>	<u>< 87.4</u>	<u>96.8</u>	<u>> 103.0</u>
<u>Sandy clays, silty clays, some clay loams (35-45% clay)</u>	<u>< 68.7</u>	<u>93</u>	<u>> 98.6</u>
<u>Clays (> 45% clay)</u>	<u>< 68.7</u>	<u>86.8</u>	<u>> 91.8</u>

~~652.4.4-Soil Additives and Amendments: The application rate for limestone, fertilizer, and other soil amendments will be determined by a soil test after cuts and embankments are completed just prior to seeding. The Plans will show the estimated tons of lime, fertilizer, and other soil amendments needed for the job based on general knowledge of the soils in the area. The final application rate will be determined by the Engineer based on the soil test, conducted in accordance with MP 700.04.10.~~

652.5-SOWING SEED:

Immediately following area preparation, seed shall be sown. Only certified seed shall be used. Certified seed is seed that has been screened to check for satisfactory genetic purity and varietal identity and meets all requirements of State Seed Law. Seed shall not be used after one year from date of germination test shown on the label Legume seed shall be inoculated with approved cultures, in accordance with the instruction of the manufacturer. Seed may be directly sown with a drill seeder, if site conditions permit. Alternatively, seed may be sown by hydroseeding. When using a hydroseeder, the inoculant shall be increased to five times the normal rate. For areas of 5,000 square feet or less, narrow strips, steep slopes, or locations inaccessible to mechanical equipment, broadcast seeding may be permitted when approved by the Engineer

~~———— If machine breakdown occurs during hydroseeding, the following practices should be used to avoid seed damage:~~

~~—— For machine breakdown of thirty (30) minutes to two (2) hours, fifty percent (50%) more seed shall be added to the slurry, based on the proportion of the slurry remaining in the tank.~~

~~i. For machine breakdown of more than two (2) hours, a full rate of seed shall be used.~~

Seed shall be sown by approved methods which provide for uniform distribution of seed. Rates of application and type of seed mixture shall be in accordance with Table 652.5 unless otherwise specified on the Plans.

~~For lawn areas, the broadcast seeding shall be made in two applications, using one half the seed each time and the second sowing to be at right angles to the first. After broadcasting or otherwise applying the seed, the seedbed shall be firmed by means of a roller or cultipacker.~~

Specific seeding dates are made for each seed mixture.

- ~~a. Type A mixture is to be seeded from ~~February~~March 15th to ~~June 20th~~ May 31st and from August 1st to October 31st.~~
- ~~b. Type B seed mixture is to be seeded from March 1st to June 20th and October 1st to October 31st.~~
- ~~c. Type C mixture is to be seeded from March 15th to May 15th and from August 1st to October 31st.~~
- ~~d. Type E mixture is to be planted from March 20th to June 30th and October 15th to the first frost.~~

652.5.1-Reseeding, Refertilizing, and Remulching: Any area failing to establish ~~a stand~~ due to weather or adverse soil conditions seventy percent (70%) of cover by area over 100% of the site due to any reason shall be reseeded, refertilized, and remulched as directed by 652.8 and by the Engineer.

TABLE 652.5 SEED MIXTURES

Variety of Seed	Type B	Type C**		Type D	Type L
		C-1	C-2		
	Medians, Shoulders (Ditch Slope) Waterways, and Mowable Areas of Interchange*	Coarse Lawn Grass ----- For Use in Urban and Rest Area Locations	Fine Lawn Grass ----- For Use where a Fine Lawn is Desired	Cut and Fill Slopes ----- (Including Benches and Bifurcated Median)	All areas
	Lb. per acre	Lb. per acre	Lb. per acre	Lb. per acre	Lb. per acre
Kentucky 31 Fescue	65	45		20	
Red Fescue (Pennlawn)	20	20	20	20	41
Kentucky Bluegrass		25	40		
Merion Bluegrass			30		
Crown Vetch				20	
Hard Fescue Mixture***					63
White Dutch Clover	3				
Annual Ryegrass Aug 1 to May 15 — or Weeping Lovegrass May 15 to Aug 1	7 3	7 3	7	7 3	12 5

* Areas will be considered mowable when slopes are 3 to 1 or flatter.

** Type C-1 and C-2 seed mixtures shall be used in all urban, suburban, and rest areas where lawn type turf is desired with mowing maintenance intended. C-2 lawn mixture shall be used along sidewalks, adjacent to private lawns.

*** A combination of approved certified varieties with no one variety exceeding 50% of the total hard fescue component.

TABLE 652.5
Seed Mixtures

<u>Variety of Seed</u>	<u>Type A</u>	<u>Type B</u>	<u>Type C</u>	<u>Type E</u>
	<u>Mowable Areas^b</u> (lb/ac)	<u>Cut and Fills</u> (lb/ac)	<u>Cool Season</u> (lb/ac)	<u>Wet Areas</u> (lb/ac)
<u>Common Oat</u> (<i>Avena sativa</i>) (March 1- October 31) ^a		<u>30</u>		
<u>Cereal Rye</u> (<i>Secale cereal</i>) (November 1-Feb 28) ^a		<u>30</u>		
<u>Autumn Bentgrass</u> (<i>Agrostis perennans</i>)	<u>10</u>	<u>3-7</u>		
<u>Perennial Rye</u> (<i>Lolium perenne</i>)	<u>10</u>	<u>3-713</u>		
<u>Chewing's Fescue</u> (<i>Festuca rubra ssp. commutate</i>)	<u>25</u>			
<u>Hard Fescue 'Chariot'</u> (<i>Festuca brevipila</i>)	<u>35</u>		<u>35</u>	
<u>Hard Fescue 'Heron'</u> (<i>Festuca ovina var. duriusecula</i>)	<u>35</u>		<u>35</u>	
<u>Turf Fescue^c</u> (<i>Festuca Variety</i>)				
<u>Creeping Red Fescue</u> (<i>Festuca rubra</i>)	<u>55</u>		<u>55</u>	
<u>White Clover</u> (<i>Trifolium repens</i>)	<u>35</u>		<u>7</u>	
<u>Red Clover</u> (<i>Trifolium pratense</i>)		<u>518</u>		
<u>Big Bluestem</u> (<i>Andropogon gerardii</i>)		<u>621</u>		
<u>Virginia Wildrye</u> (<i>Elymus virginicus</i>)		<u>8.4</u>		<u>4</u>
<u>Switchgrass</u> (<i>Panicum virgatum</i>)		<u>6.4</u>		
<u>Indiangrass</u> (<i>Sorghastrum nutans</i>)		<u>14</u>		
<u>Partridge Pea</u> (<i>Chamaecrista fasciculate</i>)		<u>14</u>		
<u>Black-Eyed Susan</u> (<i>Rudbeckia hirta</i>)		<u>0.6 4</u>		
<u>Birds Foot</u> (<i>Lotus corniculatus</i>)		<u>18</u>		
<u>Orchard Grass</u> (<i>Dactylis glomerata</i>)		<u>11</u>		
<u>Narrowleaf Mountainmint</u> (<i>Pycnanthemum tenuifolium</i>)		<u>0.1</u>		

TABLE 652.5
Seed Mixtures

<u>Variety of Seed</u>	<u>Type A</u>	<u>Type B</u>	<u>Type C</u>	<u>Type E</u>
	<u>Mowable Areas^b</u> <u>(lb/ac)</u>	<u>Cut and Fills</u> <u>(lb/ac)</u>	<u>Cool Season</u> <u>(lb/ac)</u>	<u>Wet Areas</u> <u>(lb/ac)</u>
<u>Wild Bergamot</u>		<u>0.5</u>		
<u>Panicledleaf Ticktrefoil</u> <u>(Desmodium paniculatum)</u>		<u>0.4</u>		
<u>Smooth Oxeye</u> <u>(Heliopsis helianthoides)</u>		<u>0.4</u>		
<u>Flat-top Goldentop</u> <u>(Euthamia graminifolia)</u>		<u>0.1</u>		
<u>Redtop</u> <u>(Agrostis gigantea)</u>			<u>4</u>	
<u>Birdsfoot Trefoil</u> <u>(Lotus corniculatus)</u>			<u>8</u>	
<u>Fox Sedge</u> <u>(Carex vulpinoidea)</u>				<u>4</u>
<u>Fowl Bluegrass</u> <u>(Poa palustris)</u>				<u>3.5</u>
<u>Redtop Panicgrass</u> <u>(Panicum rigidulum)</u>				<u>4</u>
<u>Common Rush</u> <u>(Juncus effuses)</u>				<u>0.5</u>
<u>Shallow Sedge</u> <u>(Carex lurida)</u>				<u>3</u>
<u>Blue Vervain</u> <u>(Verbena hastate)</u>				<u>0.8</u>
<u>Wingstem</u> <u>(Verbesina alternifolia)</u>				<u>0.2</u>
<u>Joe Pye Weed</u> <u>(Eutrochium purpureum)</u>		<u>1.5</u>		<u>1.5</u>
<u>Swamp milkweed</u> <u>(Asclepias incarnata)</u>				<u>0.1</u>
<u>Butterfly Milkweed</u> <u>(Asclepias tuberosa L.)</u>		<u>.10</u>		
<u>Common Milkweed</u> <u>(Asclepias syriaca)</u>		<u>.10 1</u>		
<u>Purple coneflower</u> <u>(Echinacea purpurea)</u>		<u>1.55</u>		

a. Choose a nurse crop according to season of planting.

TABLE 652.5
Seed Mixtures

<u>Variety of Seed</u>	<u>Type A</u>	<u>Type B</u>	<u>Type C</u>	<u>Type E</u>
		<u>Mowable Areas^b</u> (lb/ac)	<u>Cut and Fills</u> (lb/ac)	<u>Cool Season</u> (lb/ac)

- b. Type A will be utilized for mowable areas. Type A seed mixture shall be used in all urban, suburban, rest areas, WVDOH facilities, and mowable areas along roadways where lawn type turf is desired with mowing maintenance intended.
- c. A combination of approved certified varieties with no one variety exceeding fifty percent (50%) of the total turf fescue component.

652.6-APPLYING MULCH, ~~LIME,~~ AND FERTILIZER, AND OTHER SOIL AMENDMENTS:

652.6.1-General: Whenever permanent or temporary seeding is made on bare soil or newly completed construction work, the following criteria shall be followed in regard to mulching.

- i. Hydraulic erosion control products shall be used on all slopes but consult 652.6.2 for further details and specifications.
- ii. Rolled erosion control products (RECPs) may be used on slopes less than or equal to 2H:1V.
- iii. Straw mulch (excluding hay) shall be used on slopes ~~1 1/2 to 1 or flatter~~ less than or equal to 4H:1V. ~~Wood cellulose fiber mulch shall be used on cut slopes steeper than 1 1/2 to 1. The Engineer may make adjustments in the type of mulch to meet local conditions on the job.~~

When using straw mulch, the mulch shall be anchored with ~~an acceptable~~ a non-toxic tackifier or binder as described in Section 652.6.25 ~~below~~. The sequence of application, when using straw mulch shall be as follows:

- 1) Seed, ~~lime, and~~ fertilizer, other soil amendments shall be sown prior to mulching.
- 2) Mulch and ~~non-toxic tackifier mulch or~~ binder shall be placed within twenty-four (24) hours of sowing seed.

~~When permanent seeding follows a temporary cover crop, wood cellulose fiber mulch shall be used and the quantity of mulch shall be determined by the amount of living and dead plant residue on the soil surface in accordance with subsection 652.6.3.2.~~

Where the temporary seeding has been destroyed by subsequent construction, the mulch will be the same type and amount as required for bare soil or new construction.

~~**652.6.2-Straw Mulch:** Straw shall be applied at the rate of approximately two tons per acre. Straw mulch around buildings, sidewalks or other structures may be held in place with a form of netting or chemical mulch binders applied according to the manufacturers' specifications.~~

652.6.2-Hydraulic Erosion Control Products: Hydraulically applied erosion control products (HECPs) are applied to bare soil by means of a mechanically agitated hydro seeder

or by broadcast spreading. Typically, a mixture of cut or shaved wood, straw, bonded fiber matrix, or defibrated organic fiber matrix and a stabilizing emulsion or tackifier constitutes the components of HECP. Paper mulch is not approved for use other than for the use of a mulch binder on straw.

Table 652.6.2A lists qualifications for the accepted HECPs. The products are presented in respect to the acceptable slope that the individual HECPs may be applied, as shown in Table 652.6.2B.

TABLE 652.6.2A

Mulch Types					
Property	Test Method	Straw	HECP Type 1	HECP Type 2	HECP Type 3
Physical					
Color	<u>Observed</u>	<u>Natural</u>	<u>Colored to contrast application area, shall not stain concrete or painted surfaces.</u>		
Organic Matter	<u>ASTM D2974</u>	<u>100%</u>	<u>90% minimum</u>		
Water Holding Capacity	<u>ASTM D7367</u>		<u>600% Minimum</u>	<u>800% Minimum</u>	<u>1200% Minimum</u>
Acute Toxicity	<u>ASTM 7101</u>	<u>Non Toxic</u>			
	<u>EPA 2021.0-1</u>				
Endurance					
Functional Longevity	<u>ASTM D5338</u>	<u>≥ 90 days</u>	<u>≥ 90 days</u>	<u>≥ 180 days</u>	<u>≥ 365 days</u>
Performance					
Maximum Slope Application	<u>Observed</u>	<u>4.0H:1V</u>	<u>4.0H:1V</u>	<u>2.0H:1V</u>	<u>0.5H:1V</u>
Cover Factor	<u>ASTM D8298</u>	<u>-</u>	<u>C ≤ 0.3</u>	<u>C ≤ 0.05</u>	<u>C ≤ 0.01</u>
Ground Cover	<u>ASTM D6567</u>	<u>> 85%</u>	<u>> 90%</u>	<u>> 95%</u>	<u>> 97%</u>
Vegetation Establishment	<u>ASTM D7322^a</u>		<u>300% Minimum</u>	<u>400% Minimum</u>	<u>500% Minimum</u>

a. ASTM test methods developed for Rolled Erosion Control Products (RECPs) that have been modified to accommodate Hydraulic Erosion Control Products (HECPs).

TABLE 652.6.2B

Mulch Application		
Mulch	Applicable Slopes	Minimum Application Rate (lb/acre – dry) ^a
<u>HECP Type 1</u>	<u>≤ 4H:1V</u>	<u>2,500</u>
<u>HECP Type 2</u>	<u>4H:1V < S ≤ 2H:1V</u>	<u>3,000</u>
<u>HECP Type 3</u>	<u>2H:1V < S ≤ 0.5H:1V</u>	<u>4,000 ^b</u>

Straw	$\leq 4H:1V$	4,000
-------	--------------	-------

- a. A higher level of mulch may be applied than that specified on the Plans, Specifications, and other terms of the Contract. In this situation, the higher level mulch is applied at the rate for the actual slope condition of the site in accordance with the mulch tables, and payment is for the actual mulch specified, not the higher level mulch.
- b. HECP Type 3 may be used for permanent cover applications on slopes 1H:1V or greater at a minimum rate of 4,500 pounds per acre as directed by the Engineer only when the proper TRM installation is not practicable due to site constraints.

652.6.2.1-HECP Type Overview: Provide a HECP Type 1, 2, or 3 that has no germination or growth inhibiting factors and does not form a water-resistant crust that can inhibit plant growth. Provide a HECP Type 1, 2, or 3 that completely photo-degrades or biodegrades. Add seed, lime, fertilizer, and other soil amendments to the HECP Type 1, 2, or 3 mixture.

Furnish HECP Type 1, 2, or 3 where all components are pre-packaged by the manufacturer to assure material performance and compliance with the minimum requirements of Table 652.7.2.1. Under no circumstances will field mixing of HECP Type 1, 2, or 3 additives or components be accepted.

HECP Type 1 or 2 shall be applied when the soil is dry and rain is not expected within 24 hours following application. HECP Type 3 shall be applied when the soil is dry and rain is not expected within eight (8) hours following application. All applications shall have a high degree of certainty that no heavy rain events follow within forty-eight (48) hours following application.

The HECPs must comply at minimum with Tables 652.6.2A and 652.6.2B.

652.6.2.2-HECP Type 1: Provide a HECP Type 1 (Hydraulic Mulch with Tack) composed of non-toxic fibers consisting of a minimum of seventy percent (70%) wood fiber or natural fibers that contain non-toxic tackifiers or binders. The HECP Type 1 should be insoluble and non-dispersible after drying to limit raindrop impact. Paper fiber, whether recycled or virgin, may be incorporated in an amount not to exceed thirty percent (30%) of the total fiber content.

652.6.2.3-HECP Type 2: Provide a HECP Type 2 (bonded fiber matrix (BFM)) consisting of a hydraulically applied matrix composed of a minimum of seventy percent (70%) of non-toxic defibrated organic fibers with at least one of the following non-toxic additives:

- i. Soil tackifiers
- ii. Soil flocculants
- iii. Soil polymers
- iv. Cross-linked hydro-colloidal polymers, or
- v. Cross-linked tackifiers.

The HECP Type 2 should be insoluble and non-dispersible after drying to limit raindrop impact.

Do not use materials composed of paper, cellulose fiber, or any mixture containing paper or cellulose. Do not use materials listed for use as a HECP Type 1. Add seed, legume inoculant, lime, and fertilizer to the HECP Type 2 mixture.

652.6.2.4-HECP Type 3: Provide a HECP Type 3 (fiber reinforced matrix (FRM)) consisting of a hydraulically applied matrix composed of a minimum of seventy percent (70%) of non-toxic defibrated organic fibers and a minimum of five percent (5%) ~~crimped, biodegradable interlocking fibers with least one of the following non-toxic additives:~~

- i. Soil tackifiers,
- ii. Soil flocculants,
- iii. Soil polymers,
- iv. Cross-linked hydro-colloidal polymers, or
- v. Cross-linked tackifiers.

The HECP Type 3 should be insoluble and non-dispersible after drying to limit raindrop impact.

Do not use materials composed of paper, cellulose fiber, or any mixture containing paper or cellulose. Do not use materials listed for use as HECP Type 1 or 2. Add seed, legume inoculant, lime, and fertilizer to the HECP Type 3 mixture.

~~652.6.3-Hydraulic Application of Wood Cellulose Fiber as a Mulching Agent:~~

652.6.3-Hydraulic Erosion Control Products Application:

652.6.3.1-Equipment: Hydraulic equipment shall be used for the application of a slurry of fertilizer, lime, seed, prepared wood cellulose fiber, and water. tackifier, legume inoculant, water, and HECP. This equipment shall have a built-in agitation system with ~~an operating capacity sufficient to agitate, suspend, and homogeneously mix a slurry of the specified amount of fiber, fertilizer, seed, and water. a working capacity sufficient to agitate, suspend, and homogeneously mix a slurry of the specified amount of tackifier, fertilizer, lime, seed, legume inoculant, other soil amendments, water, and HECP.~~ -The slurry distribution lines shall be large enough to prevent stoppage. This discharge line shall be equipped with a set of hydraulic spray nozzles which will provide even distribution of the mixture or slurry in the various areas to be seeded. The slurry tank ~~shall have a minimum capacity of 1,000 gal and~~ shall be mounted on a traveling unit which may be either self-propelled or drawn, with a separate unit which will place the slurry tank and spray nozzles within sufficient proximity to the areas to be seeded to provide uniform distribution without waste.

652.6.3.2-Preparation of Slurry and Application of HECPs: Fertilizer, Seed, and Mulch: ~~Wood cellulose fiber shall be applied at a minimum rate of 1,500 lbs. net dry weight per acre when seeding bare soil or new construction. HECPs shall be applied at the specified rate according to the manufacturer, while following the minimum standards specified in Table 652.6.2B.~~ When seeding into a residue or growth where temporary seeding has previously been performed, the rate will be determined by the Engineer, usually 1,000 lbs. net dry weight per acre. The ~~seed, fertilizer, wood cellulose fiber, and water HECP, tackifier, seed, legume inoculant, fertilizer, lime, other soil amendments, and water~~ shall all be combined into the slurry tank for distribution of all ingredients in one operation by the hydraulic seeding method. The agitator shall be operating at a rate sufficient to keep all materials in suspension at the time such material is added. ~~Seed shall~~

~~be added first, shall be thoroughly mixed, and the fertilizer then added and put into suspension. When the tank is 40 percent (40%) full, the mulch material may be added and shall be in complete suspension by the time the tank is 75 percent (75%) full. Such increased mixing speed as is necessary for putting the entire admixture in suspension shall be maintained until the tank is emptied. Spraying may commence at such time as the full complement of water has been mixed into the slurry. It is the intent of this Specification to maintain the slurry, during the spraying operation, as~~
The addition of materials into the slurry shall be conducted in the order and time specified by the manufacturer to ensure a homogeneous slurry and survivability of the seed and inoculants. During the spraying operation, a homogenous mixture of suspended solids in the tank until the tank is emptied. Upon request of the Engineer, a representative from the HECF manufacturer shall be on site to aid in application and inspection of the mixture application.

652.6.4-Rolled Erosion Control Products: Rolled erosion control products (RECPs) shall be composed of natural or polymer fibers bound together to form a matrix to provide erosion control. RECPs shall conform to all requirements within 715.24. RECPs shall be installed in accordance with the manufacturer’s recommendations to slope with 100% surface coverage. Single net straw matting shall be installed on slopes less than or equal to 3H:1V. Double net straw matting shall be installed on slopes less than or equal to 2H:1V.

Site preparation is crucial to achieve continuous intimate contact between the soil and the RECP. The site must be fine graded to a smooth profile and the surface must be free from any bumps or dips that cause separation between the soil and the RECP. All installed RECP’s shall be inspected to ensure proper installation. All deficiencies shall be corrected.

RECPs shall be installed as follows for proper long term effectiveness. A six (6) inch by six (6) inch trench shall be dug a minimum of three (3) feet above the top of slope. The RECP shall then be laid into the trench with six (6) inches of material extended above the trench to be used for overlap. The RECP laid in the trench shall be anchored with six (6) inch anchors at one (1) foot intervals along the width of the RECP. Backfill soil shall then be added to the trench on top of the anchored RECP and compacted. The six (6) inch overlap will then wrap around the backfilled soil and be anchored. The RECP shall then be installed parallel to the slope direction.

Each RECP should overlap another by six (6) inches to provide maximum coverage and stability. Each overlap shall be anchored at one (1) foot intervals along the length of the RECP. RECPs shall be pulled to remove excess slack without breaking contact with the soil surface and anchored to the slope with six (6) inch anchors (stakes or pins). The Engineer may require longer anchors for sandy or loose soils. Refer to table 652.7.4.1 for the minimum anchor frequency requirements.

TABLE 652.6.4

RECP Anchoring Requirement	
Slope Grade	Anchoring Frequency (anchors / square yard)
<u>Up to 3H:1V</u>	<u>1.5</u>
<u>3H:1V to 2H:1V</u>	<u>2.0</u>

652.6.5-Straw Mulch: Clean, dry straw mulch may be applied on slopes less than 4H:1V. Straw mulch may be applied to slopes up to 2H:1V if the coverage area is less than 1 acre.

Straw mulch shall be applied at a rate of two (2) tons per acre with eighty five percent (85%) surface coverage by visual observation. The maximum allowable continuous slope length for straw mulch is fifty (50) feet. Slope interruption devices or rolled erosion control products are required for continuous slope length longer than fifty (50) feet. Straw mulch must be anchored with a non-toxic tackifier or binder according to the manufacturer specifications. The non-toxic tackifier or binder should be applied on the straw at the manufacturer's recommended rates. The Contractor shall be responsible for any damage to structures from the tackifier or binder.

Straw mulch around buildings, sidewalks, or other structures may be held in place with a form of netting or may be sprayed with a non-toxic tackifier or binder by hand while protecting the structures from over spray.

652.6.6-Limestone: The kind and rate of application of limestone shall be determined by the soil analysis. Agricultural granular, fast acting lime, or both may be needed depending on the results from the soil analysis. Lime is not required for temporary seeding unless directed by the Engineer.

652.6.6.1-Agricultural Granular Limestone: Agricultural granular limestone is used for long term pH remediation. Agricultural lime shall be uniformly distributed among the area and thoroughly mixed with the soil to a depth of three (3) inches. Mixing is not required when spreading lime with hydraulic methods. Agricultural lime shall be spread at the rate recommended by the soil analysis.

652.6.6.2-Fast Acting Limestone: Fast acting limestone is used for immediate pH remediation and should only be used on sites that have time-sensitive guidelines, as directed by the Engineer. Fast acting lime comes in two forms: liquid and dry. The type of fast acting lime shall be determined by the Engineer. Both forms of fast-acting limestone shall be applied at the recommended rate from results of the soil analysis.

~~**652.6.47-Fertilizer:** The kind and amount of fertilizer per acre shall consist of any type with 1-2-1 ratio (nitrogen, phosphoric acid, and potash) providing the minimum nutrient equivalent of 1,000 lb. of 10-20-10. In addition, 300 lb. per acre of slow release urea formaldehyde fertilizer shall be added whenever second step seeding and fertilizing is not feasible due to the Contract completion date. When hydraulic seeding methods are used, the fertilizer shall be applied concurrently with the seeding and mulching operation as part of the slurry mix. When commercial fertilizer is applied by the spray or hydraulic method, it need not be worked into the soil.~~

~~Fertilizer applications for second and third step seeding shall be in accordance with subsection 652.8. be determined by the soil analysis. Fertilizer type and quantity will then be prescribed by the Engineer based on a site-by-site analysis. The Engineer may require more than one type and quantity of fertilizer based on the project site characteristics due to varying soil conditions and properties.~~

~~Re-application and spot application fertilizer requirements shall be based on soil tests to determine the appropriate type and quantity to mitigate the failed vegetative establishment.~~

Temperature Release Nitrogen (Environmentally Sensitive Nitrogen (ESN)) should be considered during winter seeding to prevent excess nitrogen runoff and to preserve nitrogen for the growing season.

652.6.8-Biological Growth Stimulants: Biological growth stimulants shall be applied to all topsoil containing less than three percent (3%) organic matter by weight. The amount and type of stimulant will be determined by the soil analysis. All biological growth stimulants shall conform to 715.30.

652.6.9-Hydraulic Growth Medium: Hydraulic growth medium (HGM) shall be used when topsoil cannot be used and the subsoil analyzed for permanent seeding does not contain at least three percent (3%) organic matter by weight. The HGMs shall conform to sections 651 and 715.31.

652.6.510-Wood Chips: Wood chips, recovered from clearing and grubbing operations, or bark will be acceptable ~~as a mulch for seeding and shall be used at a rate of 35 cubic yard per acre in lieu of straw or hay for landscaping at a depth of two (2)-four (4) inches or used to fill compost socks for erosion control measures instructed by the Engineer.~~

652.7-MAINTENANCE OF SEEDED AND MULCHED AREAS:

652.7.1-Contractor Maintenance Requirements: The Contractor shall maintain all seeded areas until final acceptance of the project, minimum of seventy percent (70%) vegetative cover. ~~All areas shall be protected from equipment traffic and any damaged areas shall be repaired and reseeded.~~ and foot traffic and any damaged areas shall be repaired and reseeded. The Engineer will require spot application or re-application, or both, depending upon the completion date and estimated completion time of any remaining items on the project.

~~652.8 SECOND AND THIRD STEP SEEDING, FERTILIZING AND MULCHING:~~

652.7.2-Re-Application: The re-application of seed, mulch, and fertilizer shall be applied as directed by the Engineer based on ~~The Engineer will require second or third step seeding, or both, depending upon~~ the completion date, ~~and~~ estimated completion time of any remaining items on the project, ~~and unsatisfactory stand development.~~ ~~The second application of fertilizer, seed and mulch shall be applied as directed by the Engineer.~~ The application rates will be based on the stand of grass, severity of erosion and condition or growth of grass as described. ~~Spring seedings shall be refertilized and reseeded as needed in the fall from August 15 to October 15. Fall seeded areas shall be given a second step seeding and fertilizing, as required, the following spring from March 15, to May 15. Spring seeding shall be re-fertilized and re-seeded as needed in the summer and fall from August 1st to October 31st. Summer and fall seeded areas shall be re-seeded and re-fertilized in the following spring from March 1st to June 20th May 31st.~~

The following shall be used as a guide for ~~second step application~~ for re-application:

- i. For areas with less than fifty percent (50%) stand or subject to sever erosion, apply the ~~complete amount of seed, fertilizer, and mulch (wood cellulose fiber) as specified in the original seeding.~~ original specified seed, fertilizer, lime, and mulch rates.
- ii. For areas with over fifty percent (50%) ~~of grass and slight to moderate erosion stand,~~ apply one half the original ~~fertilizer and seed~~ fertilizer, lime, and mulch rates., . ~~If~~

~~erosion is a problem apply one half the original wood fiber mulch.~~

~~The third step seeding, mulching, and fertilizing shall consist of spot application on areas not showing a satisfactory stand after the second step application. The quantity of material will be determined on the same basis as for the second step application. No urea formaldehyde fertilizer will be needed for third step seeding.~~

652.7.3-Spot Application: Spot application is for areas that have been damaged or not showing a satisfactory stand after the original or re-application, or both for seeding, mulching, liming, and fertilizing of the project site. The quantity of material will be determined by the Engineer based on the size and requirements of the spot applications.

652.8-Blank

652.9-METHOD OF MEASUREMENT:

Ground agricultural limestone, fast-acting limestone, fertilizer, and mulch will be measured by the ton. Seed will be measured by the pound.

~~Wood chips or bark~~ Mulch will be measured by the cubic yard. It is assumed that 17.5 cubic yard of chips or bark are equal to one (1) ton of straw for seeding. Wood chips or bark mulch will be measured by truck load or other loose volume measurement, and payment will be made on one ton equivalent of straw for each 17.5 cubic yard of ~~wood chips or bark~~ mulch.

~~Second and third step seeding operations~~ Re-application and spot application will be measured and included for payment under items in subsection 652.11.

~~Chemical mulch binders~~ Tackifier or binder for anchoring mulch will not be measured separately, but their cost shall be included in the unit price bid for mulch.

652.10-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 considered full compensation for furnishing all materials and performing all the work prescribed in a workmanlike and acceptable manner, including all labor, tools, equipment, supplies, and incidentals necessary to complete the work.

Topsoil will be measured and paid for in accordance with the provisions of section 651.

The bid price for fertilizer is based on 10-20-10 type. When other types of fertilizer are used, ~~pay quantities will be determined using the following table.~~ determined by the Engineer based on soil tests, pay quantities will be established by the following table.

Type of Fertilizer	Actual Quantity Used Pounds	Pay Quantity Pounds
5-10-5	100	50
8-16-8	100	80
10-20-10	100	100
12-24-12	100	120
15-30-15	100	150
<u>18-46-0</u>	<u>100</u>	<u>180</u>

When fertilizer types other than those shown above are used, the relationship between the pay quantity and the actual quantity used will be established by the Engineer.

652.11-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
652001-*	Agricultural Limestone	Ton
<u>652001-*</u>	<u>Fast-Acting Limestone, Dry</u>	<u>Pound</u>
<u>652001-*</u>	<u>Fast-Acting Limestone, Liquid</u>	<u>Gallon</u>
652002-*	Fertilizer, "type"	Ton
652003-*	Seed Mixtures, "type"	Pound
652004-*	"type" Mulch, <u>"type"</u>	Ton
<u>652006-*</u>	<u>Biological Growth Stimulant, "type"</u>	<u>Pound</u>
<u>652006-*</u>	<u>Hydraulic Growth Medium, "type"</u>	<u>Pound</u>

* Sequence number

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 652
SEEDING AND MULCHING

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

652.1-DESCRIPTION:

This work shall cover all operations incidental to the establishment and maintenance of grass, forb, and leguminous vegetation, including the furnishing and sowing of seed; furnishing and applying fertilizer, limestone, other soil amendments, and mulch material, all in accordance with these Specifications and at locations indicated on the Plans or designated by the Engineer.

652.2-MATERIALS:

Materials shall meet the requirements in the following Subsections of Section 715:

MATERIAL	SUBSECTION
Biological Growth Stimulants	715.30
Fertilizers	715.26
Hydraulic Growth Mediums	715.31
Inoculating Bacteria	715.29
Limestone	715.25
Matting for Erosion Control	715.24
Mulch Materials	715.27
Seed	715.28
Water	*

* Water shall be reasonably free from injurious chemicals and other toxic substances harmful to plant life. The source of water used is subject to the approval of the Engineer.

Temporary seed, such as common oats and cereal rye, used in the seed mixture B shall be of a commercial grade meeting the requirements of the State Seed Law. Temporary seed labeled with the notation "germination below standard" shall not be used. Temporary seed shall not be used after one year from date of germination test shown on the label. Seed other than that specified above shall meet the requirements of subsection 715.28.

Tackifier or chemical mulch binders shall be of commercial grade and conform to the requirements in subsection 715.27.1. Topsoil, if called for, shall conform to the requirements in section 651. All materials will be subject to approval or rejection, in part or in whole.

CONSTRUCTION METHODS

652.3-SEASON OF WORK:

Permanent seeding or re-application and spot application, following the original seeding, under section 652, shall be performed between the dates of February 15th to May 31st and August 1st to October 31st. Specific seeding dates are made for each seed mixture and can be found in 652.5.

Temporary seeding outside the above planting dates shall fall under section 642. Seed shall be applied following construction at any time the weather will allow seeding equipment to operate, under 642, without regard to seasons.

652.4-AREA PREPARATION FOR SEEDING AND MULCHING:

Seeding, fertilizing, liming, applying soil treatments, and mulching shall not be conducted until the specified areas have been brought to lines and grades shown on the Plans. Topsoil or hydraulic growth media shall be spread in accordance to section 651.

652.4.1-Soil Tests and Analysis: A soil test is required on all areas greater than one (1) acre when the area has reached final grade and permanent seeding is the next step. A soil test is optional for areas less than one (1) acre and will be determined by the Engineer if required. The area shall be evaluated by the Engineer to determine where the distinguishable representative areas are located. A distinguishable representative area is defined as where visible changes, such as a change in color or texture, in soil occur. All representative areas of the site shall be divided into maximum of five (5) acre increments and tested individually.

On each representative soil type, a composite sample is needed. A minimum of ten (10) subsamples of soil from the top two (2) to three (3) will be collected. The subsamples should be taken randomly throughout the area. The subsamples should be thoroughly mixed and the composite sample should be sent to a certified soil testing laboratory for analysis. The laboratory, at a minimum, should report: pH, buffer pH, fertilizer requirements and recommendations, and lime requirements and recommendations.

652.4.2-Seedbed Preparation: Areas with 2 Horizontal : 1 Vertical (H:V) slope or flatter, excluding areas involving subsurface drainage from base course material, shall be scarified sufficiently to produce a seed bed. For slopes 3H:1V and flatter, scarify soil to a depth of 2-4 inches. For slopes 3H:1V to 2H:1V, scarify subsoil to a depth of 0.5-1 inches. Remediation of the pH should be made to the subsoil at the time of soil scarification, whether lime or sulfur is required based on soil test. See Table 653.4.3 for recommended bulk densities. All large sticks, brush, loose roots, stones exceeding two (2) inches approximately in any dimension, and other debris shall be removed prior to seeding operations. Before topsoil application, use a bulldozer to track the soil perpendicular to the slope making track indentations to reduce potential for topsoil slippage. Once check slots are in place, apply and track with a dozer to a minimum thickness of four (4) inches. The area shall be free of depressions, ruts, or excessive

equipment track marks, other than check slots, on slopes. Seed bed preparation will not be necessary on slopes steeper than 2H:1V.

652.4.3-Preparation of Lawn Type Area for Seeding: Lawn type areas will use “Type A” mixture in rest areas, medians, shoulders, and lawns. The seedbed shall be fine graded. The finished grade shall be uniform and free of irregularities or depressions. The finished grade shall be free of weed and plant growth, stones over one (1) inch in diameter, or other debris. This debris will be disposed of as directed by the Engineer. Immediately prior to seeding, all areas shall be cultivated to provide a reasonably firm but friable seedbed. The depth of tillage shall be three (3) inches or as directed by the Engineer. Limestone as required and fertilizer as specified shall be worked into the upper three (3) inches of the seedbed before seeding.

TABLE 652.4.3

Recommended Lime Bulk Densities			
Soil Texture	Ideal Bulk Densities	Bulk Densities that May Affect Root Growth	Bulk Densities that Restrict Root Growth
	(lb/ft³)	(lb/ft³)	(lb/ft³)
Sands, loamy sands	< 99.9	105.5	> 112.4
Sandy loam, loams	< 87.4	101.8	> 112.4
Sandy clay loams, loams, clay loams	< 87.4	99.9	> 109.2
Silts, silt loams	< 81.2	99.9	> 109.2
Silt loams, silty clay loams	< 87.4	96.8	> 103.0
Sandy clays, silty clays, some clay loams (35-45% clay)	< 68.7	93	> 98.6
Clays (> 45% clay)	< 68.7	86.8	> 91.8

652.4.4-Soil Additives and Amendments: The application rate for limestone, fertilizer, and other soil amendments will be determined by a soil test after cuts and embankments are completed just prior to seeding. The Plans will show the estimated tons of lime, fertilizer, and other soil amendments needed for the job based on general knowledge of the soils in the area. The final application rate will be determined by the Engineer based on the soil test, conducted in accordance with MP 700.04.10.

652.5-SOWING SEED:

Immediately following area preparation, seed shall be sown. Only certified seed shall be used. Certified seed is seed that has been screened to check for satisfactory genetic purity and varietal identity and meets all requirements of State Seed Law. Seed shall not be used after one year from date of germination test shown on the label Legume seed shall be inoculated with approved cultures, in accordance with the instruction of the manufacturer. Seed may be directly sown with a drill seeder, if site conditions permit. Alternatively, seed may be sown by hydroseeding. When using a hydroseeder, the inoculant shall be increased to five times the normal rate. For areas of 5,000 square feet or less, narrow strips, steep slopes, or locations inaccessible to mechanical equipment, broadcast seeding may be permitted when approved by the Engineer

Seed shall be sown by approved methods which provide for uniform distribution of seed. Rates of application and type of seed mixture shall be in accordance with Table 652.5 unless otherwise specified on the Plans.

Specific seeding dates are made for each seed mixture.

- a. Type A mixture is to be seeded from March 15th to May 31st and from August 1st to October 31st.
- b. Type B seed mixture is to be seeded from March 1st to June 20th and October 1st to October 31st.
- c. Type C mixture is to be seeded from March 15th to May 15th and from August 1st to October 31st.
- d. Type E mixture is to be planted from March 20th to June 30th and October 15th to the first frost.

652.5.1-Reseeding, Refertilizing, and Remulching: Any area failing to establish seventy percent (70%) of cover by area over 100% of the site due to any reason shall be reseeded, refertilized, and remulched as directed by 652.8 and by the Engineer.

**TABLE 652.5
Seed Mixtures**

Variety of Seed	Type A	Type B	Type C	Type E
	Mowable Areas ^b (lb/ac)	Cut and Fills (lb/ac)	Cool Season (lb/ac)	Wet Areas (lb/ac)
Common Oat (<i>Avena sativa</i>) (March 1- October 31) ^a		30		
Cereal Rye (<i>Secale cereal</i>) (November 1-Feb 28) ^a		30		
Perennial Rye (<i>Lolium perenne</i>)	10	13		
Chewing's Fescue (<i>Festuca rubra ssp. commutate</i>)	25			
Turf Fescue ^c (<i>Festuca Variety</i>)				
Creeping Red Fescue (<i>Festuca rubra</i>)	55		55	
White Clover (<i>Trifolium repens</i>)	5		7	
Red Clover (<i>Trifolium pratense</i>)		18		
Big Bluestem (<i>Andropogon gerardii</i>)		21		
Partridge Pea (<i>Chamaecrista fasciculata</i>)		4		
Black-Eyed Susan (<i>Rudbeckia hirta</i>)		4		
Birds Foot (<i>Lotus corniculatus</i>)		18		
Orchard Grass (<i>Dactylis glomerata</i>)		11		
Redtop (<i>Agrostis gigantean</i>)			4	
Birdsfoot Trefoil (<i>Lotus corniculatus</i>)			8	
Fox Sedge (<i>Carex vulpinoidea</i>)				4
Fowl Bluegrass (<i>Poa palustris</i>)				3.5
Redtop Panicgrass (<i>Panicum rigidulum</i>)				4
Common Rush (<i>Juncus effuses</i>)				0.5

**TABLE 652.5
Seed Mixtures**

Variety of Seed	Type A	Type B	Type C	Type E
	Mowable Areas ^b (lb/ac)	Cut and Fills (lb/ac)	Cool Season (lb/ac)	Wet Areas (lb/ac)
Shallow Sedge (<i>Carex lurida</i>)				3
Blue Vervain (<i>Verbena hastata</i>)				0.8
Wingstem (<i>Verbesina alternifolia</i>)				0.2
Swamp milkweed (<i>Asclepias incarnata</i>)				0.1
Common Milkweed (<i>Asclepias syriaca</i>)		1		
Purple coneflower (<i>Echinacea purpurea</i>)		5		

- a. Choose a nurse crop according to season of planting.
- b. Type A will be utilized for mowable areas. Type A seed mixture shall be used in all urban, suburban, rest areas, WVDOH facilities, and mowable areas along roadways where lawn type turf is desired with mowing maintenance intended.
- c. A combination of approved certified varieties with no one variety exceeding fifty percent (50%) of the total turf fescue component.

652.6-APPLYING MULCH, LIME, FERTILIZER, AND OTHER SOIL AMENDMENTS:

652.6.1-General: Whenever permanent or temporary seeding is made on bare soil or newly completed construction work, the following criteria shall be followed in regard to mulching.

- i. Hydraulic erosion control products shall be used on all slopes but consult 652.6.2 for further details and specifications.
- ii. Rolled erosion control products (RECPs) may be used on slopes less than or equal to 2H:1V.
- iii. Straw mulch (excluding hay) shall be used on slopes less than or equal to 4H:1V.

When using straw mulch, the mulch shall be anchored with a non-toxic tackifier or binder as described in Section 652.6.5. The sequence of application, when using straw mulch shall be as follows:

- 1) Seed, lime, fertilizer, other soil amendments shall be sown prior to mulching.
- 2) Mulch and non-toxic tackifier or binder shall be placed within twenty-four (24) hours of sowing seed.

Where the temporary seeding has been destroyed by subsequent construction, the mulch will be the same type and amount as required for bare soil or new construction.

652.6.2-Hydraulic Erosion Control Products: Hydraulically applied erosion control products (HECPs) are applied to bare soil by means of a mechanically agitated hydro seeder or by broadcast spreading. Typically, a mixture of cut or shaved wood, straw, bonded fiber matrix, or defibrated organic fiber matrix and a stabilizing emulsion or tackifier constitutes the components of HECP. Paper mulch is not approved for use other than for the use of a mulch binder on straw.

Table 652.6.2A lists qualifications for the accepted HECPs. The products are presented in respect to the acceptable slope that the individual HECPs may be applied, as shown in Table 652.6.2B.

TABLE 652.6.2A

Mulch Types					
Property	Test Method	Straw	HECP Type 1	HECP Type 2	HECP Type 3
Physical					
Color	Observed	Natural	Colored to contrast application area, shall not stain concrete or painted surfaces.		
Organic Matter	ASTM D2974	100%	90% minimum		
Water Holding Capacity	ASTM D7367		600% Minimum	800% Minimum	1200% Minimum
Acute Toxicity	ASTM 7101	Non Toxic			
	EPA 2021.0-1				
Endurance					
Functional Longevity	ASTM D5338	≥ 90 days	≥ 90 days	≥ 180 days	≥ 365 days
Performance					
Maximum Slope Application	Observed	4.0H:1V	4.0H:1V	2.0H:1V	0.5H:1V
Cover Factor	ASTM D8298		$C \leq 0.3$	$C \leq 0.05$	$C \leq 0.01$
Ground Cover	ASTM D6567	> 85%	> 90%	> 95%	> 97%
Vegetation Establishment	ASTM D7322 ^a		300% Minimum	400% Minimum	500% Minimum

a. ASTM test methods developed for Rolled Erosion Control Products (RECPs) that have been modified to accommodate Hydraulic Erosion Control Products (HECPs).

TABLE 652.6.2B

Mulch Application		
Mulch	Applicable Slopes	Minimum Application Rate (lb/acre – dry) ^a
HECP Type 1	$\leq 4H:1V$	2,500
HECP Type 2	$4H:1V < S \leq 2H:1V$	3,000
HECP Type 3	$2H:1V < S \leq 0.5H:1V$	4,000 ^b
Straw	$\leq 4H:1V$	4,000

- a. A higher level of mulch may be applied than that specified on the Plans, Specifications, and other terms of the Contract. In this situation, the higher level mulch is applied at the rate for the actual slope condition of the site in accordance with the mulch tables, and payment is for the actual mulch specified, not the higher level mulch.
- b. HECP Type 3 may be used for permanent cover applications on slopes 1H:1V or greater at a minimum rate of 4,500 pounds per acre as directed by the Engineer only when the proper TRM installation is not practicable due to site constraints.

652.6.2.1-HECP Type Overview: Provide a HECP Type 1, 2, or 3 that has no germination or growth inhibiting factors and does not form a water-resistant crust that can inhibit plant growth. Provide a HECP Type 1, 2, or 3 that completely photo-degrades or biodegrades. Add seed, lime, fertilizer, and other soil amendments to the HECP Type 1, 2, or 3 mixture.

Furnish HECP Type 1, 2, or 3 where all components are pre-packaged by the manufacturer to assure material performance and compliance with the minimum requirements of Table 652.7.2.1. Under no circumstances will field mixing of HECP Type 1, 2, or 3 additives or components be accepted.

HECP Type 1 or 2 shall be applied when the soil is dry and rain is not expected within 24 hours following application. HECP Type 3 shall be applied when the soil is dry and rain is not expected within eight (8) hours following application. All applications shall have a high degree of certainty that no heavy rain events follow within forty-eight (48) hours following application.

The HECPs must comply at minimum with Tables 652.6.2A and 652.6.2B.

652.6.2.2-HECP Type 1: Provide a HECP Type 1 (Hydraulic Mulch with Tack) composed of non-toxic fibers consisting of a minimum of seventy percent (70%) wood fiber or natural fibers that contain non-toxic tackifiers or binders. The HECP Type 1 should be insoluble and non-dispersible after drying to limit raindrop impact. Paper fiber, whether recycled or virgin, may be incorporated in an amount not to exceed thirty percent (30%) of the total fiber content.

652.6.2.3-HECP Type 2: Provide a HECP Type 2 (bonded fiber matrix (BFM)) consisting of a hydraulically applied matrix composed of a minimum of seventy percent (70%) of non-toxic defibrated organic fibers with at least one of the following non-toxic additives:

- i. Soil tackifiers

- ii. Soil flocculants
- iii. Soil polymers
- iv. Cross-linked hydro-colloidal polymers, or
- v. Cross-linked tackifiers.

The HECP Type 2 should be insoluble and non-dispersible after drying to limit raindrop impact.

Do not use materials composed of paper, cellulose fiber, or any mixture containing paper or cellulose. Do not use materials listed for use as a HECP Type 1. Add seed, legume inoculant, lime, and fertilizer to the HECP Type 2 mixture.

652.6.2.4-HECP Type 3: Provide a HECP Type 3 (fiber reinforced matrix (FRM)) consisting of a hydraulically applied matrix composed of a minimum of seventy percent (70%) of non-toxic defibrated organic fibers and a minimum of five percent (5%), biodegradable interlocking fibers with least one of the following non-toxic additives:

- i. Soil tackifiers,
- ii. Soil flocculants,
- iii. Soil polymers,
- iv. Cross-linked hydro-colloidal polymers, or
- v. Cross-linked tackifiers.

The HECP Type 3 should be insoluble and non-dispersible after drying to limit raindrop impact.

Do not use materials composed of paper, cellulose fiber, or any mixture containing paper or cellulose. Do not use materials listed for use as HECP Type 1 or 2. Add seed, legume inoculant, lime, and fertilizer to the HECP Type 3 mixture.

652.6.3-Hydraulic Erosion Control Products Application:

652.6.3.1-Equipment: Hydraulic equipment shall be used for the application of a slurry of fertilizer, lime, seed, tackifier, legume inoculant, water, and HECP. This equipment shall have a built-in agitation system with a working capacity sufficient to agitate, suspend, and homogeneously mix a slurry of the specified amount of tackifier, fertilizer, lime, seed, legume inoculant, other soil amendments, water, and HECP. The slurry distribution lines shall be large enough to prevent stoppage. This discharge line shall be equipped with a set of hydraulic spray nozzles which will provide even distribution of the mixture or slurry in the various areas to be seeded. The slurry tank shall be mounted on a traveling unit which may be either self-propelled or drawn, with a separate unit which will place the slurry tank and spray nozzles within sufficient proximity to the areas to be seeded to provide uniform distribution without waste.

652.6.3.2-Preparation of Slurry and Application of HECPs: HECPs shall be applied at the specified rate according to the manufacturer, while following the minimum standards specified in Table 652.6.2B. When seeding into a residue or growth where temporary seeding has previously been performed, the rate will be determined by the Engineer, usually 1,000 lbs. net dry weight per acre. The HECP, tackifier, seed, legume inoculant, fertilizer, lime, other soil amendments, and water shall all be combined into the

slurry tank for distribution of all ingredients in one operation by the hydraulic seeding method. The agitator shall be operating at a rate sufficient to keep all materials in suspension at the time such material is added. The addition of materials into the slurry shall be conducted in the order and time specified by the manufacturer to ensure a homogeneous slurry and survivability of the seed and inoculants. During the spraying operation, a homogenous mixture of suspended solids in the tank until the tank is emptied. Upon request of the Engineer, a representative from the HECP manufacturer shall be on site to aid in application and inspection of the mixture application.

652.6.4-Rolled Erosion Control Products: Rolled erosion control products (RECPs) shall be composed of natural or polymer fibers bound together to form a matrix to provide erosion control. RECPs shall conform to all requirements within 715.24. RECPs shall be installed in accordance with the manufacturer’s recommendations to slope with 100% surface coverage. Single net straw matting shall be installed on slopes less than or equal to 3H:1V. Double net straw matting shall be installed on slopes less than or equal to 2H:1V.

Site preparation is crucial to achieve continuous intimate contact between the soil and the RECP. The site must be fine graded to a smooth profile and the surface must be free from any bumps or dips that cause separation between the soil and the RECP. All installed RECP’s shall be inspected to ensure proper installation. All deficiencies shall be corrected.

RECPs shall be installed as follows for proper long term effectiveness. A six (6) inch by six (6) inch trench shall be dug a minimum of three (3) feet above the top of slope. The RECP shall then be laid into the trench with six (6) inches of material extended above the trench to be used for overlap. The RECP laid in the trench shall be anchored with six (6) inch anchors at one (1) foot intervals along the width of the RECP. Backfill soil shall then be added to the trench on top of the anchored RECP and compacted. The six (6) inch overlap will then wrap around the backfilled soil and be anchored. The RECP shall then be installed parallel to the slope direction.

Each RECP should overlap another by six (6) inches to provide maximum coverage and stability. Each overlap shall be anchored at one (1) foot intervals along the length of the RECP. RECPs shall be pulled to remove excess slack without breaking contact with the soil surface and anchored to the slope with six (6) inch anchors (stakes or pins). The Engineer may require longer anchors for sandy or loose soils. Refer to table 652.7.4.1 for the minimum anchor frequency requirements.

TABLE 652.6.4

RECP Anchoring Requirement	
Slope Grade	Anchoring Frequency (anchors / square yard)
Up to 3H:1V	1.5
3H:1V to 2H:1V	2.0

652.6.5-Straw Mulch: Clean, dry straw mulch may be applied on slopes less than 4H:1V. Straw mulch may be applied to slopes up to 2H:1V if the coverage area is less than 1 acre. Straw mulch shall be applied at a rate of two (2) tons per acre with eighty five percent (85%) surface coverage by visual observation. The maximum allowable continuous slope length for straw mulch is fifty (50) feet. Slope interruption devices or rolled erosion control products are required for continuous slope length longer than fifty (50) feet. Straw mulch must be anchored

with a non-toxic tackifier or binder according to the manufacturer specifications. The non-toxic tackifier or binder should be applied on the straw at the manufacturer's recommended rates. The Contractor shall be responsible for any damage to structures from the tackifier or binder.

Straw mulch around buildings, sidewalks, or other structures may be held in place with a form of netting or may be sprayed with a non-toxic tackifier or binder by hand while protecting the structures from over spray.

652.6.6-Limestone: The kind and rate of application of limestone shall be determined by the soil analysis. Agricultural granular, fast acting lime, or both may be needed depending on the results from the soil analysis. Lime is not required for temporary seeding unless directed by the Engineer.

652.6.6.1-Agricultural Granular Limestone: Agricultural granular limestone is used for long term pH remediation. Agricultural lime shall be uniformly distributed among the area and thoroughly mixed with the soil to a depth of three (3) inches. Mixing is not required when spreading lime with hydraulic methods. Agricultural lime shall be spread at the rate recommended by the soil analysis.

652.6.6.2-Fast Acting Limestone: Fast acting limestone is used for immediate pH remediation and should only be used on sites that have time-sensitive guidelines, as directed by the Engineer. Fast acting lime comes in two forms: liquid and dry. The type of fast acting lime shall be determined by the Engineer. Both forms of fast-acting limestone shall be applied at the recommended rate from results of the soil analysis.

652.6.7-Fertilizer: The kind and amount of fertilizer per acre shall be determined by the soil analysis. Fertilizer type and quantity will then be prescribed by the Engineer based on a site-by-site analysis. The Engineer may require more than one type and quantity of fertilizer based on the project site characteristics due to varying soil conditions and properties.

Re-application and spot application fertilizer requirements shall be based on soil tests to determine the appropriate type and quantity to mitigate the failed vegetative establishment.

Temperature Release Nitrogen (Environmentally Sensitive Nitrogen (ESN)) should be considered during winter seeding to prevent excess nitrogen runoff and to preserve nitrogen for the growing season.

652.6.8-Biological Growth Stimulants: Biological growth stimulants shall be applied to all topsoil containing less than three percent (3%) organic matter by weight. The amount and type of stimulant will be determined by the soil analysis. All biological growth stimulants shall conform to 715.30.

652.6.9-Hydraulic Growth Medium: Hydraulic growth medium (HGM) shall be used when topsoil cannot be used and the subsoil analyzed for permanent seeding does not contain at least three percent (3%) organic matter by weight. The HGMs shall conform to sections 651 and 715.31.

652.6.10-Wood Chips: Wood chips, recovered from clearing and grubbing operations, or bark will be acceptable for landscaping at a depth of two (2)-four (4) inches or used to fill compost socks for erosion control measures instructed by the Engineer.

652.7-MAINTENANCE OF SEEDED AND MULCHED AREAS:

652.7.1-Contractor Maintenance Requirements: The Contractor shall maintain all seeded areas until final acceptance of the project, minimum of seventy percent (70%) vegetative cover. All areas shall be protected from equipment and foot traffic and any damaged areas shall be repaired and reseeded. The Engineer will require spot application or re-application, or both, depending upon the completion date and estimated completion time of any remaining items on the project.

652.7.2-Re-Application: The re-application of seed, mulch, and fertilizer shall be applied as directed by the Engineer based on the completion date, estimated completion time of any remaining items on the project, and unsatisfactory stand development. The application rates will be based on the stand of grass, severity of erosion and condition or growth of grass as described. Spring seeding shall be re-fertilized and re-seeded as needed in the summer and fall from August 1st to October 31st. Summer and fall seeded areas shall be re-seeded and re-fertilized in the following spring from March 1st to May 31st.

The following shall be used as a guide for re-application:

- i. For areas with less than fifty percent (50%) stand or subject to sever erosion, apply the original specified seed, fertilizer, lime, and mulch rates.
- ii. For areas with over fifty percent (50%) stand,, apply one half the original seed fertilizer, lime, and mulch rates., .

652.7.3-Spot Application: Spot application is for areas that have been damaged or not showing a satisfactory stand after the original or re-application, or both for seeding, mulching, liming, and fertilizing of the project site. The quantity of material will be determined by the Engineer based on the size and requirements of the spot applications.

652.8-Blank

652.9-METHOD OF MEASUREMENT:

Ground agricultural limestone, fast-acting limestone, fertilizer, and mulch will be measured by the ton. Seed will be measured by the pound.

Mulch will be measured by the cubic yard. It is assumed that 17.5 cubic yard of chips or bark are equal to one (1) ton of straw for seeding. Wood chips or bark mulch will be measured by truck load or other loose volume measurement, and payment will be made on one ton equivalent of straw for each 17.5 cubic yard of mulch.

Re-application and spot application will be measured and included for payment under items in subsection 652.11.

Tackifier or binder for anchoring mulch will not be measured separately, but their cost shall be included in the unit price bid for mulch.

652.10-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 considered full compensation for furnishing all materials and performing all the work prescribed in a workmanlike and acceptable manner, including all labor, tools, equipment, supplies, and incidentals necessary to complete the work.

Topsoil will be measured and paid for in accordance with the provisions of section 651.

The bid price for fertilizer is based on 10-20-10 type. When other types of fertilizer are determined by the Engineer based on soil tests, pay quantities will be established by the following table.

Type of Fertilizer	Actual Quantity Used Pounds	Pay Quantity Pounds
5-10-5	100	50
8-16-8	100	80
10-20-10	100	100
12-24-12	100	120
15-30-15	100	150
18-46-0	100	180

When fertilizer types other than those shown above are used, the relationship between the pay quantity and the actual quantity used will be established by the Engineer.

652.11-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
652001-*	Agricultural Limestone	Ton
652001-*	Fast-Acting Limestone, Dry	Pound
652001-*	Fast-Acting Limestone, Liquid	Gallon
652002-*	Fertilizer, "type"	Ton
652003-*	Seed Mixtures, "type"	Pound
652004-*	Mulch, "type"	Ton
652006-*	Biological Growth Stimulant, "type"	Pound
652006-*	Hydraulic Growth Medium, "type"	Pound

* Sequence number

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 715
MISCELLANEOUS MATERIALS

DELETE THE ENTIRE CONTENTS OF SUBSECTIONS 715.25 THROUGH 715.32 AND REPLACE WITH THE FOLLOWING:

715.25-~~GROUND AGRICULTURAL~~ LIMESTONE:

715.25.1-Ground Agricultural Limestone: Ground agricultural limestone shall consist of high calcitic or dolomitic limestone containing not less than 85% of total calcium and magnesium carbonates, ground to such fineness and clearly labeled in accordance with the requirements of the West Virginia Department of Agriculture. Ground agricultural limestone shall be furnished and used in accordance with State Laws. Suppliers must be registered with the West Virginia Department of Agriculture.

715.25.2-Fast Acting Limestone: Fast acting limestone shall meet all requirements of ground agricultural limestone with the West Virginia Department of Agriculture, except percent by weight passing U.S. Standard Sieves.

715.26-FERTILIZERS:

Commercial fertilizers shall be supplied separately or in mixtures containing the specified percentages of total nitrogen, available phosphoric acid, and water-soluble potash. Fertilizer shall be furnished in standard containers with weight, name of plant nutrients and guaranteed percentages, clearly marked, all in accordance with governing State and Federal laws. Brands must be registered with the West Virginia State Department of Agriculture.

715.26.1-Fertilizer for Seeding: Fertilizer for seeding shall consist of any type ~~with a 12:1 ratio providing the minimum nutrient equivalent specified meeting the minimum specified by the soil analysis.~~ Urea formaldehyde fertilizer shall contain a minimum of 38 percent (38%) slowly available nitrogen.

Commercial fertilizer for seeding may be supplied in any of the following forms, subject to the approval of the Engineer.

- i. A dry, free flowing fertilizer that may be applied by ordinary agricultural spreaders.
- ~~i.~~ii. A fertilizer which is water soluble or one which will permit complete suspension of insoluble particles in water, applicable to hydraulic methods of application.

TABLE 715.27.1.2

Mulch Types				
Property	Test Method	HECP Type 1	HECP Type 2	HECP Type 3
Physical				
<u>Color</u>	<u>Observed</u>	<u>Colored to contrast application area, shall not stain concrete or painted surfaces.</u>		
<u>Organic Matter</u>	<u>ASTM D2974</u>	<u>90% minimum</u>		
<u>Water Holding Capacity</u>	<u>ASTM D7367</u>	<u>600% Minimum</u>	<u>800% Minimum</u>	<u>1200% Minimum</u>
<u>Acute Toxicity</u>	<u>ASTM 7101 EPA 2021.0-1</u>	<u>Non Toxic</u>		
<u>Mass per Unit Area (g/m²)</u>	<u>ASTM D6566</u>	<u>150</u>	<u>250</u>	<u>350</u>
<u>Thickness of Fibers (mm)</u>	<u>ASTM D6525</u>	<u>2.5</u>	<u>3</u>	<u>4</u>
Endurance				
<u>Functional Longevity</u>	<u>ASTM D5338</u>	<u>≥ 90 days</u>	<u>≥ 180 days</u>	<u>≥ 365 days</u>
Performance				
<u>Maximum Slope Application</u>	<u>Observed</u>	<u>4.0H:1V</u>	<u>2.0H:1V</u>	<u>0.5H:1V</u>
<u>Cover Factor</u>	<u>ASTM D8298 or ASTM D8297</u>	<u>C ≤ 0.3</u>	<u>C ≤ 0.05</u>	<u>C ≤ 0.01</u>
<u>Ground Cover</u>	<u>ASTM D6567</u>	<u>≥ 90%</u>	<u>≥ 95%</u>	<u>≥ 97%</u>
<u>Vegetation Establishment</u>	<u>ASTM D7322^a</u>	<u>300% Minimum</u>	<u>400% Minimum</u>	<u>500% Minimum</u>

a. ASTM test methods developed for Rolled Erosion Control Products (RECPs) that have been modified to accommodate Hydraulic Erosion Control Products (HECPs).

The mulch shall be delivered in packages not to exceed 100 lbs. The package shall bear the name of the manufacturer, the net weight and a supplemental statement of the net dry weight.

The material must be approved prior to being used. Acceptance will be based on sampling and testing by the Division for conformance to specifications.

715.27.1.3-Chemical Mulch Binder: A chemical mulch binder shall consist of a polymer, ~~synthetic resin, polypectate guar, starch, polyacylamide~~, or other material which can readily be removed and will give similar adhesive properties as asphalt when sprayed on straw or other fiber mulches.

715.27.2-Mulch Materials for Landscape Plantings: Acceptable materials for mulching shall be shredded bark, buckwheat hulls, wood chips or other organic materials approved by the Engineer.

Certain inorganic materials such as calcined clay, crushed rock or coarse gravel will be acceptable when designated on the Plans.

715.28-SEED:

The varieties of grass and legume seeds to be furnished to the project shall bear a tag on

each bag of each species showing the lot number, the seedman's name, the percent of purity, the percent of germination and the weed seed content, in accordance with governing State and Federal laws.

All seeds shall be free from noxious weed seeds as set forth in the West Virginia State seed law and in no event shall the total weed content of any lot of seed or seed mixture exceed one-half percent by weight. The minimum percent purity and germination for the various seeds shall be as shown in Table 715.28.

Seed	Purity Minimum %	Germination	
		Total Minimum (%)	Minimum Quick Sprouts (%)
Crown Vetch	99	*70	35
Kentucky Bluegrass	85	75	
Kentucky 31 Fescue	98	85	
Marion Bluegrass	90	75	
Perennial Ryegrass	95	85	
Red Fescue	98	85	
White Dutch Clover	98	*85	55

TABLE 715.28
Minimum Seed Purity And Germination

<u>Variety of Seed</u>	<u>Minimum Seed Purity (%)</u>	<u>Minimum Seed Germination (%)</u>
<u>Common Oat</u> <u>(Avena sativa) (March 1-October 31)</u>	<u>98</u>	<u>85</u>
<u>Cereal Rye</u> <u>(Secale cereal) (November 1 – February 28)</u>	<u>98</u>	<u>85</u>
<u>Autumn Bentgrass</u> <u>(Agrostis perennans)</u>	<u>95</u>	<u>85</u>
<u>Perennial Rye</u> <u>(Lolium perenne)</u>	<u>95</u>	<u>85</u>
<u>Chewing's Fescue</u> <u>(Festuca rubra ssp. commutate)</u>	<u>97</u>	<u>85</u>
<u>Hard Fescue 'Chariot'</u> <u>(Festuca brevipila)</u>	<u>97</u>	<u>85</u>
<u>Hard Fescue 'Heron'</u> <u>(Festuca ovina var. duriusecula)</u>	<u>97</u>	<u>85</u>
<u>Creeping Red Fescue</u> <u>(Festuca rubra)</u>	<u>97</u>	<u>85</u>
<u>White Clover</u> <u>(Trifolium repens)</u>	<u>99</u>	<u>85</u>
<u>Red Clover</u> <u>(Trifolium pratense)</u>	<u>95</u>	<u>80</u>
<u>Big Bluestem</u> <u>(Andropogon gerardii)</u>	<u>85</u>	<u>70</u>
<u>Virginia Wildrye</u> <u>(Elymus virginicus)</u>	<u>85</u>	<u>70</u>
<u>Switchgrass</u> <u>(Panicum virgatum)</u>	<u>95</u>	<u>75</u>

<u>Indiangrass</u> <i>(Sorghastrum nutans)</i>	<u>85</u>	<u>70</u>
<u>Partridge Pea</u> <i>(Chamaecrista fasciculata)</i>	<u>98</u>	<u>70</u>
<u>Black-Eyed Susan</u> <i>(Rudbeckia hirta)</i>	<u>80</u>	<u>60</u>
<u>Birdsf-Foot</u> <i>(Lotus corniculatus)</i>	<u>96</u>	<u>85</u>
<u>Orchardg-Grass</u> <i>(Dactylis glomerata)</i>	<u>85</u>	<u>80</u>
<u>Narrowleaf Mountainmint</u> <i>(Pycnanthemum tenuifolium)</i>	<u>80</u>	<u>40</u>
<u>Wild Bergamot</u> <i>(Monarda fistulosa)</i>	<u>80</u>	<u>40</u>
<u>Panieledleaf Ticktrefoil</u> <i>(Desmodium paniculatum)</i>	<u>90</u>	<u>70</u>
<u>Smooth Oxeye</u> <i>(Heliopsis helianthoides)</i>	<u>80</u>	<u>60</u>
<u>Flat top Goldentop</u> <i>(Euthamia graminifolia)</i>	<u>70</u>	<u>40</u>
<u>Redtop</u> <i>(Agrostis gigantean)</i>	<u>92</u>	<u>80</u>
<u>Birdsfoot Trefoil</u> <i>(Lotus corniculatus)</i>	<u>98</u>	<u>95</u>
<u>Fox Sedge</u> <i>(Carex vulpinoidea)</i>	<u>85</u>	<u>60</u>
<u>Fowl Bluegrass</u> <i>(Poa palustris)</i>	<u>90</u>	<u>70</u>
<u>Redtop Panicgrass</u> <i>(Panicum rigidulum)</i>	<u>99</u>	<u>70</u>
<u>Common Rush</u> <i>(Juncus effuses)</i>	<u>85</u>	<u>60</u>
<u>Shallow Sedge</u> <i>(Carex lurida)</i>	<u>85</u>	<u>60</u>
<u>Blue Vervain</u> <i>(Verbena hastate)</i>	<u>80</u>	<u>50</u>
<u>Wingstem</u> <i>(Verbesina alternifolia)</i>	<u>90</u>	<u>80</u>
<u>Joe Pye Weed</u> <i>(Eutrochium purpureum)</i>	<u>80</u>	<u>60</u>
<u>Swamp milkweed</u> <i>(Asclepias incarnata)</i>	<u>80</u>	<u>60</u>
<u>Butterfly Milkweed</u> <i>(Asclepias tuberosa L.)</i>	<u>80</u>	<u>60</u>
<u>Common Milkweed</u> <i>(Asclepias syriaca)</i>	<u>80</u>	<u>60</u>
<u>Purple coneflower</u> <i>(Echinacea purpurea)</i>	<u>80</u>	<u>60</u>

~~Crown vetch seed~~ All legumes shall be inoculated according to the supplier's recommendations. However, when seeding with the hydroseeder the inoculant shall be increased to five times the recommended rate.

If test results indicate noncompliance with the above germination or purity requirements,

or both, additional seed may be added to give the equivalent germination or purity, or both.

The Division reserves the right to test, reject or approve all seed after delivery on the project.

715.29-INOCULATING BACTERIA:

This material shall be used to treat all leguminous seed and shall be a pure culture of nitrogen fixing bacteria selected for maximum vitality and ability to transform nitrogen from the air into soluble nitrates and deposit them in the soil. It shall not be more than one year old.

~~715.30 through 715.32: Blank~~

715.30-BIOLOGICAL GROWTH STIMULANTS:

Biological growth stimulants (BGSs) shall be applied to topsoil containing less than 3% organic matter. BGSs shall provide immediate organic matter adjustment to help stimulate seed germination, improve the availability of nutrients to the grass, and generate robust plant growth which is more tolerant of changes in environmental conditions.

Animal by-products, municipal waste products, and liquid fertilizers are not acceptable for use as a BGSs.

BGSs shall not contain germination or growth inhibiting factors or form a water-resistant crust that can inhibit plant growth. BGSs shall come pre-packaged by the manufacturer to assure material performance and compliance with the minimum requirements in Table 715.30-1 No field mixing of components shall occur on site.

TABLE 715.30-1

<u>Minimum Biological Growth Stimulant Requirements</u>		
<u>BGS Property</u>	<u>Test Method</u>	<u>Required Value</u>
<u>Physical</u>		
<u>Humate/Humic Acid</u>		<u>1% minimum</u>
<u>Acute Toxicity</u>	<u>ASTM 7101 EPA 2021.0-1</u>	<u>Non Toxic</u>
<u>Performance</u>		
<u>Seed Germination</u>	<u>ASTM D7322^a</u>	<u>200% minimum</u>
<u>Plant Height</u>	<u>ASTM D7322^a</u>	<u>200% minimum</u>
<u>Plant Mass</u>	<u>ASTM D7322^a</u>	<u>110% minimum</u>

a. ASTM test methods developed for Rolled Erosion Control Products (RECPs) that have been modified for comparison to control at 21 days.

715.31-HYDRAULIC GROWTH MEDIUM:

Hydraulic growth mediums (HGMs) may be applied on areas to replace topsoil, by instruction of the Engineer, in areas where little to no organic matter is present in the parent subsoil. The HGMs provides a substance on which plants can be grown that requires no curing time, provides exceptional seeding germination and plant establishment, assists in soil building, and provides erosion control. HGMs may be applied to slopes with a steepness factor of 2H:1V or less.

The HGMs shall consist of a two-part system:

- i. A blend of organic and natural fibers with fast-acting soil building and growth components.

- ii. Materials and components that increase the water and nutrient holding capacity of the soil and create an environment for growth of beneficial microorganisms while allowing seed germination and vegetation establishment. These shall include at least 10% of the final composition:
 - a. Biochar
 - b. Humus/Humic Acid
 - c. Mycorrhizae Fungi
 - d. Seaweed Extract
 - e. Trace Elements
 - f. Growth Stimulators
 - g. Beneficial Microorganisms
 - h. Micronutrients
 - i. Organic Growth Mediums.

TABLE 715.31A1.1
Organic Fiber Requirements

<u>Property</u>	<u>Test Method</u>	<u>Value</u>
<u>Physical</u>		
<u>Minimum Organic Fiber Content like a combination of Bark fiber, wood fiber etc.</u>		<u>80%</u>
<u>Moisture Content</u>		<u><20%</u>
<u>Minimum Total Organic Matter</u>	<u>ASTM D586</u>	<u>88%</u>
<u>Maximum Carbon: Nitrogen Ratio</u>	<u>ASTM D1508</u>	<u>50:1</u>
<u>pH</u>	<u>ASTM D1293</u>	<u>5-7</u>
<u>Performance</u>		
<u>21 Day Germination</u>	<u>ASTM D7322</u>	<u>500%</u>
<u>Minimum Water Holding Capacity</u>	<u>ASTM D7367</u>	<u>900%</u>

The application rates for all components shall be to manufacturer’s specifications while following the minimum application rates outlined in Table 715.31B.2 and Table 715.31C.3.

TABLE 715.31B.2
Organic Fiber Material Minimum Rates

<u>Property</u>	<u>Minimum Application Rate lbs/acre</u>
<u>% Organic Matter of Subsoil</u>	
<u>≤ 0.75</u>	<u>5,000</u>
<u>0.75 – 1.5</u>	<u>4,500</u>
<u>1.5 - 2.0</u>	<u>4,000</u>
<u>2.0 – 5.0</u>	<u>3,500</u>

TABLE 715.31C.3
Soil Chemistry and Stabilizer Material Minimum Rates

<u>Slope</u>	<u>Soil Type</u>	<u>Minimum Application Rate lbs/acre</u>
<u><3H:1V</u>	<u>Sand</u>	<u>35</u>

	<u>Clay</u>	<u>70</u>
<u>3H:1V – 2H:1V</u>	<u>Sand</u>	<u>70</u>
	<u>Clay</u>	<u>140</u>

715.32-Blank

SECTION BREAK

NEW BUSINESS ITEMS

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

**SECTION 106
CONTROL OF MATERIALS**

106.1-SOURCE OF SUPPLY AND QUALITY REQUIREMENTS:

106.1.4-Use of Domestic Construction Materials:

ADD THE FOLLOWING BETWEEN THE FOURTH AND FIFTH PARAGRAPH OF THE SUBSECTION:

The United States Department of Transportation has issued a De Minimis Cost that can waive certain requirements of the Build America, Buy America Act (BABA), and FHWA Buy America requirements as further described in MP 106.10.51 and 23 CFR 635.410.

The De Minimis Cost portion waives the application of FHWA Buy America requirements for manufactured products and BABA requirements for Construction Materials and Manufactured Products under a single financial assistance award when the total value of the non-compliant construction materials and manufactured products permanently incorporated into the project is no more than the lesser of \$1,000,000 or five percent (5%) of the total applicable project costs. Total applicable project costs include the actual value of steel, iron, manufactured products, and construction materials incorporated into the project.

Cement and cementitious materials; aggregates such as stone, sand, or gravel; and binding agents or additives (referred to as Section 70917(c) materials in 2 CFR 184.3), standing alone, should not be included in the determination of total applicable project costs. These Section 70917(c) materials, however, may be included as components of manufactured products, in which case the cost of the manufactured product, including the cost of the Section 70917(c) components, should be included in the determination of total applicable project costs.

For manufactured products, compliance and non-compliance shall be determined based on the standards in effect at the time of FHWA obligation of the Federal financial assistance. The Contractor shall track and document the cumulative value of all non-compliant construction materials and manufactured products throughout the duration of the project, including

modifications and change orders, based on actual costs, to ensure the applicable threshold is not exceeded.

The FHWA's de minimis standard at 23 CFR 635.410(b)(4) applies to steel and iron products. This standard permits minimal use of steel and iron provided the cost, defined as the value of the steel and iron products as delivered to the project, does not exceed one-tenth of one percent (0.1 percent) of the total contract cost or \$2,500, whichever is greater. This includes the steel and iron included in precast concrete products and the cabinets and enclosures comprised of steel and iron for Intelligent Transportation Systems (ITS) products and other electronic hardware systems installed in the highway right-of-way.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

SECTION 106
CONTROL OF MATERIALS

106.1-SOURCE OF SUPPLY AND QUALITY REQUIREMENTS:

106.1.1-Definitions:

ADD THE FOLLOWING DEFINITIONS TO THE SUBSECTION:

“Fifty-Five Percent (55%) Requirement” means that the cost of components of the manufactured product that are mined, produced, or manufactured in the United States must be greater than Fifty-Five percent (55%) of the total cost of all components of the manufactured product, in accordance with 23 CFR 635.410.

“Kit” means components and/or products with the intent of being assembled or installed into one product at the work site to perform a unified function are defined as a kit. The components shall be acquired from a single manufacturer or supplier and assembled by them at the work site. The kit if classified as a manufactured product through 23 CFR 635.410 should be classified as a singular manufactured product. The individual components should not be classified as separate manufactured products, even though they may be brought to the work site separately.

“Predominantly of iron or steel or a combination of both” means that the cost of the iron and steel content exceeds 50 percent of the total cost of all its components. The cost of iron and steel is the cost of the iron or steel mill products (such as bar, billet, slab, wire, plate, or sheet), castings, or forgings utilized in the manufacture of the product and a good faith estimate of the cost of iron or steel components.

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

106.1.5-State and/or Federal Use of Manufactured Products: All manufactured products ~~used in permanently incorporated into~~ the project are to be ~~produced~~ manufactured in the United States in accordance with 23 CFR 635.410. Manufactured products shall be classified in accordance with 23 CFR 635.410(c)(2) at the time the product is brought to the work site for incorporation into the project. The final assembly of the manufactured product shall ~~be manufactured occur~~ in the United States and ~~compliant with the~~ shall comply with 23 CFR 635.410 and the “Infrastructure Investment and Jobs Act,” Section 70901-52, entitled the “Build America, Buy America Act”, as implemented by the Office of Management and Budget (OMB) in the OMB Memorandum M-24-02, CFR Part 184, and MP 106.10.50.

For Federal-aid highway projects obligated on or after October 1, 2026, all manufactured products permanently incorporated into the project shall also comply with 23 CFR 635.410(c)(1)(vii)(B). In addition to final assembly occurring in the United States, the manufactured product shall meet the 55% Requirement.

For precast concrete products classified as manufactured products, any components that consist predominantly of iron or steel, or a combination of both, as defined in 23 CFR 635.410(c)(1)(vi), shall comply with the Buy America requirements for iron and steel under 23 CFR 635.410(b), regardless of the date of project obligation.

For Intelligent Transportation Systems (ITS) and other electronic hardware systems installed in the highway right-of-way or other real property and classified as manufactured products, cabinets or other enclosures that consist predominantly of iron or steel, or a combination of both, shall comply with 23 CFR 635.410(b).

For projects obligated on or after October 1, 2026, the cost of iron or steel components required to comply with 23 CFR 635.410(b) shall be included in the calculation of the Fifty-Five Percent (55%) Requirement.

When manufactured products are permanently incorporated into the project, the Contractor shall supply manufacturer certification and adequate documentation certifying compliance with applicable Buy America requirements prior to incorporation into the project in accordance with MP 106.10.50.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 106

CONTROL OF MATERIALS

106.1-SOURCE OF SUPPLY AND QUALITY REQUIREMENTS:

106.1.1-Definitions:

ADD THE FOLLOWING DEFINITIONS TO THE SUBSECTION:

“Fifty-Five Percent (55%) Requirement” means that the cost of components of the manufactured product that are mined, produced, or manufactured in the United States must be greater than Fifty-Five percent (55%) of the total cost of all components of the manufactured product, in accordance with 23 CFR 635.410.

“Kit” means components and/or products with the intent of being assembled or installed into one product at the work site to perform a unified function are defined as a kit. The components shall be acquired from a single manufacturer or supplier and assembled by them at the work site. The kit if classified as a manufactured product through 23 CFR 635.410 should be classified as a singular manufactured product. The individual components should not be classified as separate manufactured products, even though they may be brought to the work site separately.

“Predominantly of iron or steel or a combination of both” means that the cost of the iron and steel content exceeds 50 percent of the total cost of all its components. The cost of iron and steel is the cost of the iron or steel mill products (such as bar, billet, slab, wire, plate, or sheet), castings, or forgings utilized in the manufacture of the product and a good faith estimate of the cost of iron or steel components.

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

106.1.5-State and/or Federal Use of Manufactured Products: All manufactured products ~~used in~~ permanently incorporated into the project are to be ~~produced~~ manufactured in the United States in accordance with 23 CFR 635.410. Manufactured products shall be classified in accordance with 23 CFR 635.410(c)(2) at the time the product is brought to the work site for incorporation into the project. The final assembly of the manufactured product

~~shall be manufactured occur~~ in the United States and ~~compliant with the~~ shall comply with 23 CFR 635.410 and the “Infrastructure Investment and Jobs Act,” Section 70901-52, entitled the “Build America, Buy America Act”, as implemented by the Office of Management and Budget (OMB) in the OMB Memorandum M-24-02, CFR Part 184, and MP 106.10.50.

For Federal-aid highway projects obligated on or after October 1, 2026, all manufactured products permanently incorporated into the project shall also comply with 23 CFR 635.410(c)(1)(vii)(B). In addition to final assembly occurring in the United States, the manufactured product shall meet the 55% Requirement.

For precast concrete products classified as manufactured products, any components that consist predominantly of iron or steel, or a combination of both, as defined in 23 CFR 635.410(c)(1)(vi), shall comply with the Buy America requirements for iron and steel under 23 CFR 635.410(b), regardless of the date of project obligation.

For Intelligent Transportation Systems (ITS) and other electronic hardware systems installed in the highway right-of-way or other real property and classified as manufactured products, cabinets or other enclosures that consist predominantly of iron or steel, or a combination of both, shall comply with 23 CFR 635.410(b).

For projects obligated on or after October 1, 2026, the cost of iron or steel components required to comply with 23 CFR 635.410(b) shall be included in the calculation of the Fifty-Five Percent (55%) Requirement.

When manufactured products are permanently incorporated into the project, the Contractor shall supply manufacturer certification and adequate documentation certifying compliance with applicable Buy America requirements prior to incorporation into the project in accordance with MP 106.10.50.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

ADD THE FOLLOWING SECTION:

**SECTION 115
JOB ORDER CONTRACTING**

115.1- DESCRIPTION:

This Section establishes Job Order Contracting (JOC) as a method of construction contracting under which the Contractor shall perform construction, maintenance, repair, or minor improvement work as directed by the West Virginia Division of Highways (WVDOH) through individually issued JOC.

Job Order Contracts shall be issued under competitively bid Master Agreements awarded by WVDOH. Each JOC constitutes a binding construction contract issued under and governed by the Master Agreement and shall define the scope, location, quantities, schedule, and applicable requirements for the work.

At initial implementation, JOC under this Section is intended for use on piling wall projects. Additional work categories may be added in the future at the discretion of the Division through revisions to the Master Agreement, project-specific special provisions, or both.

Work under a Master Agreement is performed on an as-needed basis. No minimum quantity of work is guaranteed.

The Contractor shall comply with this Special Provision and all applicable WVDOH Standards and Supplemental Specifications.

115.2-MASTER AGREEMENT:

115.2.1-General: Master Agreements shall be advertised and bid in accordance with WVDOH standard bidding procedures and applicable federal and state requirements. Each Master Agreement shall include a schedule of items with unit bid prices applicable to the defined categories of work. The Master Agreement establishes unit bid prices and prequalifies contractors for future competition at the individual Job Order Contract level. The Master Agreement does not authorize construction work and does not obligate funds.

Federal contract provisions shall be included in the advertisement and bidding documents.

The Master Agreement does not constitute a Federal-aid project and is not required to be included in the Statewide Transportation Improvement Program (STIP). Federal authorization, NEPA clearance, and STIP inclusion shall be obtained at the individual JOC level, as applicable.

115.2.2-Eligibility and Duration:

- A. Contractors must be responsible bidders and provide proof of insurance meeting WVDOH requirements.
- B. No performance or payment bond is required for the Master Agreement.
- C. Contractors must be prequalified in the major item(s) of work for which the Master Agreement is intended.
- D. Master Agreements shall be awarded to all responsible bidders in accordance with this Special Provision.
 - i. The award of Contract, if it be awarded, will be made within thirty (30) calendar days after the opening of Proposals to all responsible and prequalified bidders. The Commissioner may withhold award for any length of time. All responsible bidders will be made aware of intent to withhold the award, and may withdraw their bid at that time if they so choose. All responsible bidders will be notified that their bid has been accepted and they have been awarded a Contract.
- E. No bid bond shall be required for the Master Agreement or for individual Job Order Contracts, unless otherwise specified in the advertisement.
- F. No Disadvantaged Business Enterprise (DBE) goal is established for the Master Agreement.
- G. The maximum total duration of a Master Agreement, including any extensions, shall not exceed five (5) years. Master Agreements shall be administratively closed at the end of each calendar year, with continuation or renewal subject to Division determination and applicable procurement requirements.

115.3-JOB ORDER CONTRACT DEVELOPMENT:

115.3.1-Abbreviated PS&E: An Abbreviated Plans, Specifications, and Estimate (PS&E) package shall be developed for each JOC and shall include, at a minimum:

- 1. Right-of-Way and Utility status
- 2. NEPA clearance
- 3. Schedule of items with estimated quantities sufficient to complete the project, including traffic control, erosion and sediment control, piling, and other required work
- 4. Cost estimate
- 5. Working time analysis
- 6. A plan set sealed by a Professional Engineer sufficient for construction using standard details
- 7. JOC completion date
- 8. Liquidated damages based on the JOC value in accordance with WVDOH specifications

Each JOC shall have its own State and Federal project number and shall receive individual authorization in Federal Highway Administration's (FHWA) Fiscal Management Information System (FMIS).

115.4-AWARD OF JOB ORDER CONTRACTS:

Each JOC shall be awarded on a competitive basis among Master Agreement holders applying the unit prices established under the Master Agreement to the estimated quantities included in the Abbreviated PS&E. Award shall be determined solely by multiplying the estimated quantities by the applicable unit prices. Unit prices established in the Master Agreement shall not be renegotiated for individual JOCs.

- A. The schedule of items and estimated quantities included in the Abbreviated PS&E for the JOC shall be used to determine the lowest overall total cost by multiplying the estimated quantities by the unit prices bid under the Master Agreement.
- B. The lowest responsible bidder shall be offered the JOC for the construction of the project.
 - 1. The apparent low bidder shall have five (5) working days from notification by the Division to accept or reject the JOC. The five (5) working day acceptance period shall run concurrently with the two (2) working day protest period established in Subsection 115.4.2.
 - 2. Acceptance or rejection may be submitted by email or other acceptable written format.
 - 3. If the Contractor rejects the JOC or fails to respond within five (5) working days, the JOC shall be offered to the next lowest responsible bidder.
 - 4. This process shall continue until the JOC is accepted or no responsible Master Agreement holders remain.
- C. Upon written acceptance by the Contractor, the Job Order Contract shall constitute a binding construction contract issued under the Master Agreement. No separate contract document shall be required unless otherwise specified in the Job Order Contract. No bid bond, performance bond, or payment bond shall be required unless specified in the individual Job Order Contract.
- D. Notice to Proceed shall not be issued prior to authorization in FMIS.

115.4.1-Issuance of Job Orders: The Division will issue Job Orders describing the specific scope of work. Each Job Order shall include:

- A. Location of work
- B. Description of work
- C. Applicable items and quantities from the Schedule of Items
- D. Time allowed for completion
- E. Indication of federal-aid participation, if any

115.4.2-Protest of Award: Following evaluation of the Abbreviated PS&E quantities and application of the unit prices established under the Master Agreement, the Division will notify all Master Agreement holders of the apparent low bidder for the Job Order Contract.

Any protest concerning the evaluation, selection, or proposed award of a Job Order Contract shall be submitted in writing within two (2) working days of issuance of the Division’s notification of the apparent low bidder.

Protests shall be submitted and handled in accordance with Section 103.2 – Bid Protests, except as modified herein.

The Division shall not finalize the award of the Job Order Contract until the two (2) working day protest period has expired or any timely filed protest has been resolved.

115.4.3 – Failure to Commence or Perform Work: If a Contractor accepts a Job Order Contract and subsequently fails to begin work or to complete the within in accordance with subsections 115.4.4 and 115.9, the Division may take the following actions:

- A. The Division may rescind the Job Order Contract, in whole or in part, at no cost to the Division.
- B. Upon rescission, the Division may offer the Job Order Contract to the next lowest responsible Master Agreement holder in accordance with Subsection 115.4.
- C. Failure to commence work or to maintain satisfactory progress may be grounds for the Contractor to be declared non-responsible for purposes of future Job Order Contract awards under the Master Agreement.
- D. Removal from consideration for future Job Order Contracts under the Master Agreement shall not relieve the Contractor of liability for any damages or other remedies available to the Division under the Contract Documents.

115.4.4 – Commencement of Work: The Contractor shall begin physical work at the project site within twenty-one (21) calendar days after issuance of the Notice to Proceed, unless otherwise specified in the individual Job Order Contract.

Failure to commence work within the required time, or failure to thereafter prosecute the work with sufficient forces and progress to ensure completion within the time allowed, may result in rescission of the Job Order Contract in accordance with Subsection 115.4.3.

115.5 MOBILIZATION

Upon commencement of work under an issued Job Order Contract, the Contractor shall be entitled to payment for mobilization in the amount of one (1) unit of Item 204003-000, “Mobilization per Job Order,” per Job Order Contract.

Mobilization shall be paid on the first progress estimate following the start of physical work at the project site.

If a Job Order Contract includes work at multiple locations within the same county, mobilization shall be paid only once for that county. If the Job Order Contract includes work in more than one county within the District, one additional mobilization payment will be made for each additional county in which work is performed, unless otherwise specified in the Job Order Contract.

Payment for mobilization shall constitute full compensation for all preparatory operations, including but not limited to movement of personnel, equipment, materials, bonds, insurance, field office setup (if required), and all other incidentals necessary to begin work under the Job Order Contract.

115.6-APPLICABLE SPECIFICATIONS:

Unless otherwise stated in the JOC, the following shall apply:

1. WVDOH Standard Specifications, latest edition
2. Applicable Supplemental Specifications
3. WVDOH Manuals and Standard Drawings
4. Applicable ASTM, AASHTO, and other recognized industry standards

The Contractor shall meet the same material, construction, and quality requirements as required for traditionally bid projects.

115.6.1 – Clearing and Grubbing: Clearing and grubbing required for the construction of a Job Order shall be performed in accordance with Section 201 – Clearing and Grubbing, and shall be considered incidental to Item 207001-001, “Unclassified Excavation.”

No separate measurement or payment will be made for clearing and grubbing; all costs shall be included in the unit price for Unclassified Excavation.

Payment shall constitute full compensation for labor, equipment, materials, disposal, and all incidentals necessary to complete the clearing and grubbing work in accordance with Section 201 and the requirements of the Job Order Contract.

115.6.2 – Construction Layout Stakes: Construction layout stakes required for the performance of any work under a Job Order Contract, including setting reference points, grade, alignment, or other layout control, shall be considered incidental to the respective unit prices under the Job Order Contract.

No separate measurement or payment will be made for construction layout stakes; all labor, materials, equipment, and incidentals necessary to provide and maintain the layout stakes shall be included in the applicable unit prices of the JOC.

115.7-ORDER OF PRECEDENCE:

In the event of conflict between Contract documents, the following order of precedence shall apply:

1. Job Order Contract (JOC)
2. Master Agreement
3. Special Provisions
4. Contract Documents
5. Schedule of Items
6. WVDOH Standard Specifications and Supplemental Specifications
7. WVDOH Standard Details and Manuals

115.8-INSPECTION AND ACCEPTANCE:

All work shall be subject to inspection by the Division. Acceptance shall be based on compliance with the Job Order Contract, approved plans, and applicable specifications.

Final acceptance shall be made on an individual Job Order Contract basis in accordance with Subsection 105.16.2. Each Job Order Contract shall be administered and accepted individually for purposes of inspection, punch list, final quantities, and final acceptance, but shall remain subject to the Master Agreement. Acceptance of one Job Order Contract shall not constitute acceptance of the Master Agreement or any other issued Job Order Contract.

Nonconforming work may be rejected at no additional cost to the Division.

115.9-TIME FOR COMPLETION:

Each JOC shall establish a specific time for completion. Failure to complete the work within the allowed time shall result in liquidated damages assessed in accordance with subsection 108.7.1 - Failure to Complete on Time and Liquidated Damages, based on the total authorized value of the individual JOC. Liquidated damages shall not be based on the value of the Master Agreement.

115.10-CHANGES TO JOB ORDERS:

Changes within the general scope of a JOC shall be priced using applicable unit prices from the Master Agreement Schedule of Items. Work not included in the Schedule of Items shall be handled according to subsection 104.3-Extra Work.

115.11-MEASUREMENT AND PAYMENT:

Measurement shall be based on actual quantities of work performed and accepted.

Payment shall be made using the unit prices established under the Master Agreement and the quantities authorized in the JOC.

No payment shall be made for work not authorized by a JOC.

115.11.1 – HCSI Classification for Piling Walls: When piling wall work is included in a Job Order Contract, the Abbreviated PS&E shall identify a single Hardness and Compress Strength Index (HCSI) classification for the project in accordance with Special Provision 614.8.1.

Only the steel pile pay items corresponding to that HCSI classification shall be included in the Schedule of Items for the Job Order Contract.

Estimated quantities shall reflect total anticipated pile length regardless of localized subsurface variation.

115.12-SUBCONTRACTING:

Subcontracting shall be in accordance with subsection 108.1 – Subletting of Contract and all other Contract Documents.

For each individual Job Order Contract, the Contractor shall perform with its own organization work amounting to not less than thirty percent (30%) of the total contract cost, unless otherwise permitted under subsection 108.1.

The Contractor remains fully responsible for the quality and timely completion of all Subcontracted work.

115.13-NON-EXCLUSIVE CONTRACT:

The Division reserves the right to perform work with its own forces or through other Contracts. The Division makes no guarantee as to the quantity, value, or frequency of Job Orders to be issued under the Master Agreement.

115.14-FEDERAL-AID / FHWA REQUIREMENTS:

115.14.1-Federal-Aid Participation: When federal funds participate in a JOC, all applicable FHWA requirements apply, including:

1. Title 23, United States Code
2. Title 23, Code of Federal Regulations
3. FHWA-1273 Required Contract Provisions
4. Davis-Bacon wage rate requirements
5. Buy America requirements
6. Equal Employment Opportunity provisions
7. Debarment and suspension requirements

Each Job Order will indicate whether federal-aid funds are involved.

Appendix – Sample Bid Items (Informational Only)

The sample bid items provided in this appendix are for **illustrative purposes only** to facilitate discussion and understanding of potential Job Order Contract work. These items **do not constitute a Schedule of Items**, nor are they authorized for bidding, payment, or contract use. Actual bid items, quantities, and unit prices will be established and provided in the Schedule of Items for each individual Job Order Contract in accordance with the Master Agreement and approved Abbreviated PS&E.

PAY ITEM	DESCRIPTION	UNITS
204001-000	Mobilization	EA
207001-001	Uncl. Excavation	CY
207034-000	Fabric for Separation	SY
211002-000	Rock Borrow Excavation	CY
307001-000	Aggregate Base Course, class 1	TN
307001-000	Aggregate Base Course, class 10	TN
614010-003	HP 10X42 Steel Pile (HCSI 4 or less)	LF
614010-006	HP 12X53 Steel Pile (HCSI 4 or less)	LF
614010-008	HP 12X74 Steel Pile (HCSI 4 or less)	LF
614011-003	HP 10X42 Steel Pile (HCSI greater than 4)	LF
614011-006	HP 12X53 Steel Pile (HCSI greater than 4)	LF
614011-008	HP 12X74 Steel Pile (HCSI greater than 4)	LF
614003-001	Concrete Lagging, thickness 6"	SF
614003-001	Concrete Lagging, thickness 8"	SF
636011-001	Traffic Control Device	UN
636014-001	Flagger	HR
636022-001	Changeable Message Sign	DA
636023-002	Temporary Traffic Signal, Portable	MO
636017-004	Temporary Traffic Barrier, TL-2, II	LF
636017-005	Temporary Traffic Barrier, TL-3, II	LF
636025-001	Warning Lights, Ty B	DA
642004-001	Seed Mixture, Temporary	LB
642005-001	Mulch, Straw or Hay	TN
642006-001	Fertilizer	TN
642012-001	Silt Fence	LF

WEST VIRGINIA DIVISION OF HIGHWAYS
JOB ORDER CONTRACT (JOC) – CONTRACTOR ACCEPTANCE FORM

1. Master Agreement Information

Master Agreement No.: _____

Master Agreement Title: _____

Contractor Name (as shown in Master Agreement): _____

2. Job Order Contract Information

Job Order Contract (JOC) No.: _____

State Project No.: _____

Federal Project No. (if applicable): _____

County: _____

Location/Route: _____

Description of Work: _____

3. Schedule of Items and Contract Amount

The Contractor acknowledges receipt of the Abbreviated PS&E for the above-referenced Job Order Contract, including the Schedule of Items and estimated quantities.

The total authorized amount for this Job Order Contract, determined by applying the unit prices established under the Master Agreement to the estimated quantities, is:

\$ _____

4. Contract Time

Time for Completion: _____ calendar days

Liquidated Damages (per Section 108.7.1, as applicable to JOC value):

\$ _____ per calendar day

5. Contractor Acceptance and Agreement

By signing below, the Contractor:

1. Accepts the above-referenced Job Order Contract.
2. Agrees to perform the work in accordance with:
 - o Master Agreement No. _____
 - o Section 115 – Job Order Contracting
 - o The issued Job Order Contract
 - o The Abbreviated PS&E
 - o WVDOH Standard Specifications, Supplemental Specifications, Standard Details, and all applicable Contract Documents.
3. Acknowledges that this written acceptance constitutes execution of the construction contract for this Job Order Contract under the Master Agreement.
4. Agrees to begin work within the time specified in Section 115.4.4 following issuance of the Notice to Proceed.
5. Acknowledges that failure to commence or prosecute the work in accordance with Section 115 may result in rescission of this Job Order Contract and potential removal from consideration for future Job Orders under the Master Agreement.

6. Signatures

CONTRACTOR

Authorized Representative: _____

Title: _____

Signature: _____

Date: _____

WEST VIRGINIA DIVISION OF HIGHWAYS

By: _____

Title: _____

Date: _____

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

SECTION 614
PILING WALLS

614.1-DESCRIPTION:

ADD THE FOLLOWING.

614.1.1-HCSI Steel Piles: This work shall consists of furnishing and installing steel piles as described in Section 614, with the additional requirement that steel piles be classified according to the Hardness and Compress Strength Index (HCSI). HCSI classifications will govern the pay items for steel piles, as described below. Work shall conform to all provisions of Section 614 except as modified herein.

614.1.2-Hardness and Compress Strength Index (HCSI): The HCSI classification system is based on rock field hardness at the pile location, as shown in Table 614.11.1:

TABLE 614.1.2				
HCSI Value	Description	Rock Field Hardness (PSI)		
0	ES = Extremely Soft	20	-	100
1	VS = Very Soft	100	-	1,000
2	S = Soft	1,000	-	4,000
3	A = Average	4,000	-	8,000
4	H = Hard	8,000	-	16,000
5	VH = Very Hard	16,000	-	32,000
6	EH = Extremely Hard	Over 32,000		
Notes:				
1	The applicable HCSI value for each piling location shall be identified in the Abbreviated PS&E or plan set.			
2	HCSI values shall be determined solely by the Division’s Geotechnical Engineer based on borings, cores, field observations, laboratory testing, and engineering judgment.			
3	The Contractor shall not independently assign or reinterpret HCSI classifications.			

614.8-METHOD OF MEASUREMENT:

Steel piles shall be measured and paid by linear foot based on pile size and the HCSI classification at the pile location, as listed below:

614.8.1 – Measurement for Job Order Contracts (JOC): For work performed under Special Provision 115 – Job Order Contracting, steel piles shall be measured and paid using a single HCSI classification for the entire Job Order Contract.

The applicable HCSI classification shall be the highest HCSI value shown in the geotechnical data included in the Abbreviated PS&E for the limits of piling wall construction, as determined by the Division’s Geotechnical Engineer.

All steel piles furnished and installed under the Job Order Contract shall be paid under the pay item corresponding to that highest HCSI classification, regardless of localized variations in subsurface conditions.

No adjustment in unit price or pay item will be made based on differing HCSI conditions encountered at individual pile locations within the project limits.

This provision applies only to Job Order Contracts issued under Special Provision 115.

614.9-BASIS OF PAYMENT:

Payment for steel piles shall be full compensation for furnishing all materials, performing all work, and completing all related operations described in Section 614, including drilling, concrete or grout placement, wales, and painting. The cost of drilling through different HCSI-classified soils or rock, as well as any additional equipment or labor required due to rock hardness, shall be included in the unit price bid.

614.10-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
614010-003	HP 10X42 Steel Pile (HCSI 4 or less)	Linear Foot
614010-006	HP 12X53 Steel Pile (HCSI 4 or less)	Linear Foot
614010-008	HP 12X74 Steel Pile (HCSI 4 or less)	Linear Foot
614011-003	HP 10X42 Steel Pile (HCSI greater than 4)	Linear Foot
614011-006	HP 12X53 Steel Pile (HCSI greater than 4)	Linear Foot
614011-008	HP 12X74 Steel Pile (HCSI greater than 4)	Linear Foot

Note: For Job Order Contracts, only the pay item corresponding to the highest HCSI classification identified in the Abbreviated PS&E shall be included in the Schedule of Items.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

SECTION 645
REINFORCED SOIL SLOPES

645.1-DESCRIPTION:

ADD THE FOLLOWING SUBSECTION AFTER THE FIRST PARAGRAPH:

~~645.1.1-Standard Expanded Polystyrene (S-EPS) - Elastic Inclusion work~~ Work shall consist of installation of an ~~elasticized-Standard~~ Expanded Polystyrene (S-EPS) and geotextile separation fabric between the back of concrete surfaces and backfill material, in accordance with these specifications and in close conformity with manufacturer's recommendations, the lines shown on the plans or as established by the Engineer.

645.2-MATERIALS:

ADD THE FOLLOWING SUBSECTION:

~~645.2.3-Elasticized Standard~~ Expanded Polystyrene (EPS S-EPS) Material:

a) ~~Elasticized Standard~~ Expanded Polystyrene (EPS S-EPS): Provide EPS15 EPS blocks in accordance with ASTM D-6817, "Standard Specification for Rigid Cellular Polystyrene Geofoam," that meet the physical property requirements in the following table. EPS shall have a size tolerance of 1/8" for each dimension and conform to the following:

Physical Property	Test Method	Requirements
Compressive strength	ASTM D-1621	5 psi +/- 0.4 psi @10% strain
Water Absorption	ASTM C-272	Max. 3% by volume
Insect Resistance	ASTM D-3345	Resistance to ants, termites, etc.

Physical Property	Test Method	Requirements
Density	ASTM D1622 (Use 2-inch cubic samples. Report results for minimum samples)	0.85 pcf min., 0.95 pcf max. (for each sample)
Compressive strength	ASTM D-1621	518 psf. Min. @ 1% strain 1152 psf min. @ 5% strain 1350 psf min., 1650 psf max. @ 10% strain.
Water Absorption	C272	Max 4% by Volume
Insect Resistance	ASTM D-3345	Resistance to ants, termites, etc.

~~The EPS shall be elasticized, with a linear elastic stress-strain behavior up to 10 percent strain and linear proportional stress-strain behavior up to 30 percent strain.~~

The S-EPS shall contain no chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (HFCs) or formaldehyde. It shall be chemically and biologically inert when in contact with acidic and alkaline soils. It shall be treated to prevent insect attack.

Materials shall withstand temperature variations from ~~-68°F~~ 0°F to 140°F without deforming and shall maintain their original dimensions and placement without chipping, spalling, or cracking. Material shall not deteriorate because of contact with sodium chloride, calcium chloride, mild alkalis and acids, or other ice control materials.

The S-EPS shall contain a flame retardant additive.

b) Geotextile Separation Fabric: A non-woven geotextile separation fabric shall be placed between the S-EPS and the backfill material. Fabric joints shall have a minimum overlap of 1 foot. Fabric shall extend a minimum of 1 foot beyond the S-EPS surface and overlap with adjacent concrete surface.

The separation fabric shall have the following properties:

Physical Property	Test Method	Requirements
Grab Strength	ASTM D-4632	Min. 250 lb.
Puncture Strength	ASTM D-4833	Min. 110 lb.
Tear Strength	ASTM D-4533	Min. 90 lb.
Permittivity	ASTM D-4491	Min. 0.5 sec-1
Apparent Opening Size	ASTM D-4751	Max. 0.3 mm

Geotextile separation fabric shall be protected front mud, dirt, dust, sunlight, and debris during transport and storage. Material shall be inert to commonly encountered chemicals; resistant to mildew, rot, insects, and rodents; and biologically and thermally stable. Geotextile separation fabric for subsurface installation shall not be exposed to direct sunlight for more than 24 hours during installation.

Tensile strength requirements are in the machine and cross-machine directions.

c) Neoprene Sheet For Semi-Integral Abutments: Where shown on the plans, provide 3/32-inch thick general purpose, heavy-duty neoprene sheeting with nylon fabric reinforcement, conforming to this specification or an approved alternate. Examples of acceptable products include “Fairprene NN0003” by E.I. DuPont De Nemours and Company, Inc., and “Wingprene” by the Goodyear Tire and Rubber Company. The neoprene shall meet the requirements listed in the table below:

<u>Physical Property</u>	<u>Test Method</u>	<u>Requirements</u>
<u>Thickness, inch</u>	<u>D 751</u>	<u>3/32 ± 0.01</u>
<u>Breaking Strength, Grab WXF, N, minimum</u>	<u>D 751</u>	<u>3130 × 3130</u>
<u>Adhesive 1-inch Strip, 2-inch Minimum, N minimum</u>	<u>D 751</u>	<u>27 N</u>
<u>Burst Strength (mullen) psi, minimum</u>	<u>D 751</u>	<u>1400 psi</u>
<u>Heat Aging 70 h at 100°C, 180° Bend without cracking</u>	<u>D 2136</u>	<u>No cracking of coating</u>
<u>Low Temperature Brittleness, 1 hour at -40°C, Bend around ¼-inch Mandrel</u>	<u>D 2136</u>	<u>No cracking of coating</u>

Installation shall consist of three (3) foot wide strips at locations shown on the plans. The neoprene sheeting shall be secured to the concrete with 1 ¼” (length) x 3/32” (shank diameter) x ¼” (head diameter) galvanized button head spikes through a 3/32-inch (outside diameter), 1/8-inch (thick) galvanized washer. Other similar galvanized devices that will not damage either the neoprene or the concrete may be used subject to the approval of the Engineer. Maximum fastener spacing shall be nine (9) inches unless otherwise noted herein or on the Plans.

Horizontal laps shall be a minimum of one (1) foot for non-bonded material and six (6) inches where vulcanized or adhesive-bonded.

Vertical strips shall be continuous, overlapping horizontal strips, with a single line of fasteners along the edge nearest the centerline of the roadway. The distance from the vertical edge of the neoprene strip to the fasteners shall be 6 inches (+/-). Also install 2 additional fasteners at 6 inches center to center across the top of the neoprene strip on the same side of the joint as the single vertical row of fasteners is located.

e)d) Adhesive: Adhesive shall be provided for bonding the S-EPS to concrete surfaces. The adhesive shall be compatible with the material and applied in accordance with the manufacturer’s recommendations. All concrete surfaces to

receive adhesive shall be clean and dry, free of laitance, oil, grease, or other deleterious substances, and prepared in accordance with the manufacturer's instructions.

d)e) Backfill Material: Backfill material adjacent to the separation fabric or neoprene sheeting shall conform to the requirements of Subsection 645.2.2. Backfill shall be placed and compacted in a manner that does not dislodge or damage the S-EPS, geotextile, or neoprene sheeting. Care shall be taken to prevent shifting, tearing, or crushing of installed materials during backfilling operations.

645.3-FOUNDATION PREPARATION:

ADD THE FOLLOWING SUBSECTION AFTER THE FIRST PARAGRAPH:

Before placement of S-EPS, geotextile separation fabric, or neoprene sheets, concrete surfaces shall be abrasive blast cleaned using a positive contact sandblaster or prepared in accordance with the adhesive manufacturer's recommendations and as approved by the Engineer. All non-adherent laitance, oil, grease, or other deleterious matter shall be removed prior to installation.

645.4-GEOSYNTHETIC INSTALLATION:

ADD THE FOLLOWING SUBSECTION AFTER THE SECOND PARAGRAPH:

The S-EPS shall be attached to the back of concrete surfaces with an adhesive compatible with the material. Concrete surfaces must be thoroughly dry and clean, with any laitance, oil, grease, or other deleterious matter removed by abrasive blast cleaning or as recommended by the adhesive manufacturer and approved by the Engineer. Adhesive shall be applied in accordance with the manufacturer's recommendations.

Geotextile separation fabric shall be installed either pre-attached to the S-EPS or after the S-EPS is in place. The fabric shall cover all exposed surfaces of the S-EPS and extend to provide the required overlaps.

Where neoprene sheeting is specified, the material shall be installed in accordance with 645.2.3(c) and secured to concrete with approved fasteners. Horizontal and vertical laps, fastener spacing, and alignment shall comply with the requirements set forth in 645.2.3(c). The S-EPS, geotextile, and neoprene shall be installed in close conformity with the manufacturer's recommendations and the lines shown on the plans or as established by the Engineer.

645.7-ACCEPTANCE:

ADD THE FOLLOWING SUBSECTION AFTER THE FIRST PARAGRAPH:

Elasticized S-EPS shall be tested by an independent commercial laboratory to verify compliance with the material requirements specified herein. The Contractor shall provide written documentation of all tests, including style, lot, roll numbers, and actual results, as well as the name, address, and contact information of the testing laboratory and the date of testing.

After installation and prior to acceptance, the Contractor and Inspector shall perform a visual inspection of the S-EPS, geotextile separation fabric, and neoprene sheeting to verify proper coverage, adhesion, and alignment. Any areas deemed unacceptable or questionable as to remaining in position during backfill placement shall be removed or repaired as required. Replacement or repair shall be performed using new material and in accordance with the installation requirements. All additional work, including labor and materials for repairs, shall be borne by the Contractor.

645.8-METHOD OF MEASUREMENT:

ADD THE FOLLOWING SUBSECTION AFTER THE SECOND PARAGRAPH:

Measurement of the elasticized S-EPS material shall be incidental to the area of geosynthetic soil reinforcing material shown on the contract plans. Measurement of geotextile separation fabric and neoprene sheeting shall also be incidental unless otherwise noted on the plans. The units of measurement for the neoprene sheeting shall include all material, fasteners, overlaps, and any preparation required for proper installation, as specified in 645.2.3(c).

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 660
TRAFFIC SIGNALS

660.9-LOOP TRAFFIC DETECTORS:

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

Installation shall conform to the details and notes shown on the Plans.

Slots cut in the pavement for the loop conductor shall be neat and true to the dimensions shown on the Plans. Slots shall be blown out and dried before loop conductors are installed.

The # 14 THWN stranded loop conductor shall run continuous and unspliced from the roadway loop to a junction box or ~~condulet~~ conduit body as indicated in the Plans. Each loop shall consist of a single separate wire and shall be connected to the detector by a separate lead-in wire. The loops shall consist of three turns of wire, unless otherwise specified.

All loop wire installation shall be made without damage to the wire or its insulation and all damaged wires shall be replaced. The wire must be ~~so placed~~ placed so that there are no kinks or curls and no straining or stretching of the insulation. It shall be installed and secured as deep in the slot as possible. A blunt object, similar to wooden paint stirrer shall be used to seat the loop wire. A screwdriver or other sharp tool shall not be used for this purpose.

Prior to placing the loop slot sealant, the loop wire shall be checked for continuity, resistance and insulation integrity. Insulation integrity shall be checked by applying a megger between each end of the loop wire and ~~the nearest reliable electrical ground street light, fire hydrant, etc~~ a verified electrical ground (cabinet grounding bus or driven ground rod). If no available ground exists, a suitable ground shall be established for the measurement, (e.g., driven metal spike). The megger reading shall be in excess of ten megohms under all conditions, (500 volts DC). The continuity and megger checks shall be recorded by the ~~e~~Engineer.

Lead-in wire from the loop conductor to the detector terminal strip shall be two # 14 AWG solid copper.

The lead-in wire shall also be continuous and unspliced from junction box or ~~condulet~~ conduit body to the detector terminal strip in the cabinet.

Splices between the loop conductor and the lead-in wire shall be soldered with ~~fuseable~~ fusible metal or alloy. These splices shall first be joined and made mechanically secure and tested electrically. No spring connectors will be allowed for splicing. When the mechanical connection has been shown to be electrically functional under operational conditions, it shall then be soldered.

Each splice shall then be insulated with a permanent, waterproof covering as specified or as approved by the eEngineer. Waterproof adhesive shall be applied to the splice and on at least two (2) inches of loop wire and lead-in wire insulation on both sides of the splice. The splice shall then be covered with half-lapped, 3/4 inch, self-bonding electrical tape; starting at the center of the splice and proceeding to 3/4 inch onto the wire insulation, returning to the center of the splice. The entire splice shall then be wrapped with half-lapped, 3/4 inch, all-weather electrical tape using the same procedure as above. When both ends of the loop wire and lead-in wires are so spliced and wrapped, both splices shall then be wrapped together with 3/4 inch, all-weather electrical tape. The 635-entire splice area to the end of the adhesive coating shall be covered. The splice shall then be completed by inserting a four (4) inch piece of all-weather electrical tape into the “V” formed by the loop wires.

~~The loop slot cuts in the pavement shall be filled with a permanent, flexible weatherproof sealant after the placement of the loop wire in the slots. The sealant shall be resistant to traffic, water, gasoline, chemical fumes, mild alkalies, oils and mild acids; no noticeable deterioration of the sealant shall be apparent after exposures to temperatures ranging from minus 20°F to plus 160°F. Before sealing the loop, slots must be clean and dry and blown out with oil-free air. The sealant shall be placed to within 5/8 inch of the pavement surface and surplus sealant shall be removed from the adjacent road surfaces without the use of solvents.~~

~~————The loop slot sealant shall be of “Weatherban 101 sealer” as manufactured by the 3-m company or an approved equal.~~

The eContractor shall be responsible for replacement of damaged loops and lead-in cable to the existing splice box or otherwise designated junction box.

The eContractor shall be responsible for replacing all damaged traffic signal loops within the construction limits within fourteen (14) calendar days of when damage occurs.

Standard (6 foot x 6 foot) detector loops shall consist of three (3) turns of stranded #14 AWG copper wire, with quadrupole presence loops consisting of two (2) turns of stranded #14 AWG copper wire meeting IMSA conductor specifications. All detector loops shall conform to ~~specifications~~ subsections 715.42.2 and 715.42.13.

660.9.1-LOOP TRAFFIC SEALANT: ~~The loop slot cuts in the pavement shall be filled with a permanent, flexible weatherproof sealant after the placement of the loop wire in the slots. Sealants are either one-component or two-component materials and are appropriate for application in both asphalt and concrete pavements. These sSealants are to shall be engineered to exhibit stability, preventing shrinkage, swelling, or cracking during and subsequent to their curing process. Sealants must exhibit resistance to the following: vehicular traffic, water, gasoline, chemical fumes, mild alkalies, oils, mild acids, de-icing agents, motor oil, sodium chloride 5%, hydraulic brake fluid; no noticeable deterioration of the sealant shall be apparent after exposures to temperatures ranging from -20°F to 160°F. The sealant shelf life must meet a minimum of 12 months in unopened containers. The sealant must also be approved on the West Virginia Department of Highways Approved product list prior to use.~~

~~Prior to sealant application, the loop slots must be thoroughly cleaned, dried, and cleared of debris using oil-free compressed air. The application equipment, techniques, and temperature range utilized must strictly conform to the manufacturer’s recommendations and standards. Upon application, the sealant must demonstrate a sufficiently free-flowing consistency to ensure thorough filling of the road cavity. The sealant shall be placed such that its final surface is within 5/8 inch of the pavement surface, and any excess sealant must be meticulously removed from the adjacent road surfaces without the use of chemical solvents to~~

avoid prevent vehicles catching on to the tire contact with excess material. Loop sealants must meet ASTM D2240 and fall within the durometer hardness ratings on the following table.

<u>Sealant Type</u>	<u>ASTM D2240 Shore A Hardness</u>	<u>Expected Tack-Free Time (at 77°F)</u>	<u>Full Cure Time (Typical Range)</u>
<u>Polyurea</u>	<u>Mid-High (60–80)</u>	<u>10-30 Minutes</u>	<u>One to Two Days</u>
<u>Polyurethane</u>	<u>Mid-High (50-75)</u>	<u>1 – 4 Hours</u>	<u>Three to Seven Days</u>
<u>Flexible Epoxy</u>	<u>Mid-High (50-75)</u>	<u>20 – 30 Minutes</u>	<u>Two to Five Days</u>

Note: Tack-free times vary based on weather and temperature, therefore manufacturer’s recommendations and standards for tack-time must be followed.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

SECTION 636
MAINTAINING TRAFFIC

636.1-DESCRIPTION:

ADD THE FOLLOWING TO THE END OF SUBSECTION

636.1.1-Temporary Pavement Markings - Orange: This work shall consist of furnishing, applying, maintaining, and removing temporary orange pavement markings for traffic control in designated work zones for traffic control as shown on the Plans or as directed by the Engineer.

Temporary orange markings shall be used only within active work zones and are not intended as permanent pavement markings.

636.2-MATERIALS:

ADD THE FOLLOWING TO THE END OF SUBSECTION

Orange pavement marking material shall conform to the applicable requirements of subsections 711.40 and 711.41; except that the color shall be traffic orange instead of white or yellow. The color shall conform to ASTM D6628 (Traffic Orange) or a WVDOH approved work zone orange standard, as approved by the Engineer. Temporary orange markings shall provide adequate visibility during both day and night conditions.

636.8- TEMPORARY PAVEMENT MARKINGS AND RAISED PAVEMENT MARKERS:

ADD THE FOLLOWING TO THE END OF SUBSECTION:

Application shall comply with Sections 636.8 and 663, except as modified below:

1. Temporary orange pavement markings shall be used only within active work zones.

- 2. Temporary markings shall maintain visibility.
- 3. Orange markings shall not conflict with permanent pavement markings.
- 4. All conflicting pavement markings shall be eradicated in accordance with subsection 636.7 prior to placement.
- 5. Markings shall be removed or eradicated when no longer applicable to traffic control.
- 6. Orange markings shall not remain in place once permanent pavement markings are installed.

636.23-METHOD OF MEASUREMENT

636.23.9-Temporary Pavement Markings - Paint:

ADD THE FOLLOWING TO THE END OF SUBSECTION:

The quantity of Temporary Pavement Markings – Paint (Orange) shall be the linear feet of six (6) or eight (8) inch line actually placed on the pavement.

636.25-PAY ITEMS

ADD THE FOLLOWING PAY ITEM:

ITEM	DESCRIPTION	UNIT
636008-025	Temporary Pavement Marking-Paint 6 Inch (Orange)	Linear Feet
636008-026	Temporary Pavement Marking-Paint 8 Inch (Orange)	Linear Feet

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

PROJECT SPECIFIC SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: S320-064-57.44 00

FEDERAL PROJECT NUMBER: NHPP-064(497)

**SECTION 636
MAINTAINING TRAFFIC**

636.22-Blank:

DELETE THE TITLE AND CONTENTS OF SUBSECTION 636.22 AND REPLACE WITH THE FOLLOWING:

636.22-PORTABLE QUEUE DETECTION SYSTEM:

636.22.1-Description: This work shall consist of furnishing, installing, operating, relocating and removing an automated Portable Queue Detection System and providing service and maintenance of the complete system for the duration of the Project.

This item shall include a vehicle trailer with designated sensors, changeable message signs, leveling of trailers, cameras, website, communications equipment, relocation, service, and maintenance. Included in the operational responsibilities is the assumption of all trailer license plates, communication costs such as FCC licensing, cellular telephone, wireless data networks, satellite and internet subscription charges, solar system support and battery charging, and maintenance. In addition to these requirements, the Contractor shall assume all responsibility for any damaged equipment included in the system due to crashes, vandalism, adverse weather, etc. that may occur during system deployment.

This system shall monitor the Project’s work zone area and provide the WVDOH’s Transportation Management Center (TMC) with real-time data. The system shall be completely operational on December 15, 2026 to allow for traffic data accumulation by the system. The Portable Queue Detection System shall consist of an automated system using trailer-mounted microwave sensors that transmit vehicle speed and related data through cellular communications to a Contractor-hosted central computer system. The central computer system shall send automated commands to changeable message signs through cellular communications to display stopped traffic information. The speed data and changeable message sign content shall be hosted on a Contractor-supplied website.

The Portable Queue Detection System shall be capable of detecting the presence of queued traffic in the segments identified on the plans and reporting via a queue warning Portable Queue Detection System Changeable Message Sign/Queue Sensor Trailer (PCMQ). The distance from the PCMQ to the detected back of queue shall be reported within 1/2 mile accuracy on the system, but reported on the PCMQ at 1 mile accuracy rounded up to the nearest mile. This “real-time” queue location information shall be calculated and displayed on the applicable PCMQ to the nearest minute.

The Portable Queue Detection System shall have the capability to notify the construction field office, Contractor or others, as determined by the Engineer, of travel times and when the speed through the work zone decreases below 30 mph. The system shall be capable of transferring real-time data in a file format compatible with Oracle®. In addition, any number of Department or Contractor employees shall be notified via email or text message for these speed changes. Contact information will be furnished by the Engineer at the start of the Project.

All the required components of the Portable Queue Detection System shall be fully operational on December 15, 2026. If not fully operational on December 15, 2026, a payment reduction of 10% for each day the entire system is not operating will apply, as determined by the Engineer.

Once operations begin, the Portable Queue Detection System shall perform with no major malfunctions throughout the Contract, unless the Engineer requests the system or portions of the system be removed. Malfunctions include, but are not limited to, the inability of the equipment to provide accurate delay, or travel time information, inability to withstand the construction roadside environment or normal weather conditions. The Engineer reserves the right to terminate this item at any time if it is determined the Portable Queue Detection System is not performing in accordance with this specification. This work shall consist of furnishing, installing, relocating, operating and maintaining any devices called out per contract plans that provide an automated, portable, real-time Portable Queue Detection System.

636.22.2–Equipment and Materials:

1. The Portable Queue Detection System shall consist of the following equipment:
 - a. Four (4) Portable Work Zone Management System Queue Trailers/Sensors (PQTs)
 - b. Two (2) Portable Work Zone Management System Changeable Message Signs/Queue Sensor Trailers (PCMQs) to display real-time travel time messaging and back of queue warning to the traveling public
 - c. Communication equipment including wireless data networks, base stations, cell phone data interfaces, Ethernet network interfaces, and internet interfaces
 - d. Customized Webpage integrated with the Portable Queue Detection System to include traveling public and Project staff accessibility; Portable Queue Detection System website shall be allowed to “link” to the Department’s website
 - e. Software package customized for this particular Project’s needs. The Engineer reserves the right to add or remove locations as needed.

2. The following shall be provided for each PQT and PCMQ:
 - a. Plan showing approximate locations of changeable message signs and traffic sensors as recommended by manufacturer
 - b. Clean stone or processed rock to provide a level area for trailers and provide for sufficient height for sensors to operate correctly
 - c. Individually mounted on trailer units with solar power
 - d. Equipped with digital wireless cellular modems as required
 - e. Linked to the Contractor's central computer server
 - f. Maintained as needed to remain operational, including cleaning and inspecting components, snow and ice removal from solar panels and keeping batteries charged
 - g. Extra set of programming instructions stored in the units for emergency use

3. The Portable Queue Detection System Queue Trailer/Sensor (PQT), and Portable Changeable Message Signs/Queue Sensor Trailers (PCMQ) shall collect and process traffic data as programmed within the software provided with the sensor. This data shall be transmitted over a digital cellular network to access and store the respective data remotely. The remote monitoring and data collection shall be placed in areas where wireless communication is available. The Queue Sensor System shall use both solar power and deep cycle batteries to provide a self-contained completely autonomous system.
 - a. Trailer and power requirements:
 - i. 2-wheel industrial grade trailer with stabilizer legs
 - ii. Available as a portable unit or permanent mount
 - iii. Adjustable solar array for maximum exposure to sun
 - iv. Removable trailer tongue
 - v. Battery bank sized for 30-day autonomy
 - b. Queue Trailer/Sensor (PQT) requirements:
 - i. Microwave detection reliably detects up to 6 lanes of traffic
 - ii. Data provided includes speed, volume and occupancy
 - iii. Available as a portable unit or permanent mount
 - iv. Digital cellular communications

4. The Portable Queue Detection System Changeable Message Sign/Queue Sensor Trailer (PCMQ) shall be configured with the following changeable message sign requirements or approved equal:
 - a. Trailer and power requirements:
 - i. 2-wheeled trailer structurally adequate to serve as both a carrier and an operating platform
 - ii. Meets Federal Regulations for safety and travel
 - iii. Color of trailer paint shall be safety orange or as approved by the Engineer
 - iv. Bank of batteries capable of being recharged automatically by a group of solar panels located at the highest point on the unit

- v. Changeable message signs shall be designed with sufficient energy backup to operate for a period of 30 days (minimum) at 75°F without sun exposure
- vi. Solar panel generator array shall recharge the battery bank at a rate of 2 1/2 hours peak sun per 24 hour period of usage
- vii. Solar panel array sized to replace the power used in typical daily operation with less than 4 hours of sun
- viii. Deep cycle, lead acid 12 volt batteries wired in parallel, housed in a lockable heavy duty steel weatherproof battery box
- ix. Batteries recharged by a solar panel array producing 110 watts of power minimum
- x. Built-in battery charger with minimum 25 ampere per hour rating
- xi. Solar charge current meter and battery charger current meter visible
- xii. Protective housing painted with manufacturer's standard colors
- b. Changeable Message Sign/Queue Sensor requirements:
 - i. Sign panel of welded aluminum alloy construction, assembled to prevent dissimilar metal action from occurring
 - ii. Length of sign panel 128 inches or less
 - iii. Front face of sign covered with clear UV-inhibited polycarbonate to prevent fading
 - iv. Message center:
 - 1. 3 separate lines, center justified
 - 2. Each line up to 8 characters, equally spaced a minimum of 3 inches apart
 - 3. Each character 18 inches high by 12 inches wide
 - 4. Each character configured with 35 LED lamp pixels in a 5 x 7 element arrangement
 - 5. Message color 590 nanometers (yellow-orange)
 - v. Remote sign operation via central computer
 - vi. Messages to be displayed shall have capability to be timed to changes at various times of day and days of week
 - vii. Trailer-mounted variable message board consisting of optically enhanced LED lamp matrix panels powered by a bank of batteries in order to convey bright, distinctive messages to the traveling public
 - viii. Sign capable of displaying up to 8 pages in a multiple page message, with variable timing in 1/10 second increments under computer control
 - ix. Sign shall completely change all lines of message copy in not more than 100 milliseconds
 - x. Sign clearly visible and legible from a distance of 800 feet under both day and night conditions, with a photocell automatically adjusting its light source for variable light level conditions
 - xi. Sign panel supported on a telescoping upright member with hydraulic lift to permit raising the sign for operation and lowering the sign for transport

- xii. Telescoping upright able to rotate 360 degrees and shall lock into position
- xiii. Telescoping distance of nominally 5 feet to allow bottom of sign to be at least 7 feet above the ground
- xiv. Sign panel shall pivot to the longitudinal axis of the trailer for transport, to reduce aerodynamic drag
- xv. Static sign attached identifying the message board is for the Project; coordinate sign content and appearance with the Engineer
- xvi. Microwave detection (Wavetronics Smart Sensor HD or approved equal) with dual radar that reliably detects up to 22 lanes of traffic, auto configuration
- xvii. Data provided from sensor to include speed, volume and occupancy
- xviii. Available as a portable unit or permanent mount
- c. Changeable Message Sign on-board dedicated computer requirements:
 - i. Solid state design, removable, including a keyboard through which user originated messages may be entered for display or storage
 - ii. LCD display screen upon which messages can be reviewed before display on the message sign
 - iii. Storage of a minimum of 100 preprogrammed messages for display when called upon by an operator through the keyboard and a minimum of 100 users originated multiple page messages.
 - iv. Password coding or key entry
 - v. Control programming to present sequenced messages under operator control through keyboard entry
 - vi. Control for moving arrow displays
 - vii. Calendar program to automatically start and stop the display of sequences at predetermined times
 - viii. Character board and battery diagnostics
 - ix. Computer housing: weather resistant, shock resistant lockable control box with a light for night operation
 - x. Power control unit housed in a lockable, steel, weatherproof battery box containing 2 current meters (to show amperage generated with battery charger and amperage from solar panels to battery bank)
 - xi. Power control unit to incorporate a PV regulator with thermal compensation for variances in ambient temperature, to regulate the charge rate to the battery bank
 - xii. Control circuitry connected to Changeable Message Sign's photocell that detects ambient light conditions and reduces lamp intensity at night to reduce glare
- d. Changeable Message Sign - other requirements:
 - i. Changeable Message Sign operation using cellular telephone and cellular telephone service (trailer must be located within cellular telephone coverage), allowing operator remote control of the on-board computer
 - ii. A Queue Trailer/Sensor may be located next to designated PCMQ to collect data

- iii. The message sign shall provide for remote sign operation via central computer base station or Website allowing operators to manually override the automated messaging in order to display a message at any time. The operator shall be able to cancel this override and initiate the systems automated messaging feature.
- iv. Any request to change messages on the Changeable Message Signs shall be approved by the Department.

636.22.3–System Compatibility: The Contractor shall be responsible for coordinating with WVDOH’s ITS Coordinator (contact information to be provided by the Engineer) to ensure equipment capability with regard to components and communication.

636.23-METHOD OF MEASUREMENT:

636.23.2: Blank

DELETE THE TITLE AND CONTENTS OF THE SUBSECTION 636.23.2 AND REPLACE WITH THE FOLLOWING:

636.23.2-Portable Queue Detection System:

- 1. The Portable Queue Detection System will be measured as a monthly item.
- 2. The entire system shall be operational by December 15, 2026. A payment reduction of 10% for each day the entire system is not operating shall be assessed.
- 3. All components of the Portable Queue Detection System must be operational for payment. Portable Queue Detection System will be measured for payment by the month or fraction of a month as follows:
 - a. The items will be measured based on uninterrupted operation of all queue trailer/sensors, changeable message signs, solar panels, batteries, website, operations, cellular communications, programming, and integration.
 - b. If any of the components of the Portable Queue Detection System are down for more than 10 total days in a month, whether they are consecutive or cumulative, then NO payment will be made for that month.

636.24–BASIS OF PAYMENT:

ADD THE FOLLOWING PARAGRAPH TO THE END OF THE SUBSECTION:

Portable Queue Detection System will be paid for at the contract unit price per month, complete in place, which price shall include all preparation, submittals, component delivery, system set up, and all materials, furnishing and installing equipment in an acceptable manner, tools, supplies and labor incidentals necessary to complete the work.

636.25-PAY ITEMS:

ADD THE FOLLOWING TO THE TABLE:

ITEM	DESCRIPTION	UNIT
636036-001	Portable Queue Detection System	Month

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

**SECTION 662
ROADWAY LIGHTING**

662.2-MATERIALS:

662.2.3-ELECTRICAL CONDUIT:

ADD THE FOLLOWING SUBSECTION:

662.2.3.5-Type PR (PVC-Coated Rigid Galvanized Steel Conduit “PVC-RGS”):
Type PR (PVC-Coated Rigid Galvanized Steel Conduit) shall meet the applicable requirements of Section 715.42.10.1 and Section 715.42.10.5.

662.17-PAY ITEMS:

ADD THE FOLLOWING TO THE TABLE

ITEM NUMBER	DESCRIPTION	UNIT
662005-001	PVC-Coated Rigid Galvanized Steel Conduit	Lump Sum

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

**SECTION 715
MISCELLANEOUS MATERIALS**

715.42-TRAFFIC SIGNAL MATERIALS AND EQUIPMENT:

715.42.10-Electrical Conduit:

715.42.10.5-PVC-coated, Galvanized Rigid Conduit:

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

A nominal 40 mil polyvinyl chloride exterior coating shall be bonded to a hot-dipped galvanized rigid steel conduit conforming to NEMA/ANSI C80.1. The bond between the PVC coating and the conduit surface shall be greater than the tensile strength of the coating. The interior of the conduit shall have a nominal 2 mil urethane coating. The threads shall be urethane coated as well. The conduit shall be epoxy prime coated prior to the application of PVC and urethane coatings.

Female ends shall have plastic sleeve extending a minimum of one pipe diameter or two (2) inches, whichever is less beyond the opening. The inside diameter of the sleeve shall be the same as the outside diameter of the conduit to be used with it.

Conduit shall pass the high temperature water PVC coating adhesion test and be ETL Verified PVC-001. Conduit shall meet standards NFPA 70 Type RMC, NEMA/ANSI C80.1, UL 6, and NEMA RN 1.