

20250108 – January Specifications Committee Meeting

January Specifications Committee Meeting Agenda

Meeting Date

Wednesday, January 8, 2025 @ 9:00am

Meeting Location: Building 5, Conference Room #843, Contract Administration Charleston, WV

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

******2025 SPECIFICATION COMMITTEE MEETING UPDATE******

WE ARE GOING TO BE SWITCHING TO ODD MONTHS SO WE WILL MEET:

January (1/8), March (3/5), May (5/7), July (7/9), September (9/3), and November (11/5).

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

*******DEADLINE FOR MARCH SUBMISSIONS*******

February 3, 2025

Approved Permanent Specification changes from last Committee meeting (12/04/24)

- **101.2-Definitions, 307.2.4.1.1-For Compaction, 401.6.1-Quality Control Testing, 401.6.4.1-Density Testing, 401.6.4.1.1-Gauge Comparison, 401.6.4.2-Lot-by-Lot Testing, 401.6.4.3-Roller Pass Testing, 401.13.3-:, 410.6.1-Quality Control Testing:, 514.4.2.3-Density Testing, 626.5.3.4-Acceptance:** The revision adds the definition for Moisture/Density Gauge resulting in the removal of the word “nuclear”.
- **106.3-Samples-** All agreed to remove the word “an” from before “E-Ticketing”.
- **601.3-Proportioning and 601.4-Testing-** The revision replaces the Rapid Chloride Permeability Test with the Surface Resistivity test. It also includes price adjustments based upon the result.
- **604.15-Pay Items-**Specification Change to 604-Pipe Culverts. Revision adds numerical value to the Z2 Metal Corrugations Column.
- **685.1.3-Phase Three, 687.3.6-Shop Painting Metal Structures, 688.5.4-Surface Preparation-** The revision adds/references materials acceptance requirements for soluble salt removers. Any products meeting these requirements can be placed on the MCS&T APL for Soluble Salt Removers (688.002.003).

Approved Project Specific Special Provisions (SP) from last Committee meeting (12/04/24)

- **SP Subcontractor Prompt Payment**

Items removed from Committee Agenda

- **None**

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Old Business Items

SECTION	TITLE	DESCRIPTION
SP 695	SP 695-Mainline Pavement V. Allison	2nd time to Committee. Update to a previously approved Special Provision (SP) for Mainline Pavement. The Special Provision removes subsection 695.6-Thickness Testing. Approval is expected in January.

New Business

SECTION	TITLE	DESCRIPTION
651	Section 651-Furnishing and Placing Soil Section 652-Seeding and Mulching Section 715.25-715.32 <i>(Ground Agricultural Limestone, Fertilizers, Mulch Material, Seed, Inoculating Bacteria, Biological Growth Stimulants, and Hydraulic Growth Material)</i> D. Kirk	1st time to Committee. Three specification changes updating the requirements for seeding and mulching. 1. Section 651-Furnishing and Placing Soil 2. Section 652-Seeding and Mulching 3. Section 715.25-715.32 a. (Ground Agricultural Limestone, Fertilizers, Mulch Material, Seed, Inoculating Bacteria, Biological Growth Stimulants, and Hydraulic Growth Material) The specifications are redlined showing the revisions.
SP 207	SP207-Settlement Plates A. Wentz	1st time to Committee. Converting a Project Specific Special Provision into a Special Provision (SP) for Settlement Plates. Settlement plates are used to determine the magnitude and rate of settlement of embankments and subgrades. The reason for changes to this project is to clarify the use of settlement plates, as well as how they are to be installed and the frequencies with which they are to be monitored. The SP is redline copy showing the revision.

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<u>SP 601</u>	SP601-Structural Concrete A. Thaxton	1st time to Committee. This is an update to a previously approved Special Provision (SP) for Class (S) Structural Concrete. The Special Provision removes Sequential Air Method (SAM) Test (AASHTO T 395) from the table in 601.4.1. SP is redlined showing the revisions.
<u>SP 662</u> <u>SP715</u>	SP662-Roadway Lighting, PVC-Coated Rigid Galvanized Steel Conduit SP715-Miscellaneous Materials, PVC-Coated Rigid Galvanized Steel Conduit R. Tabassum	1st time to Committee. Two Special Provisions (SP) for PVC-Coated Rigid Galvanized Steel Conduit to be used for all roadway crossings. • SP662-Roadway Lighting, PVC-Coated Rigid Galvanized Steel Conduit • SP715-Miscellaneous Materials, PVC-Coated Rigid Galvanized Steel Conduit The Standard Detail Volume II, Sheet TEL-30 referring to road crossing and trench details work shall now be bid under this item.
<u>615</u>	615.6.3-Bearings and Anchorage's J. Adkins	1st time to Committee. Specification Change to 615-Steel Structures, 615.6.3-Bearings and Anchorage's. Revision updates a typo in the specification. The specification is redlined showing the revision.
<u>679</u>	679.2.2-Specialized Concrete Mix Design and Testing A. Thaxton	1st time to Committee. Specification Change to 679-Overlaying of Portland Cement Concrete Bridge Decks, 679.2.2-Specialized Concrete Mix Design and Testing. The revision update replaces the rapid chloride permeability test with the surface resistivity test and requirements. The specification is redlined showing the revision.
<u>679</u>	679.2.3.1.1-Hydrodemolishing Equipment	1st time to Committee. Specification Change to 679-Overlaying of Portland Cement Concrete Bridge Decks, 679.2.3.1.1-Hydrodemolishing Equipment. The revision adds pressure requirements for the hydrodemolishing equipment. The intent of this specification change is

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	J. Neeley	to get a profile for adhesion and removal of all unsound/bad concrete. The specification is redlined showing the revision.
701	701.3-Blended Hydraulic Cements K. Kukaua	1st time to Committee. Specification Change to 701-Hydraulic Cement, 701.3-Blended Hydraulic Cements. The revision adds Portland Ternary Cement, Type 1T. This will be governed by ASTM C595. The specification is redlined showing the revision.
SP709	SP709.1.3-Galvanized Coated Bars for Concrete Reinforcement C. Preston	1st time to Committee. Special Provision (SP) for 709-Metals, 709.1.3-Galvanized Coated Bars for Concrete Reinforcement. The revision adds inspection requirements for galvanized reinforcing steel. The revision also adds requirements if ASTM A767 is used as the method of galvanizing. The SP is redlined showing the revision.

Deadline for new items & updates for the March 5, 2025 Meeting are due February 3, 2025.

If you are the ‘champion’ of any specification changes and/or project specific special provisions currently in the Specification Committee, it is your responsibility to edit/update/modify them in a timely manner per comments and discussion in Spec Committee. *Failure to submit updates may result in removal of item and/or delays.*

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: **Janie.M.Adkins@wv.gov**

File Format Structure and Progression of items thru Specifications Committee

The purpose of the below protocol is to provide guidance on the file structure of Proposed Specifications & Project Specific Provisions as they progress 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.

TYPES OF PROVISIONS:

There are three standard types of provisions typically discussed in committee:

1. **Specification Changes** – These are permanent changes to the WVDOT Standard Specifications.
 - Unless inserted into a project proposal, these changes typically go into effect in January (of subsequent year) with the Supplemental Specifications

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2. **Special Provisions (SP)** – Are applied to an individual project or a small group of projects and require two (2) meetings for approval.
3. **Project Specific Special Provisions (PSSP)** – Can be shown to committee-but not required, does not require two (2) meetings for approval, **requires management approval.** Project Specific Special Provisions are applied to only an individual project.

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 setup in the following format:

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

PROGRESSION OF ITEMS THRU COMMITTEE AND APPROVAL:

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

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

2023 Standard Specification Roads and Bridges

Print Version:

WVDOH Employees-contact us or stop by Technical Support

Industry-We have an order form on our webpage here:

- https://transportation.wv.gov/highways/TechnicalSupport/specifications/Documents/SpecBookOrderForm_20230925.pdf

2025 Supplemental Specifications

The 2025 Supplemental is posted on our webpage.

- <https://transportation.wv.gov/highways/TechnicalSupport/specifications/Pages/default.aspx>

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

**SECTION 695
MAINLINE PAVEMENT**

695.1-DESCRIPTION:

This Special Provision shall define the requirements to construct mainline pavement, which includes roadway pavement and full depth paved shoulders, to the limits as shown by the contract plans. The contractor shall construct one of the pavement systems as described herein and by the contract plans.

Asphalt Pavement System:

An asphalt pavement system shall be constructed as defined by the asphalt typical section(s) and all other documents referenced in the contract plans. This work and materials shall include asphalt wearing surface, asphalt base courses, free draining base, fabric for separation, subgrade, and subgrade preparation. The pay items, as shown on the typical section(s) of the contract plans, define the specification for the materials, pay adjustments and workmanship only.

Concrete Pavement System:

A concrete pavement system shall be constructed as defined by the concrete typical section(s) and all other documents referenced in the contract plans. This work and materials shall include jointed plain concrete pavement, free draining base, fabric for separation, subgrade, and subgrade preparation. The pay items, as shown on the typical section(s) of the contract plans, define the specification for the materials, pay adjustments, and workmanship only.

695.2-RESTRICTIONS:

The pavement system, selected by the Contractor, shall be the complete system as shown by the typical section(s) in the contract plans.

The entire "Mainline Pavement System" shall be constructed by a single pavement system.

No change in pavement system will be permitted once the paving operation has commenced.

695.3-ADJUSTMENTS:

695.3.1-Material Adjustments:

695.3.1.1-Asphalt Adjustment: This Special Provision shall make use of the latest version of the Standard Specifications, Supplemental Specifications, and applicable Special Provisions for asphalt adjustments, except as described by this special provision.

The proposed Job Mix Formula (JMF) submitted by the contractor, as described in Subsection 401.4.2, shall provide the quantity of asphalt cement, per square yard- inch (SY-IN), for each JMF. The asphalt adjustment shall be based on the lots used for thickness verification. If the pavement section is determined to be less than plan, the ratio of the average thickness to the plan thickness shall be applied to the asphalt cement quantity, for the lot considered for adjustment.

The bidding index (Ib) and the placement index (Ip) may be found posted at the Department Of Transportation's website Contract Administration's Lettings page: <https://transportation.wv.gov/Highways/Contractadmin/Lettings/Pages/FuelandAsphaltPrices.aspx#AsphaltPrices>

695.3.1.2-Cement Adjustment: The compensation for the quantity of Portland cement used in the Concrete Pavement System shall be adjusted based on the latest published price, in dollars per ton, for Portland Cement (Type I) quoted for the average of Cincinnati and Pittsburgh in the Engineering News Record (ENR), Construction Economics Section available at the ENR website: <https://www.enr.com/economics> using the posted price as published on Wednesday prior to the first day of the month, with the effective date of the index being the first day of the month. If the Wednesday prior to the first day of the month falls on a holiday or the price is otherwise not published for that date the index prices will be based on the next earliest date reported.

The adjustment shall apply regardless of an increase or decrease in the published price as described above. The contract items listed in the Proposal in the Table Of Materials To Be Adjusted For Price Of Portland Cement At The Time Of Placement will be adjusted in accordance with the Division's indices for Portland Cement.

The placement index (Ip) will be the price in effect for the first day of the month in which the specified adjustable material was actually placed. Both the bidding index (Ib) and the placement index (Ip) will be based on the average of the posted prices described above.

The bidding Portland cement index (Ib) and the placement cement index (Ip) may be found posted at the Department Of Transportation's website Contract Administration's Lettings page:

<http://www.transportation.wv.gov/Highways/Contractadmin/Lettings/Pages/FuelandAsphaltPrices.aspx#CementPrices>.

Any dispute concerning the bidding index shall be resolved during the first voucher estimate review.

695.3.1.3-Price Adjustment Formula: The portion of the contract unit price which reflects the cost of the specified material will be adjusted for the change in accordance with the following formula:

Asphalt

$$Pa = Q * AC * (Ip - Ib)$$

Concrete

$$Pa = Q * Wc * Tadj * (Ip - Ib)$$

Where:

<i>Pa</i>	=	<i>Price Adjustment</i>
<i>Ip</i>	=	<i>Price Index at time of placement</i>
<i>Ib</i>	=	<i>Price Index for Bidding</i>
<i>Q</i>	=	<i>“As Constructed” Quantity</i> <i>(converted to CY for Cement Adj.)</i> <i>(converted to TN for Asphalt Adj.)</i>
<i>AC</i>	=	<i>Asphalt Content (see Specifications, Table 109.10.1)</i>
<i>Wc</i>	=	<i>tons cement per cubic yard from approved mix design</i>
<i>Tadj</i>	=	<i>(t_{avg}) / (t_{plan}) as per 695.3.1.3</i>

The price index for determining price adjustments for all work performed after the contract completion date, as revised by approved time extensions, will be determined as follows: The price index (Ip) shall be for the first day of the month in which the contract completion date (as extended), or the price index for first day of the month in which the work was performed, whichever is less.

The quantity of fly ash substitution shall not be included in the quantity eligible for adjustment.

The Portland cement adjustment shall be based on the lots used for thickness verification. If the pavement section is determined to be less than plan, the ratio of the average thickness to the plan thickness shall be applied to the Portland cement quantity, for the lot considered for adjustment.

695.3.2-Smoothness Adjustments: The smoothness for the chosen system of Mainline Pavement shall meet the criteria established in Section 720.

695.3.3-Fuel Adjustments:

695.3.3.1-Subgrade and Free Draining Base: Any fuel adjustment for these items shall be applied directly to the subgrade and free draining base layers of the pavement section as per the table in Section 109.9 of the Standard Specifications. The quantities shall be determined by the cubic yard (CY) calculation that was placed for the respective items in a given month applying the specifications formulas accordingly.

695.3.3.2-Pavement System: The Contractor shall include the unit weight per SY-IN of the pavement system placed (excluding subgrade and free draining base) for the conversion to the Fuel Adjustment as described in Subsection 109.9 *Table Of Materials To Be Adjusted And Cost Adjustment Factors For Diesel Fuel Usage*. For this adjustment the total square yardage will be the measured quantity accepted and the thickness in inches will be based upon the lots as established for thickness verification. If the pavement section

is determined to be less than plan, the ratio of the average thickness to the plan thickness shall be applied to the Fuel Adjustment quantity, for the lot considered for adjustment.

695.3.4-Percent Within Limits (PWL) Adjustments: Section 410 requires pay adjustments for each lift of asphalt, which is based on the bid cost of the individual lift pay item. To determine this, the following equation will be used:

$$\frac{\text{Theoretical lift payment per SY used for 410 pay adjustments} = (695 \text{ pay item}) \times 0.72 \times (\text{thickness of lift} / \text{total pavement thickness})}{}$$

695.4-METHOD OF MEASUREMENT:

The quantity of Mainline Pavement to be paid for will be the number of square yards (meters) complete in place and accepted. The width for measurement will be the width of the pavement shown on the surface of the typical cross section of the Plans and additional widening where called for or as otherwise directed in writing by the Engineer. This width shall be verified by field measurements. Widths exceeding the plan dimensions shall not be paid for. The length will be measured on the surface along the centerline of each roadway ramp.

Bridge approach expansion joints will be measured separately and shall be the actual number of joints constructed, complete in place and accepted. Intersection pavement, radius returns, left and right turning lanes (including tapers), will be field verified and paid for at the completion of the project paid for in the last progress payment that includes payment for any additional pavement directed by the Engineer.

Mainline Pavement is to be placed on all side roads up to the edge of the radius return furthest from the edge of mainline traveled way as shown by the detail in the plans.

All testing and pay adjustments in each pavement section will be according to their appropriate specifications.

695.5-BASIS OF PAYMENT:

695.5.1-General: The quantities, determined as provided above, will be paid for at the contract unit prices less adjustments referred to below, which shall constitute full compensation for furnishing all materials as described in the item's specification and all labor, equipment, tools, field laboratory, supplies and incidentals necessary to complete the work.

695.5.2-Progress Payments: The Progress Payment Schedule shall be based upon the pavement system as shown below. This schedule is intended to compensate the contractor for the material and work accepted.

- | | |
|--|---|
| 2 – Lane Roadway [$L_T = 4 \times \text{project length}$] | Project Length as defined on title sheet. |
| 4 – Lane Roadway [$L_T = 8 \times \text{project length}$] | |

695.5.2.1-Asphalt Pavement System:

MATERIAL IN PLACE	VALUE	L_P / L_T	Q (SY)	SUBTOTAL (SY) = Value x (L_P / L_T) x Q
HMA Mainline Pavement	0.72			
Free Drain. Base	0.12			
Fabric	0.02			
Subgrade	0.12			
Subgrade Prep.	0.02			
Total Progress Payment				(SY)

Where:

Q = Total Bid Quantity (SY)

L_P = Length placed and accepted (Ft)

L_1 = A constructed length of asphalt pavement at a thickness of t_1 x L_1 = ft-in

t_1 = A proposed thickness of specified lift (in)

L_T = Total Lane Lengths (Ft) for the varying widths of different lifts
(lanes & shoulders)

t_T = Total Pavement Thickness (in) per Typical Section(s)

HMA L_P/L_T shall be calculated as follows:

$$\frac{L_1 t_1 + L_2 t_1 + L_3 t_3 \dots}{L_T t_T}$$

Where 1, 2, 3... Represent the different lifts as shown on the typical section(s)

695.5.2.2-Concrete Pavement System:

MATERIAL IN PLACE	VALUE	L_P / L_T	Q (SY)	SUBTOTAL (SY) = Value x (L_P / L_T) x Q
PJCP Mainline Pavement	0.72			
Free Drain. Base	0.12			
Fabric	0.02			
Subgrade	0.12			
Subgrade Prep.	0.02			
Total Progress Payment				(SY)

Where:

Q = Total Bid Quantity (SY)

L_P = Length placed and accepted (Ft)

L_1 = A constructed length of Cement pavement at a thickness of t_1 x L_1 = ft²

t_1 = A proposed thickness of specified lift (in)

L_T = Total Lane Lengths (Ft) for the varying widths of different lifts
(lanes & shoulders)

t_T = Total Pavement Thickness (in) per Typical Section(s)

PJCP L_P/L_T = Length Placed/Length Total

695.6 THICKNESS TESTING:

~~The measurements which represent the thickness of the sampling units shall be analyzed to determine the average value of the pavement thickness. T=Pavement Thickness, all of the Pavement System above the Free Draining Base. This value will be used to determine the degree of compliance with the provisions set forth in 501.19 and to develop certain factors to be used in the derivation of equitable deductions as set forth in 501.23.1.2 and 501.23.1.3, in the event the provisions of this Specification are not met. When Scratch Course is called for on the plans, "T" shall be as defined above plus ½ inch.~~

~~No payment will be made for pavement areas that are 0.922T or less in thickness, the area being defined in the manner set forth in 501.19.2. Pavement which is deficient in thickness by more than 0.7 inches (18 mm) and is considered by the Engineer to be inadequate to perform satisfactorily shall be removed and replaced at no added cost to the Division. The balance of the item, the portion of the item not treated in the manner set forth above, will be treated in the manner set forth in 501.23.1.2 or 501.23.1.3.~~

~~**695.6.1** When the average value of the pavement thickness is equal to or greater than the specified thickness, the quantity of pavement represented by this average thickness will be paid at the contract unit price. No additional compensation will be provided for pavement thicknesses greater than as shown by the typical section(s).~~

~~**695.6.2** When the average value of the pavement thickness is less than the specified thickness, the fraction of pavement having a thickness greater than the 0.922T will be paid for at a unit price as set forth in the following schedule, and no payment will be made for the remainder of the pavement being considered.~~

SCHEDULE OF UNIT PRICES	
AVERAGE VALUE OF PAVEMENT THICKNESS (inch)	UNIT PRICE AS PERCENT OF CONTRACT UNIT PRICE
0.01 to 0.10 Less Than Specified Thickness	98.0
0.11 to 0.20 Less Than Specified Thickness	96.0
0.21 to 0.30 Less Than Specified Thickness	94.0
0.31 to 0.40 Less Than Specified Thickness	92.2
0.41 to 0.50 Less Than Specified Thickness	90.3
0.51 to 0.60 Less Than Specified Thickness	88.4
0.61 to 0.70 Less Than Specified Thickness	86.5
More Than 0.70 Less Than Specified Thickness	0

695.76 PAY ITEMS:

ITEM	DESCRIPTION	UNIT
695001-002	Mainline Pavement – Asphalt System	Square Yard (Meter)
695001-003	Mainline Pavement – Concrete System	Square Yard (Meter)

SECTION BREAK

NEW BUSINESS ITEMS

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 inches. For Type B and C seed mixtures, the topsoil must be tracked again to compact to a minimum thickness of 4 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 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:

MATERIAL	SUBSECTION
<u>Biological Growth Stimulants</u>	<u>715.30</u>
Fertilizers	715.26
Ground Agricultural Limestone	715.25
<u>Hydraulic Growth Mediums</u>	<u>715.31</u>
Inoculating Bacteria	715.29
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 4 February 15th~~ to June ~~15-20th~~ 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 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.

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

- i. 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.
- ii. 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 is to be seeded from February 15th to June 20th 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 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>Mowable</u> <u>Areas</u> ^b (lb/ac)	<u>Type B</u> <u>Cut and</u> <u>Fills</u> (lb/ac)	<u>Type C</u> <u>Cool</u> <u>Season</u> (lb/ac)	<u>Type E</u> <u>Wet</u> <u>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>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. duriuscula</i>)	<u>35</u>		<u>35</u>	
<u>Creeping Red Fescue</u> (<i>Festuca rubra</i>)	<u>55</u>		<u>55</u>	
<u>White Clover</u> (<i>Trifolium repens</i>)	<u>3</u>		<u>7</u>	
<u>Big Bluestem</u> (<i>Andropogon gerardii</i>)		<u>6</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>1</u>		
<u>Black-Eyed Susan</u> (<i>Rudbeckia hirta</i>)		<u>0.6</u>		
<u>Narrowleaf Mountainmint</u> (<i>Pycnanthemum tenuifolium</i>)		<u>0.1</u>		
<u>Wild Bergamot</u>		<u>0.5</u>		
<u>Panicledleaf Ticktrefoil</u> (<i>Desmodium paniculatum</i>)		<u>0.4</u>		
<u>Smooth Oxeye</u> (<i>Heliopsis helianthoides</i>)		<u>0.4</u>		
<u>Flat-top Goldentop</u> (<i>Euthamia graminifolia</i>)		<u>0.1</u>		
<u>Redtop</u> (<i>Agrostis gigantean</i>)			<u>4</u>	

TABLE 652.5
Seed Mixtures

<u>Variety of Seed</u>	<u>Type A</u> <u>Mowable</u> <u>Areas</u> ^b (lb/ac)	<u>Type B</u> <u>Cut and</u> <u>Fills</u> (lb/ac)	<u>Type C</u> <u>Cool</u> <u>Season</u> (lb/ac)	<u>Type E</u> <u>Wet</u> <u>Areas</u> (lb/ac)
<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>.1</u>
<u>Butterfly Milkweed</u> (<u>Asclepias tuberosa L.</u>)		<u>.10</u>		
<u>Common Milkweed</u> (<u>Asclepias syriaca</u>)		<u>.10</u>		
<u>Purple coneflower</u> (<u>Echinacea purpurea</u>)		<u>1.5</u>		

- 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.

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 ½ to 1 or flatter~~ less than or equal to 4H:1V. Wood cellulose fiber mulch shall be used on cut slopes steeper than 1½ to 1. The Engineer may make adjustments in the type of mulch to meet local conditions on the job.
- i.
- 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

<u>Property</u>	<u>Test Method</u>	<u>Straw</u>	<u>HECP Type 1</u>	<u>HECP Type 2</u>	<u>HECP Type 3</u>
<u>Physical</u>					
<u>Color</u>	<u>Observed</u>	<u>Natural</u>	<u>Colored to contrast application area, shall not stain concrete or painted surfaces.</u>		
<u>Organic Matter</u>	<u>ASTM D2974</u>	<u>100%</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</u>	<u>Non Toxic</u>			
	<u>EPA 2021.0-1</u>				
<u>Endurance</u>					
<u>Functional Longevity</u>	<u>ASTM D5338</u>	<u>≥ 90 days</u>	<u>≥ 90 days</u>	<u>≥ 180 days</u>	<u>≥ 365 days</u>
<u>Performance</u>					
<u>Maximum Slope Application</u>	<u>Observed</u>	<u>4.0H:1V</u>	<u>4.0H:1V</u>	<u>2.0H:1V</u>	<u>0.5H:1V</u>
<u>Cover Factor</u>	<u>ASTM D8298</u>	<u>-</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>> 85%</u>	<u>> 90%</u>	<u>> 95%</u>	<u>> 97%</u>
<u>Vegetation Establishment</u>	<u>ASTM D7322a</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

<u>Mulch Application</u>		
<u>Mulch</u>	<u>Applicable Slopes</u>	<u>Minimum Application Rate (lb/acre – dry) ^a</u>
<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>
<u>Straw</u>	<u>≤ 4H:1V</u>	<u>4,000</u>

- 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.

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 HECF. 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 HECF.~~ -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. HECFs 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~~ HECF, 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 parallel 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

<u>RECP Anchoring Requirement</u>	
<u>Slope Grade</u>	<u>Anchoring Frequency (anchors / square yard)</u>
<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.~~

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.

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

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-*	<u>"type"</u> 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 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.
- 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.

715.26.2-Fertilizer for Landscape Planting: The fertilizer shall be a co-granulated magnesium ammonium phosphate and magnesium potassium phosphate, controlled release, inorganic fertilizer compound (coarse grade). It shall have a guaranteed minimum analysis of:

	Percent
Nitrogen	7
Maximum water soluble ammoniacal nitrogen.....	2
Minimum water insoluble ammoniacal nitrogen	5
Phosphoric acid (available P ₂ O ₅)	40
Potash(K ₂ O)	6

715.27-MULCH MATERIAL:

715.27.1-Mulch Material for Seeding:

715.27.1.1-Straw Mulch: Straw mulch for seeding shall include baled wheat or oats straw, ~~or baled grass hay. Alfalfa, clover and salt grass hay are not acceptable~~ free of seed heads. Hay shall not be used. Straw mulch shall be dry and reasonably free from weeds, sticks, or other foreign material.

Acceptance shall be based on the Division's visual inspection of the material.

Wood Mulch for seeding should be 100% recycled materials, biodegradable, thermally refined, plastic-free, and phytosanitized to eliminate potential weed seeds and pathogens.

715.27.1.2-~~Wood Cellulose Mulch~~ Hydraulic Erosion Control Products (HECP): Mulch for use with the hydraulic application of grass seed shall consist of a minimum of 70% wood cellulose fiber. It should become insoluble and non- dispersible after drying to limit raindrop impact on soil. Do not use materials composed of paper, cellulose fiber, or any mixture containing paper or cellulose. It shall contain no growth or germination inhibiting factors ~~and~~, shall be dyed green, and shall not form a water-resistant crust.

When the material is agitated in slurry tanks with fertilizers, grass seed, water and other approved additives, the fibers shall become uniformly suspended to form a homogeneous slurry. The hydraulically sprayed slurry shall form a blotter-like ground cover impregnated with grass seed. The ground cover shall permit the absorption of water and allow rainfall or mechanically applied water to percolate to the underlying soil, and it must completely photo-degrade or biodegrade.

The ~~wood cellulose fiber mulch~~ hydraulic erosion control product shall conform to the following requirements:

Length of fibers	10 mm. maximum
Thickness of Fibers	1 mm. maximum
Net Dry Weight Content*	Minimum stated on bag
pH*	4.0-8.5
Water Holding Capability*	90% Minimum

~~* Test Procedure MP 715.27.20~~

TABLE 715.27.1.2

<u>Mulch Types</u>				
<u>Property</u>	<u>Test Method</u>	<u>HECP Type 1</u>	<u>HECP Type 2</u>	<u>HECP Type 3</u>
<u>Physical</u>				
<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>
<u>Endurance</u>				
<u>Functional Longevity</u>	<u>ASTM D5338</u>	<u>≥ 90 days</u>	<u>≥ 180 days</u>	<u>≥ 365 days</u>
<u>Performance</u>				
<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</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, polyacrylamide, 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-Octotber 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>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. duriuscula)</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>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> <u>(Sorghastrum nutans)</u>	<u>85</u>	<u>70</u>
<u>Partridge Pea</u> <u>(Chamaecrista fasciculata)</u>	<u>98</u>	<u>70</u>

<u>Black-Eyed Susan</u> <u>(Rudbeckia hirta)</u>	<u>80</u>	<u>60</u>
<u>Narrowleaf Mountainmint</u> <u>(Pycnanthemum tenuifolium)</u>	<u>80</u>	<u>40</u>
<u>Wild Bergamot</u> <u>(Monarda fistulosa)</u>	<u>80</u>	<u>40</u>
<u>Panicledleaf Ticktrefoil</u> <u>(Desmodium paniculatum)</u>	<u>90</u>	<u>70</u>
<u>Smooth Oxeye</u> <u>(Heliopsis helianthoides)</u>	<u>80</u>	<u>60</u>
<u>Flat-top Goldentop</u> <u>(Euthamia graminifolia)</u>	<u>70</u>	<u>40</u>
<u>Redtop</u> <u>(Agrostis gigantea)</u>	<u>92</u>	<u>80</u>
<u>Birdsfoot Trefoil</u> <u>(Lotus corniculatus)</u>	<u>98</u>	<u>95</u>
<u>Fox Sedge</u> <u>(Carex vulpinoidea)</u>	<u>85</u>	<u>60</u>
<u>Fowl Bluegrass</u> <u>(Poa palustris)</u>	<u>90</u>	<u>70</u>
<u>Redtop Panicgrass</u> <u>(Panicum rigidulum)</u>	<u>99</u>	<u>70</u>
<u>Common Rush</u> <u>(Juncus effuses)</u>	<u>85</u>	<u>60</u>
<u>Shallow Sedge</u> <u>(Carex lurida)</u>	<u>85</u>	<u>60</u>
<u>Blue Vervain</u> <u>(Verbena hastata)</u>	<u>80</u>	<u>50</u>
<u>Wingstem</u> <u>(Verbesina alternifolia)</u>	<u>90</u>	<u>80</u>
<u>Joe Pye Weed</u> <u>(Eutrochium purpureum)</u>	<u>TBD</u>	<u>TBD</u>
<u>Swamp milkweed</u> <u>(Asclepias incarnata)</u>	<u>TBD</u>	<u>TBD</u>
<u>Butterfly Milkweed</u> <u>(Asclepias tuberosa L.)</u>	<u>TBD</u>	<u>TBD</u>
<u>Common Milkweed</u> <u>(Asclepias syriaca)</u>	<u>TBD</u>	<u>TBD</u>
<u>Purple coneflower</u> <u>(Echinacea purpurea)</u>	<u>TBD</u>	<u>TBD</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 715.31.1

<u>Organic Fiber Requirements</u>		
<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 715.31.2 and Table 715.31.3.

TABLE 715.31.2

<u>Organic Fiber Material Minimum Rates</u>	
<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 715.31.3

<u>Soil Chemistry and Stabilizer Material Minimum Rates</u>		
<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

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

SECTION 207

EXCAVATION AND EMBANKMENT

207.1-DESCRIPTION:

ADD THE FOLLOWING:

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

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

207.2-MATERIALS:

ADD THE FOLLOWING:

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

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

An excavation slightly larger than the settlement plate shall be made to an elevation established by the Engineer. The excavation shall form a pit having a minimum depth of twelve (12) inches with a level bottom.

The plate shall be placed in the pit with one section of marker pipe attached. The attached marker pipe shall be five (5) feet in length as shown in Settlement Plate Detail in the Bridge Plans. The plate shall have full bearing and the marker pipe plumb before proceeding with the stem assembly. When realignment of the plate and marker pipe is necessary, the plate and pipe shall be removed and the pit bottom reshaped for proper alignment.

With plate and marker pipe in place, wrap the lower six (6) inches of marker pipe with oakum; slip one section of casing pipe over the marker pipe; and, lower the casing to uniformly encase the oakum seal while seating the casing on the plate as shown in Settlement Plate Detail in the Bridge Plans.

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

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

The embankment or surcharge material in the immediate vicinity of the settlement plate stem shall be placed and compacted in accordance with the requirements of the Specifications, or as directed by the Engineer. Embankment or surcharge material within three (3) feet of the stem shall be placed and compacted by hand with non-impact, light vibratory plate compactors.

When surface of the embankment or surcharge reaches a level approximately two (2) feet below the top of the stem section in place, the next section of marker pipe and casing shall be installed, the casing shall be capped, and the stem flagged for protection. Added sections shall be five (5) feet in length.

As the height of the embankment or surcharge material increases, this procedure shall be repeated until the embankment and/or surcharge material placement is completed.

Settlement plate assemblies constructed within permanent embankment material shall remain in place and become the property of the West Virginia Division of Highways. Settlement plate assemblies constructed within temporary surcharge shall be removed as specified in project plans.

The Contractor will obtain and record all measurements and elevations necessary for the accurate determinations of settlement data following construction of the embankment or surcharge. Elevations shall be surveyed at frequencies as directed in project plans. The surveying must be performed by leveling methods using instruments and methods to yield a vertical accuracy of plus or minus 0.002 feet. Establish a benchmark on stable ground that is not subject to settlement and is located away from any earthwork/construction activities. The settlement data should be provided to the Engineer to evaluate when

foundation construction can proceed. It is expected that construction ~~of the abutment foundations~~ can proceed once it is determined that the rate of settlement is less than 1/10 of an inch per week for at least two (2) consecutive weeks at each settlement plate location.

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

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

207.15-METHOD OF MEASUREMENT:

ADD THE FOLLOWING:

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

207.16-BASIS OF PAYMENT:

ADD THE FOLLOWING:

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

207.17-PAY ITEM:

ADD THE FOLLOWING:

ITEM	DESCRIPTION	UNIT
207035-001	Settlement Plate Assembly	Each

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

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 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 3.3 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 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.

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 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 Section 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 Section 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 Section 601.3.2.4.1. The 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 Section 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	$\frac{1}{2}$ or $\frac{3}{8}$	7.5
K	4,000	618	0.44	1 or $\frac{3}{4}$	7.0
B	3,000	524	0.49	1 or $\frac{3}{4}$	7.0
C	2,500	454	0.58	1 or $\frac{3}{4}$	6.0
D	2,000	360	0.62	1 or $\frac{3}{4}$	5.5
H	4,000	See Table 601.3.1E	0.40	1 or $\frac{3}{4}$	6.5
S	4,000	600	0.42 ^{Note 4}	1 or $\frac{3}{4}$	6.5
DC ^{Note 3}	4,500	665	0.44	$\frac{1}{2}$ or $\frac{3}{8}$	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 $\frac{3}{4}$ 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 section 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 _{eq})	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

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

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
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* The alkali content of all approved SCM sources is listed on the WVDOT 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 WVDOT project.

** The CaO content of approved fly ash sources is listed on the WVDOT 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 WVDOT 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 Section 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 (Section 601.3.1.1.1.4)" except for Class H and Class S concrete.

The approved lithium nitrate admixture shall meet the requirements of Section 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 (Section 601.3.1.1.1.4)" 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 sub-section, 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 section 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:

Sequential Air Method (SAM) Test	AASHTO T 395
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 k Ω -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:

ADD THE FOLLOWING TO THE TITLE OF THE SUBSECTION:

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 temporally 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 Sections 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

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

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:

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

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

FOR

**SECTION 715
MISCELLANEOUS MATERIALS**

715.42-TRAFFIC SIGNAL MATERIALS AND EQUIPMENT:

715.42.10-Electrical Conduit:

ADD THE FOLLOWING SUBSECTION:

715.42.10.5-Type PR (PVC-Coated Rigid Galvanized Steel Conduit): 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.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

**SECTION 615
STEEL STRUCTURES**

615.6-ERECTION

615.6.3-Bearings and Anchorage's:

DELETE THE CONTENTS OF THE SECOND PARAGRAPH OF 615.6.3 AND
REPLACE WITH THE FOLLOWING

The Contractor shall drill the holes and set the anchor bolts, except where the bolts are built into the masonry. The bolts shall be set accurately and fixed with Portland cement ~~grout~~completely grout completely filling the holes. The location of anchor bolts in relation to the slotted holes in the expansion shoes shall correspond with the temperature at the time of erection. The nuts or anchor bolts at the expansion ends of spans shall be adjusted to permit the free movement of the span.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
SUPPLEMENTAL SPECIFICATION
FOR
SECTION 679
OVERLAYING OF PORTLAND CEMENT CONCRETE BRIDGE DECKS

679.2-MATERIALS:

679.2.2-Specialized Concrete Mix Design and Testing:

DELETE THE CONTENTS OF SUBSECTION 679.2.2 AND REPLACE WITH THE FOLLOWING:

Specialized concrete shall consist of a homogeneous mixture of cement, fine aggregate, coarse aggregate, latex or silica fume admixture, chemical admixtures, and water. The use of fibers in the specialized concrete shall be allowed.

The Contractor shall determine mixture proportions in general accordance with ACI 211.1, "Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete." Establishment of mixture proportions shall be coordinated with the manufacturer of the latex or silica fume admixture. The dosage rate in lbs./cy of fibers for any application shall be the manufacturer's recommendation to meet the requirements of 715.3. The dosage rate shall not be less than the submitted rate used for product approval which can be found in the approved products list. The dosage rate shall not exceed 5.0 lbs./cy, unless the manufacturer can demonstrate, through a field demonstration, that the concrete mixture will be workable and fiber balling is not a problem.

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 section 679.2.2.1 or 679.2.2.2. This mix design shall be prepared in accordance with MP 711.03.23.

Design mixture testing shall include air content, slump, and compressive strength results at 28 days and results of ~~rapid-chloride-permeability~~AASHTO T 358 ~~concrete surface resistivity tests.~~ Compressive strength cylinders for silica fume concrete shall be cured in accordance with ASTM C192 for 28 days, but compressive strength cylinders for latex modified concrete shall be moist cured in accordance with ASTM C192 for 2 days then air cured in the lab at a temperature between 73.5 ± 3.5 °F for 26 days. For establishment of mixture proportions, ~~rapid-chloride-permeability-concrete surface resistivity tests~~ for silica fume concrete shall be made on representative samples cured for ~~56-28 days in accordance with ASTM C192,~~ then allowed to air dry in the lab at a temperature of 73.5 ± 3.5 °F until the

time of test. These specimens then shall be prepared and tested in accordance with AASHTO -T -358 at an age of 28 days.

For establishment of mixture proportions, ~~rapid-chloride permeability-surface resistivity~~ tests for latex modified concrete shall be made on representative samples moist cured in accordance with ASTM C192 for 2 days, air cured at in the lab at a temperature between 73.5 ± 3.5 °F for 54 days, then resubmerged in in the pour solution for 7 days then prepared and tested in accordance with AASHTO T 358 at an age of 61 days ~~AASHTO T 277 at an age of 56 to 90 days.~~ The ~~final rapid-chloride permeability-surface resistivity test result shall consist of the average of two individual test results the three cylinders.~~ This average shall be at least 30 kΩ-cm.

~~For establishment of mixture proportions, as an alternative to the curing methods for rapid chloride permeability testing outlined in the previous paragraph,~~ Silica fume concrete specimens may be moist cured for 7 days in accordance with ASTM C192, then cured for 21 days in lime-saturated water at 100.0 ± 3.5 °F, then tested at an age of 28 days. For establishment of mixture proportions, as an alternative to the curing methods for ~~rapid-chloride permeability testing outlined in the previous paragraph~~ surface resistivity test, latex modified concrete specimens may be moist cured for 2 days in accordance with ASTM C192, then cured for 26 days in air at 100.0 ± 3.5 °F and a minimum of 50% relative humidity, then resubmerged in in the pour solution for 7 days and tested at an age of 28 36 days. ~~These methods of curing shall be noted as the accelerated RCPT curing methods.~~

~~The 28-day compressive strength of the test mix that satisfies the 750-coulomb~~ A surface resistivity result of at least 30 kΩ-cm shall be used as the basis for acceptance of the Specialized Concrete Overlay permeability requirements. Concrete for any slump test shall be deposited in a manner and location that excludes the effects of vibrations caused by traffic and concrete placement operations.

The total concrete constituents shall contribute less than 0.10% water soluble chloride ion by weight of cement. Use one brand and/or one source for any concrete constituent.

The Contractor shall obtain a written statement from the manufacturer of the latex or silica fume admixture that confirms the compatibility of the material combination and the sequence in which they are combined. The written statement, along with the results of all required tests, shall be furnished to the Engineer prior to the pre-construction meeting (refer to 679.2.2.3). Substantiating data showing compliance with the requirements of this specification shall also be submitted. This data shall also include the sources of coarse and fine aggregates as well as the brands of all admixtures to be used.

Contractor's Quality Control: Quality control of the specialized concrete is the responsibility of the Contractor as designated in MP 601.03.50. The Contractor shall maintain equipment and qualified personnel, including at least one certified Portland Cement Concrete Technician who shall direct all field inspection, sampling, and testing necessary to determine the magnitude of the various properties of concrete governed by the Specifications and shall maintain these properties within the limits of this Specification. The Contractor's personnel who conduct the field sampling and testing shall be a certified Portland Cement Concrete Inspector. The quality control plan designated in MP 601.03.50 shall be submitted to the Engineer at the preconstruction conference. Work shall not begin until the plan is reviewed for conformance with the contract documents.

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

During construction, a minimum of three specimens shall be fabricated ~~rapid-chloride permeability-surface resistivity testing~~ in accordance with ~~AASHTO T358~~ AASHTO T-277 every time that a set of compressive strength specimens is fabricated.

~~If the 28-day compressive strength of the in-place concrete, obtained from specimens made as outlined in the previous paragraph, is less than or equal to eighty percent (80%) of the compressive strength of the approved test mix, these rapid chloride permeability test specimens shall be tested, as outlined in the following two paragraphs. Otherwise, testing of these specimens is not required.~~

~~When silica fume concrete is used, these specimens shall be moist cured for 56 days and then allowed to air dry at a temperature of 73.5 ± 3.5 °F until the time of test. These Two specimens shall be tested at an age of ~~90~~28 days in accordance with AASHTO ~~T277~~T358, and if necessary, the remaining two specimens shall be tested at an age of 180 days in accordance with AASHTO T-277. The average result of the ~~two-three~~ values from these specimens shall be reported as the result required in Note (a) in section 679.2.2.2.~~

~~When latex modified concrete is used these specimens shall be moist cured for 2 days and then air dried at a temperature of 73.5 ± 3.5 °F until the time of the compressive strength test. These specimens shall be resubmerged for 7 days and tested at an age of ~~36~~ 90 days in accordance with AASHTO ~~T358~~277, and the average result of the ~~two-three~~ values from these specimens shall be reported as the result required in Note (a) in section 679.2.2.1. If necessary, the remaining two specimens shall be tested at an age of 180 days in accordance with AASHTO T-277 358, and the average result of the two values from these specimens shall be reported as the result required in Note (a) in section 679.2.2.1.~~

Gradation testing shall be performed in accordance with Section 601.3.2.4.

697.2.2.1-Latex Modified Concrete:

DELETE & REPLACE THE FOLLOWING TABLES FIELDS & FOOTNOTES WITH:

The following test criteria must be met for all latex modified concrete pours placed at the structure. This testing shall be performed by the Contractor or his designated representative and certified results provided to the Engineer prior to final acceptance of the project.

Table 679.2.2.1

<u>Surface Resistivity</u> ^(a) Chloride Permeability ^(a)	<u>Minimum 30 kΩ-cm @ 28 days (per AASHTO T 358)</u> 1000 coulombs @ 90 or 180 days, maximum (per AASHTO T-277)
Compressive Strength ^(b)	not less than 80% of 28-day compressive strength of the approved test mix
Water/Cement Ratio ^(c)	0.40 by weight, maximum
Portland Cement Content	658 lb/cu. yd., minimum

Table 679.2.2.1

Latex Admixture Content ^(d)	24.5 gal/cu. yd., minimum
Air Content ^(e)	6.5% maximum (Per AASHTO T 152)
Slump	4.0 inches $\pm$ 2.0 inches

- Note (a) ~~When required, as outlined in the Contractor's Quality Control Section of Section 679.2.2, the surface resistivity tests shall be performed and the results tabulated and submitted to the Engineer. If the compressive strength requirements noted in Table 679.2.2.1 are not satisfied, and the surface resistivity value is under the requirement noted in the Table 679.2.2.1, then the concrete represented by these strength and surface resistivity values may be removed and replaced by the Contractor. When required, as outlined in the Contractor's Quality Control Section of Section 679.2.2, rapid chloride permeability tests shall be performed and the results tabulated and submitted to the Engineer. Chloride permeability of the in-place concrete shall be considered acceptable if the 28-day compressive strengths obtained in Section 679.2.2 are greater than eighty percent (80%) of the 28-day compressive strength of the approved test mix. If the compressive strength requirements noted in Table 679.2.2.1 are not satisfied, and the permeability value noted in the Table 679.2.2.1 is exceeded, then the concrete represented by these strength and permeability values 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 679.2.2.2B.
- Note (b) ~~The minimum 28-day compressive strength shall be 4,000 psi. Overlay concrete with a compressive strength of less than this acceptance level may be removed and replaced at the contractor's expense. The minimum compressive strength for the overlay concrete shall be 80% of the 28-day compressive strength of the approved test mix. However, the minimum 28-day compressive strength shall be 4,000 psi. Overlay concrete with a compressive strength of less than this acceptance level may be removed and replaced at the contractor's expense.~~
- Note (c) The amount of added water shall be adjusted to provide slump at or below the prescribed limit. The water portion of all admixtures shall be included as part of the water/cement ratio.
- Note (d) Latex sampling shall be in accordance with 707.5.
- Note (e) The initial mix design shall be based on an expected air content range of 3% to 6%. The mixture proportions shall be determined using actual conditions for fineness modulus and bulk specific gravities (saturated surface dry for aggregates).

679.2.2-Specialized Concrete Mix Design and Testing:

679.2.2.2-Silica Fume Concrete:

DELETE & REPLACE THE FOLLOWING TABLES FIELDS & FOOTNOTES WITH:

The following test criteria must be met for all silica fume concrete pours placed at the structure. This testing shall be performed by the Contractor or his designated representative and certified results provided to the Engineer prior to final acceptance of the project.

Table 679.2.2.2A

<u>Surface Resistivity (a)</u> Chloride Permeability ^(a)	<u>Minimum 30 kΩ-cm @ 28 days (per AASHTO T 358)</u> 1000 coulombs @ 90 days or 180 days; maximum (per AASHTO T 277)
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Table 679.2.2.2A

Compressive Strength ^(b)	not less than 80% of 28-day compressive strength of the approved test mix
Water/(Cementitious Materials) Ratio ^(c)	0.37 by weight, maximum
Portland Cement Content ^(d)	680 lb/cu.yd., minimum
Silica Fume Content ^(e) (Dry Weight)	50 lb./cu. yd., minimum
Air Content	7.0% (plus or minus 1.5%) (Per AASHTO T 152)
Slump	6.5 inches $\pm$ 1.5 inches
High Range Water Reducer (Superplasticizers) ^(f)	As needed for workability, slump and water/cementitious ratios

Note (a) ~~When required, as outlined in the Contractor's Quality Control Section of Section 679.2.2, the surface resistivity tests shall be performed and the results tabulated and submitted to the Engineer. If the compressive strength requirements noted in Table 679.2.2.2 are not satisfied, and the surface resistivity value noted in the Table 679.2.2.2 is under the requirement, then the concrete represented by these strength and surface resistivity values may be removed and replaced by the Contractor. When required, as outlined in the Contractor's Quality Control Section of Section 679.2.2, rapid chloride permeability tests shall be performed and the results tabulated and submitted to the Engineer. Chloride permeability of the in place concrete shall be considered acceptable if the 28 day compressive strengths obtained in Section 679.2.2 are greater than eighty percent (80%) of the 28 day compressive strength of the approved test mix. If the compressive strength requirements noted in Table 679.2.2.2 are not satisfied, and the permeability value noted in the Table 679.2.2.2 is exceeded, then the concrete represented by these strength and permeability values 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 679.2.2.2B.

Note (b) ~~The minimum 28-day compressive strength shall be 4,000 psi. Overlay concrete with a compressive strength of less than this acceptance level may be removed and replaced at the contractor's expense. The minimum compressive strength for the overlay concrete shall be 80% of the 28 day compressive strength of the approved test mix. However, the minimum 28 day compressive strength shall be 4,000 psi. Overlay concrete with a compressive strength of less than this acceptance level may be removed and replaced at the contractor's expense.~~

Note (c) The amount of added water shall be adjusted to provide slump at or below the prescribed limit. The water portion of all admixtures shall be included as part of the water/cement ratio.

Note (d) An equal volume of fly ash may be substituted for cement to a maximum of 1 ¼ bags per cubic yard. An equal volume of slag cement may be substituted for cement to a maximum of 3 bags per cubic yard. When fly ash or slag cement are used, equivalent volumes of fly ash or slag cement shall be considered as cement for purposes of determining the proportioning ratios.

Note (e) Silica fume sampling shall be in accordance with 707.4.3.

Note (f) A high range water-reducing admixture is required to improve workability. No more than two additions of the admixture shall be made, and the total quantity shall not exceed the manufacturer's maximum dosage rate. Each time high range water reducer is added, the concrete shall be mixed an additional minimum of 30 revolutions. The total number of revolutions shall not exceed 300.

Table 679.2.2.2B

Permeability result obtained in Table 679.2.2.1 or 679.2.2.2A. See Note (a) (values expressed in Coulombs)	Percent of unit bid price paid according to Section 679.6.3 which will be paid for material in question
>1,000 — 1,500	95%
>1,500 — 2,000	90%
>2,000 — 2,500	85%
>2,500 — 3,000	80%
>3,000 — 3,500	70%
>3,500 — 4,000	60%
>4,000	Remove and replace

Table 679.2.2.2B

<u>Resistivity Result (kΩ-cm)</u>	<u>Percent of Unit Bid Price Paid</u>
<u>>25-29</u>	<u>90%</u>
<u>>20-25</u>	<u>70%</u>
<u>>15-20</u>	<u>50%</u>
<u>≤15</u>	<u>Remove & Replace</u>

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
SUPPLEMENTAL SPECIFICATION
FOR
SECTION 679
OVERLAYING OF PORTLAND CEMENT CONCRETE BRIDGE DECKS

679.2-MATERIALS:

679.2.3-Equipment:

679.2.3.1-Cutting Equipment:

679.2.3.1.1-Hydrodemolishing Equipment:

DELETE THE CONTENTS OF THE FIRST PARAGRAPH IN SUBSECTION 679.2.3.1.1 AND REPLACE WITH THE FOLLOWING:

The hydrodemolishing system shall be self-propelled, completely programmable, designed for high production concrete removal, and ~~capable of removing precise depths of sound concrete~~ utilizes a high-pressure water jet stream capable of attaining pressures in the range of 18,000 to 20,000 PSI and removing all unsound, or otherwise designated, concrete to the depth specified.. The pressure used for this work shall be a minimum of 18,000 PSI and a maximum of 20,000 PSI. Ultra high-pressure machines shall not be permitted. Water usage per minute shall be a minimum of 55 gallons (55 GPM minimum). Hydrodemolishers shall be capable of removing concrete from around and below the steel reinforcement. Lances shall be of a type intended to remove rather than scarify concrete. Individuals certified by the equipment manufacturers shall operate the removal equipment.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

**SECTION 701
HYDRAULIC CEMENT**

701.3-BLENDED HYDRAULIC CEMENTS:

ADD THE FOLLOWING CONTENTS TO THE END OF 701.3:

Blended hydraulic cement shall conform to the requirements of ASTM C595 for Portland blast-furnace slag cement, Type IS, or Portland-pozzolan cement, Type IP, or Portland-limestone cement, Type IL, or Portland ternary cement, Type 1T.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

**SECTION 709
METALS**

709.1-STEEL BARS FOR CONCRETE REINFORCEMENT:

709.1.3-Galvanized Coated Bars for Concrete Reinforcement

DELETE THE CONTENTS OF SUBSECTION 709.1.3 AND REPLACE WITH THE FOLLOWING:

For galvanized coated reinforcing steel, the uncoated material shall conform to Section 709.1. The galvanized coating shall conform to the requirements of ASTM A767 for the immersion process or ASTM A1094 for the continuous hot dip galvanizing process, ~~unless otherwise specified in the Contract Documents.~~ All field handling and repair requirements shall conform to ASTM A767 or ASTM A1094 as applicable. All galvanized reinforcing steel shall be inspected by a representative of the WVDOH MCS&T Division, at the location of galvanizing, prior to shipment. If ASTM A767 is used as the method of galvanizing, the coating shall be Class 1, field bending shall be prohibited, and shop bending shall be prohibited after galvanizing.