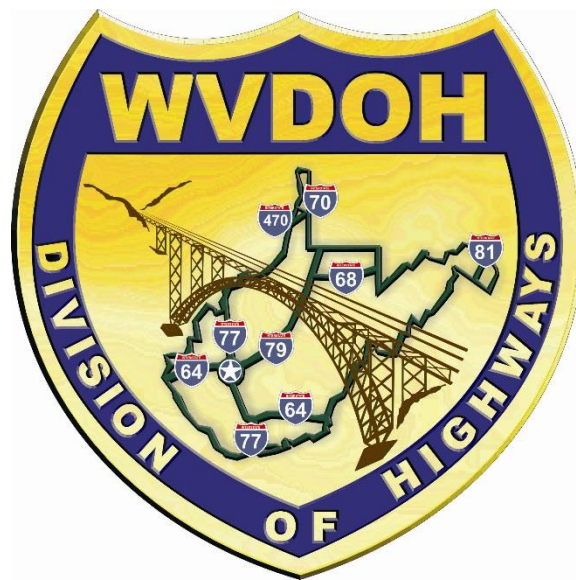


**WEST VIRGINIA  
DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS**



***2024 SUPPLEMENTAL SPECIFICATIONS***

**To accompany the 2023 Edition of the  
Standard Specifications of Roads and Bridges**

**Electronic copies of this book can be obtained via the Internet at  
<https://transportation.wv.gov/highways/TechnicalSupport/>**



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## **DIVISION 100 GENERAL PROVISIONS**

### **SECTION 101 DEFINITION OF TERMS**

#### **101.1-ABBREVIATIONS:**

DELETE NTPEP FROM THE SUBSECTION:

#### **101.2-DEFINITIONS:**

DELETE THE DEFINITION OF ENGINEER AND HOLIDAY AND REPLACE WITH THE FOLLOWING:

**Engineer**-The Chief Engineer, assigned by the Commissioner, or a designated representative, who acts within the scope of particular duties or authority given to them by West Virginia State Code, the Commissioner, these Specifications, or the Contract Documents.

**Holidays**-Official holidays are New Year's Day, Martin Luther King's Birthday, Presidents' Day, Memorial Day, West Virginia Day, Independence Day, Labor Day, Columbus Day, Veteran's Day, Thanksgiving Day, The day after Thanksgiving Day (Lincoln's Day), Christmas Day, and any day in which an election (Primary, General, or Special) is held throughout the State and such other days as the President, Governor, or other duly constituted authority shall proclaim to be holidays. If a holiday falls on a Sunday, the following Monday shall be observed in lieu thereof. If a holiday falls on a Saturday, the previous Friday shall be observed in lieu thereof.

### **SECTION 106 CONTROL OF MATERIALS**

#### **106.1-SOURCE OF SUPPLY AND QUALITY REQUIREMENTS:**

##### **106.1.1-Definitions:**

DELETE THE DEFINITION OF "CONSTRUCTION MATERIAL" AND REPLACE WITH THE FOLLOWING:

"Construction material" means an article, material, or supply that is or consists primarily of non-ferrous metals, plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables), glass (including optic glass), fiber optic cable (including drop cable), optic fiber, engineered wood, lumber, or drywall. A "construction material" does not include an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives. Items that consist of two or more of the listed materials that have been combined together through a manufacturing process, and items that

include at least one of the listed materials combined with a material that is not listed through a manufacturing process, are treated as manufactured products and not as construction materials.

**106.1.4-Use of Domestic Construction Materials:**

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

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

**106.3-SAMPLES:**

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

All materials will be inspected, tested and approved prior to incorporation into the work. Any work which incorporates materials prior to the above evaluation shall be performed at the Contractor's risk, and may subsequently be considered as unacceptable. Unless otherwise specified, the materials shall meet the applicable Standard or Interim Specifications of the American Association of State Highway and Transportation Officials (AASHTO), the Standard or Tentative Specifications of the American Society for Testing and Materials (ASTM), or Standards adopted by other specifying agencies, with preference given in the same order in which the above agencies are listed. The specification which is current at the time of advertisement for bids shall govern, except that, with the approval of the Engineer, subsequent revisions or adoptions may govern. All materials being used are subject to inspection, testing or rejection at any time prior to final acceptance of the completed work.

The Contractor shall be responsible for the quality of construction and materials incorporated. When called for in the Specifications and/or Materials Procedure, the Contractor shall perform all necessary process control inspection, sampling and testing. All materials will be approved for acceptance through the Division's acceptance procedures. The Division has the exclusive right and responsibility for determining the acceptability of the construction and materials incorporated. The Division may use the results of the Contractor's inspection, sampling and testing for acceptance purposes.

Tests shall not be considered complete until they are submitted by the Contractor to the Division. The submission of test results shall be provided in a timely manner as specified in MP 109.00.21. Failure to submit test results by the established guideline will result in a price penalty assessed based on MP 109.00.21.

The Contractor may submit for acceptance, materials that appear on the Division Approved Source/Product Listing (APL). These submissions shall include a clear and legible invoice from the manufacturer and contain the product's approved lab number. Products that are not on the approved product list may be used on projects as long as these products meet the requirements for that material. Prospective new products for the approved product list shall follow the guidelines of MP 106.00.02 and MP 106.00.03.

Lot or subplot sizes will normally be designated. In the event that operational conditions cause work to be interrupted, or only partially completed before the lot size designated has been

achieved, the lot or subplot may be redefined by the Engineer as being either the amount of work accomplished within the day or that work partially completed combined with the next lot or subplot of work. It is the intent of these Specifications that the number of samples required to evaluate each lot or subplot will be unchanged even when the lot or subplot is redefined.

When an acceptance plan is cited, it shall be in accordance with 106.3.1.

**106.3.1-Acceptance Plans:**

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

**106.3.1.1-Sampling of Reworked Lots or Sublots:** It is the intent of these Specifications that lots or sublots of materials, products, items of construction or completed construction meet specification requirements at the time of submission. Lots or sublots generally will not be resampled unless reworked before submission. Sampling after reworking will be at the expense of the Contractor.

**SECTION 107  
LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC**

**107.21-PROTECTION OF RIVERS, STREAMS, AND IMPOUNDMENTS:**

**107.21.3-Basis of Payment:**

DELETE THE ENTIRE CONTENTS OF SUBSECTION 107.21.3 AND REPLACE WITH THE FOLLOWING:

The Department will specify pay items in the contract to protect rivers, streams and impoundments. These include but are not limited to sections 641, 642, 651, 652, 653, 654, 655, and 656. Cost and quantities for items deemed necessary or beneficial by the Engineer or Environmental Monitor that are not specifically described and furnished as pay items in the contract shall be negotiated by the Engineer and Contractor to be included in the Contract.

**SECTION 109  
MEASUREMENT AND PAYMENT**

**109.20-WEIGH TICKETS:**

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

A weigh ticket shall be required with each load of material from a commercial source which would normally have truck scales. This includes, but is not limited to, all asphalt paving materials and all aggregates regardless of the contract pay unit. The weigh ticket shall include gross, tare, and net weights, time and date of loading, Item Number or Description of Materials, Project Number, license number of haul unit, and signature of the weigher certifying that all information on the ticket is correct. All weigh tickets shall contain as a minimum the information required in



MP 307.00.50, MP 401.03.50, and MP 601.03.50, for aggregate, asphalt, and concrete respectively. If the weigher's name is printed by the computer on the ticket, then it only needs to be initialed by the weigher.

For material from a commercial source or a batch plant, which would not normally have truck scales, a weigh ticket documenting the tare weight, license number of haul unit, date weighed, location of scales, and signature of the weigher certifying that all information on the ticket is correct, may be supplied for each haul unit as an alternate to the ticket required in the previous paragraph. The tare weight ticket shall be supplied for each contract on a yearly basis and when modifications are made to the vehicle or combination of vehicles. The weight of the material delivered shall be calculated and furnished by the vendor/supplier shipping the material to the project site or DOH facility. This includes, but is not limited to, structural steel, piling, reinforcing steel and all prepackaged material of known weight, such as cement, grout, fertilizer, lime, abrasives, etc.

## **DIVISION 200 EARTHWORK**

### **SECTION 201 CLEARING AND GRUBBING**

#### **201.7-DISPOSAL:**

DELETE THE CONTENTS OF THE EIGHTH PARAGRAPH IN SUBSECTION 201.7 AND REPLACE WITH THE FOLLOWING:

The in ground trench is to be placed outside the construction limits, unless otherwise approved by the Engineer. If the trenches are not to be eliminated in the subsequent excavation operation, they shall be backfilled. All backfill within construction limits shall be accomplished in accordance with the requirements of Section 207. Compaction of backfill outside construction limits shall be performed so as to obtain a minimum density equal to that of the surrounding ground.

### **SECTION 202 BUILDING DEMOLITION, WELL AND SEPTIC TANK ABANDONMENT**

#### **202.4-BUILDINGS:**

DELETE THE CONTENTS OF THE FIRST PARAGRAPH IN SUBSECTION 202.4 AND REPLACE WITH THE FOLLOWING:

Buildings and appurtenances shall be removed to the existing ground level, which operation shall include removal of concrete slabs or any other type of floor resting upon the ground. Basements shall be cleared of all debris, appliances, wood or metal partition walls, wood floors, etc., so that only the foundation walls and basement floor remain. The basement floors shall be shattered. If pits, trenches, holes, or basements are not to be eliminated in subsequent excavation operation, they shall be backfilled. All backfill within the construction limits shall be accomplished in accordance with the requirements of Section 207. Compaction of backfill outside the construction limits shall be performed so as to obtain a minimum density equal to that of the surrounding ground.

### **SECTION 219 CONTROLLED LOW-STRENGTH MATERIAL**

#### **219.4-CONSTRUCTION METHODS:**

##### **219.4.2-Testing:**

DELETE THE CONTENTS OF THE SECOND PARAGRAPH IN SUBSECTION 219.4.2 AND REPLACE WITH THE FOLLOWING:

The Contractor shall determine the flow, and shall mold one set (3 cylinders) of standard six (6) inch by twelve (12) inch compressive strength specimens for every 100 cubic yards, or fraction thereof, of material that is placed per day. These cylinders shall be cured and tested in accordance with ASTM D4832 except that they shall be stored at the construction site in the storage container until the fourteenth day after preparation. After the fourteenth day, they shall be transported to the site of the curing environment, specified in ASTM D4832, where they will be cured for the remainder of the 28 day period. The average compressive strength at 28 days shall meet the strength requirements listed in section 219.3. Material not meeting the minimum compressive strength at 28 days shall be removed at the Contractor's expense. The Division shall evaluate Type A material that exceeds the maximum compressive strength.

**DIVISION 400  
ASPHALT PAVEMENTS**

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

**401.2-MATERIALS:**

DELETE THE TABLE AND REPLACE WITH THE FOLLOWING:

MATERIAL	SUBSECTION
Coarse Aggregate	703.1 thru 703.3 <sup>Note 1</sup> (See MP 401.02.28 for exceptions and additions required for Superpave Items.)
Fine Aggregate	702.3 (See MP 401.02.28 for additions required for Superpave Items)
Mineral Filler	702.4
Performance Graded Binders	705.5

Note 1 When slag is specified in the contract, the coarse aggregate shall be slag which meets the requirements of 703.3, except as amended in this subsection.

**401.9-EQUIPMENT:**

**401.9.7-Trucks for Transporting Mixture:**

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

The inside surfaces of trucks shall be thinly coated with a AASHTO Product Evaluation and Audit Solutions evaluated asphalt release agent. The use of diesel fuel, kerosene, or similar solvent-based products which can dissolve the asphalt film from the aggregate particles will not be permitted. Any commercial release agent which can be certified by the Producer/Supplier as harmless to the mix may be used; however, the Division reserves the right to restrict any release agent that is shown to cause problems during placement of the mix. In the case of mixtures composed of PG Binders which contain polymer modification, truck surfaces should be coated with a release agent recommended by the binder supplier. All excess coating material shall be removed from the truck bed prior to loading the asphalt.

**401.9.10-Material Transfer Vehicle:**

DELETE SUBSECTION 401.9.10 AND REPLACE WITH THE FOLLOWING:

A Material Transfer Vehicle (MTV) shall be designed to independently transfer and continuously mix asphalt concrete to mitigate thermal and particle size segregation when

transferring from the haul equipment to the paving equipment.

An MTV shall have a high-capacity truck unloading system be capable of receiving and transferring material at a rate that exceeds the capacity of the delivery and paving equipment, and have a minimum combined capacity of 15 tons of asphalt concrete, including the MTV storage bin and hopper. An MTV shall include a system contained within an integrated storage bin which continuously mixes the asphalt concrete prior to discharge to the paving equipment. Additionally, the MTV should have a discharge conveyor with the ability to swivel to allow for the delivery of material to the paver while the MTV operates from an adjacent lane.

The MTV shall be maintained and in proper working condition.

**401.9.11-Compaction Equipment:** Compaction shall be performed by self-propelled steel-wheeled or pneumatic-tired rollers. The use of either vibratory or oscillatory type rollers is acceptable. Pneumatic rollers shall be equipped with skirting around the wheel area to prevent heat loss to the tires and tire pads. Hand-held rollers or vibrating plates may be used in small inaccessible areas as approved by the Engineer. Prior to use on any project, the roller shall be inspected to see that it is in good mechanical condition. The total weight, weight per inch of width (steel-wheeled), and average ground contact pressure (pneumatic-tired) shall be documented in the contractors QCP in accordance with MP 401.03.50.

## **SECTION 402 ASPHALT SKID RESISTANT PAVEMENT**

### **402.2-MATERIALS:**

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

The coarse aggregate shall consist of gravel, slag, or other acceptable polish resistant aggregate, or combinations thereof, meeting the requirement of Subsections 703.1 through 703.3.

When stone or gravel is specified in the contract, the coarse aggregate shall consist of gravel or other acceptable polish resistant aggregate, or combination thereof meeting the requirements of 703.1 through 703.3. When slag is specified in the contract, the coarse aggregate shall be slag which meets the requirements of 703.3.

Acceptable dolomite may be used alone or as a part of a coarse aggregate blend on roadways with a projected ESAL value of less than 3,000,000. On roadways with a projected ESAL value of 3,000,000 or greater, acceptable dolomite may be used only as a part of the coarse aggregate blend and shall not exceed 50% of that blend.

ADD THE FOLLOWING SECTION:

## **SECTION 406 HIGH FRICTION SURFACE TREATMENT**

### **406.1-DESCRIPTION:**

This work shall consist of the construction of a high friction surface treatment (HFST) material, composed of binder material and aggregate, upon an existing surface, in accordance with these Specifications and in reasonably close conformity with the lines, grades, thicknesses, and cross sections shown on the Plans or established by the Engineer.

The Contractor shall notify the Engineer a minimum of two weeks prior to starting any high friction surface treatment operation.

### **406.2-MATERIALS:**

The binder and aggregate shall meet the requirements of AASHTO MP-41.

**406.2.1-Quality Control Testing:** Quality control is the responsibility of the Contractor as specified in 106.1.

The Contractor shall design a quality control plan in accordance with applicable section of MP307.00.50, excluding attachment 1, detailing the methods by which the quality control program will be conducted. Samples shall be obtained at a minimum frequency of one sample per day of aggregate placement.

### **406.3-ACCEPTANCE TESTING:**

The material shall be evaluated by AASHTO Product Evaluation and Audit Solutions. Acceptance sampling and testing of aggregates is the responsibility of the Division, except for furnishing the necessary materials. Quality control sampling and testing performed by the Contractor may be used by the Division for Acceptance.

**406.3.1-Skid Testing:** Test Sections are defined as a continuous lane of pavement to which a layer of high friction surface treatment (HFST) has been applied. The Engineer will submit a "Pavement Testing Request" form to [DOHMCSnTRoadway@wv.gov](mailto:DOHMCSnTRoadway@wv.gov), within five (5) days after all lanes are continuously open to traffic. The Division or an independent testing firm at the discretion of the Division, will perform initial skid testing within ninety (90) days after receiving the request. Skid testing will be performed with the ribbed tire as prescribed in AASHTO T242, *Frictional Properties of Paved Surfaces Using a Full-Scale Tire*. The frequency of tests shall be five (5) per lane-mile or three (3) per lane, whichever is greater. An average Friction Number (FN) of less than 69 will be deemed unacceptable and will require reinstallation of the complete surface system of the failed test section at no cost to the Division.

**406.3.2-Acceptance for the Grading of Aggregate:** Acceptance for gradation shall be on the basis of test results on consecutive random samples from a lot. A lot shall be considered the quantity of material represented by an average test value, not to exceed five sublots. Generally, at the beginning of the project, the average shall be started on the second sample in accordance with MP 300.00.51. A subplot is the quantity of material represented by a single gradation test. In the case where only one sample is taken, this

sublot shall be considered the lot. The material shall be sampled and tested in accordance with the applicable specification. The gradation test results shall be plotted on a control chart in accordance with MP 300.00.51. When the average, or when the most recent three consecutive individual test values fall outside the guidelines for this aggregate the lot of material represented will be considered nonconforming to the extent that the last of its sublots is nonconforming. When this occurs, the last sublot shall have its price adjusted in accordance with Table 406.12.1. In the case where the average is nonconforming and the last sublot contained is conforming, then there would be no price adjustment. In no event, however, shall a sublot of material have its price adjusted more than once, and the first adjustment, which is determined, shall apply.

**406.3.2.1-Degree of Nonconformance:** When a sublot of material is to have its price adjusted, the percentage point difference between the nonconforming test value and the specification limit shall be determined for each sieve size determined to be nonconforming and this value shall be multiplied by its appropriate multiplication factor as set forth in Table 406.3.2.1 to determine the degree of nonconformance on that sieve.

**TABLE 406.3.2.1**

<b>Nonconforming Sieve Size</b>	<b>Multiplication Factor</b>
No. 6 (3.35mm)	1.5
No. 16 (1.18mm)	2.0

The total measure of nonconformance of an individual sublot is the sum of all nonconformances on the various sieve sizes of that sublot. When the total degree of nonconformance has been established and it is 12.0 or less, the material will be paid for at an adjusted contract price as specified in Table 406.11.1. When the degree of nonconformance is greater than 12.0, the nonconforming sublot shall be resolved on an individual basis, requiring a special investigation by the Engineer to determine the appropriate course of action to be followed.

## **CONSTRUCTION METHODS**

### **406.4-WEATHER RESTRICTIONS:**

The polymer binder material shall not be placed on a wet surface, when the ambient air or surface temperature is either \*below 50 degrees Fahrenheit or ambient temperature above 110 degrees Fahrenheit, or when the anticipated weather conditions or pavement surface temperature would prevent proper application of the surface treatment as determined by the Engineer in consultation with the manufacturer’s representative.

\*Applications below 50 degrees Fahrenheit will be considered acceptable if the manufacturer can demonstrate a cure rate (dry through time) of <3 hours at current field conditions.

Do not place the HFST with visible moisture on the prepared surface at the time of placing. Test for moisture in the pavement by taping an 18”x18” plastic sheet to the pavement per ASTM D4263. Perform the plastic sheet test only when surface temperatures and ambient conditions are within the established parameters for application of the overlay system. In the event of rain, the pavement must be allowed to air dry prior to performing the plastic sheet test. A 2 hour minimum test duration is allowed in lieu of the 16 hours specified in ASTM D4263.

#### **406.5-PLACING:**

The Contractor shall ensure that a manufacturer's representative is on site to provide technical assistance during the startup operations and as necessary during the surface preparation, material placement and during any necessary remedial work.

The Contractor shall cover and protect all existing pavement markings and utilities that are left in place prior to placement. All inadequately sealed joints and cracks greater than ¼" shall be cleaned and filled with a crack sealant approved by the polymer resin manufacturer.

For applications on new asphalt pavements, install the polymer binder and high friction aggregate topping a minimum of 30 days after placement of the new pavement.

Surfaces shall be clean, dry, and free of all dust, oil, debris and any other material that might interfere with the bond between the polymer resin binder material and existing surfaces. Adequate cleaning of all surfaces will be determined by the manufacturer's representative. Utilities, drainage structures, curbs and any other structure within or adjacent to the treatment location shall be protected from the application of the surface treatment materials. Cover and protect all existing pavement markings that are adjacent to the application as directed by the Engineer. Pavement markings that conflict with the surface application shall be removed by grinding and the surface shall be swept clean prior to the polymer binder application.

Clean concrete pavement surfaces by shot blasting and vacuum sweeping. Shot blast all surfaces to remove all curing compounds, loosely bonded mortar, surface carbonation, and deleterious material. Ensure that the prepared surface complies with the International Concrete Repair Institute (ICRI) standard for surface roughness CSP 5. After shot blasting, vacuum sweep or air wash, with a minimum of 180cfm of clean and dry compressed air, all surfaces to remove all dust, debris, and deleterious material. Maintain air lance perpendicular to the surface and the tip of the air lance within 12 inches of the surface.

Utilities, drainage structures, curbs, and any other structures within or adjacent to the treatment location must be protected against the application of the HFST materials.

When magnesium phosphate concrete is placed prior to the HFST bridge deck overlay, the magnesium phosphate concrete must be placed at least 72 hours prior to placing the polymer resin binder.

When modified high alumina based concrete is placed prior to the HFST bridge deck overlay, the polymer resin binder must not be placed on the concrete until at least 30 minutes after final set of the modified high alumina based concrete.

Expansion joints and deck drains must be adequately isolated prior to applying HSFT.

All debris, excess aggregate, material containers, and other waste shall be disposed of off the Right-of-Way according to Section 207 by the Contractor at no direct cost to the Department.

Any roadway features disturbed by the work of the Contractor's operations shall be restored in kind by the Contractor and approved by the Engineer at no cost to the Department.

**406.5.1-Mixing and Application:** The HFST must conform to the following:

1. Surface preparation work, surface temperature, placement of the HFST must be in conformance with the binder supplier's specifications, these special provisions and as approved by the Engineer.
2. The spread rate range for polymer resin binder shall be 3-3.5 sq yd./gal.
3. The spread rate range of retained aggregate shall be 13-20 lb/sq yd.
4. HSFT must be allowed to cure for the minimum duration as recommended by the



supplier's specifications and during that time the application area must be closed to all traffic including Contractor's equipment.

**Mechanical Application:**

The applicator equipment must be capable of placing the resin binder and high friction aggregate, at the spread rates limits defined above, in a single pass. It shall provide adequate capacity of aggregate and resin binder capable of placing 1,500 lineal feet of HFST.

The polymer binder shall be blended and mixed in the ratio per the manufacturer's specification (+/- 2% by volume); the polymer binder shall be continuously applied once blended.

The mechanical aggregate spreader shall be capable of applying up to a continuous 12 foot width application. The high friction aggregate shall begin within 20 seconds (+/- 1 sec) of the base polymer binder application onto the pavement section. Complete coverage of aggregate shall be completed within 60 seconds of the resin binder contacting the pavement. No exposed wet spots of the polymer binder shall be visible once the aggregate is installed.

The operations shall proceed in such a manner that will not allow the mixed material to separate, cure, dry, be exposed or otherwise harden in such a way as to impair retention and bonding of the high friction surfacing aggregate, walking, standing or any form of contact or contamination with the wet uncured resin will result in that section of resin being removed and replaced at the contractor's expense.

**Hand Application:**

Hand application acceptable only for areas deemed to be low volume and less than 300 feet in length, unless otherwise noted in the plans. The resin binder and aggregate shall be placed at the application limits defined above.

The resin binder shall be mixed in accordance to the manufacturer's recommendations and uniformly spread over the surface. The high friction aggregates shall be completed within 60 seconds of the resin binder contacting the pavement. No exposed wet spots of the polymer binder shall be visible once the aggregate is installed.

**406.6-CLEANING AND SWEEPING & RECOVERED AGGREGATE:**

Excess and loose aggregate must be removed from the traveled way and shoulders by street sweeping. Application of HFST requires a second street sweeping 24-48 hours after application. All cost for street sweeping shall be included in HFST pay item.

The excess aggregate may be recovered and reused. The excess aggregate shall be recovered by a mechanical sweeper and shall be clean, dry and uncontaminated. Aggregate shall not be recovered from areas that were not previously cleaned.

The recovered aggregate may be used at a rate no higher than 1 part recovered aggregate to 2 parts virgin aggregate. The recovered aggregate and virgin aggregate shall be a homogeneous blend and is subject to sampling and testing for gradation.

**406.7-ENVIRONMENTAL REGULATIONS:**

All regulations of the State of West Virginia shall be met involving the storage, application, and disposal of all materials on the project.

**406.8-JOINTS:**

The longitudinal construction joints between adjacent lanes shall be kept clean of material

foreign to the type of surface being treated. The joints shall be constructed without overlaps or gaps between the materials.

The transverse joint at the end of successive sections or lanes shall be adequately protected to prevent overlapping of the binder material. Following its use, the materials shall be removed and disposed of satisfactorily.

**406.9-PROTECTION OF PAVEMENT AND TRAFFIC CONTROL:**

The Contractor shall be responsible for the protection of the surface against damage by their equipment and personnel. Traffic shall not be permitted on any part of the work under construction until the treatment has cured sufficiently to prevent raveling or pickup under traffic. The applicable provisions of 636 shall apply for regulating traffic.

**406.10-METHOD OF MEASUREMENT:**

No materials shall be removed from the Project for any purpose until the operation has been completed and the quantities of materials incorporated into the operations have been determined, except when authorized by the Engineer.

The Quantity of “High Friction Surface Treatment”, when specified to be paid by the square yard, shall be measured by the total area the surface treatment is applied measured in place and accepted.

When items for maintaining traffic are included in the Contract, they will be measured and paid as provided in Section 636.

**406.11-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 described above in a workmanlike and acceptable manner, including all labor, tools, equipment, supplies, and incidentals necessary to complete the work.

The Quantity of “High Friction Surface Treatment” when specified to be paid by the square yard shall include the cleaning and sweeping, binder material, aggregate and all labor and equipment required to perform the operation.

**406.11.1-Price Adjustment:** Aggregates not conforming with the requirements of gradation as described in Table 406.2B-Aggregate, will be paid for at the adjusted contract price based on the degree of nonconformance as specified in Table 406.11.1.

**TABLE 406.11.1**

<b>Adjustment of Contract Price for Gradation Not Within Specifications</b>	
<b>Degree of Nonconformance</b>	<b>Percent of Contract Price To Be Reduced</b>
1.1 to 3.0	2
3.1 to 5.0	4
5.1 to 8.0	7
8.1 to 12.0	11
Greater than 12	*

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

**406.12-PAY ITEMS:**

ITEM	DESCRIPTION	UNIT
406001-*	High Friction Surface Treatment	Square Yard

\* Sequence Number

**SECTION 410  
ASPHALT BASE AND WEARING COURSES,  
PERCENT WITHIN LIMITS (PWL)**

**410.13-BASIS OF PAYMENT:**

**410.13.6-Bond Strength Adjustment:**

DELETE THE CONTENTS OF THE FIRST PARAGRAPH IN SUBSECTION 410.13.6 AND REPLACE WITH THE FOLLOWING.

For Interstates and divided NHS Routes, bond Strength PWL calculations shall be in accordance with MP 401.13.50, Guide to Statistical Analysis of Material Using Quality Level Analysis-Percent within Limits. However, for the purpose of relieving large standard deviations from abnormally strong samples, any sample with a strength exceeding 150 psi will be evaluated as 150 psi instead of the actual strength. However, the actual strength shall be recorded as such on the reporting form and is used in the lower Quality Index (Q<sub>L</sub>) calculation of MP 401.13.50.

**SECTION 420  
SINGLE / MULTIPLE COURSE MICRO SURFACING**

**420.3-MIXTURE REQUIRMENTS:**

**420.3.1-Mix Design:**

DELETE THE CONTENTS OF THE FIRST PARAGRAPH AND REPLACE WITH THE FOLLOWING.

Submit to the Engineer, at least fourteen calendar days before the start of production, a complete mix design prepared and certified by an experienced laboratory. The source for all materials must be shown. Provide a job mix formula (JMF) to the Engineer at the pre-paving meeting showing individual proportions of each material, that when combined, shall meet the requirements of AASHTO R 103, with the exception that the Saturated Abrasion Loss by ISSA TB-144 shall be 2.0 grams max. A new mix design is required for any change in aggregate or asphalt emulsion source.

# DIVISION 500 RIGID PAVEMENT

## SECTION 501 PORTLAND CEMENT CONCRETE PAVEMENT

### 501.2-MATERIALS:

ADD THE FOLLOWING TO THE TABLE:

MATERIAL	SUBSECTION
Fibers	715.3

### 501.3-PROPORTIONING:

ADD THE FOLLOWING AFTER THE FIRST PARAGRAPH:

The addition of fibers in concrete pavement or concrete overlay shall be allowed. 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.

ADD THE FOLLOWING BEFORE PARAGRAPH FIVE:

The Contractor may develop mix designs with a reduced target cement factor as indicated in Table 501.3.1.1 in lieu of Table 501.3.1, 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.

**TABLE 501.3.1.1**

Minimum 28-Day Design Strength	Minimum Cement Factor	Maximum Water Content	Nominal Maximum Aggregate Size	Target Entrained Air
Pounds per square inch	lbs./c.y.	lb. of water / lb. of cement	Inches	Percent
3,000 Compressive or 500 Flexural <sup>Note 1</sup>	524 <sup>Note 2</sup>	0.44	1 or ¾	7.0

Note 1 Flexural strength when tested by the third point method.

Note 2 An equal mass of a SCM may be substituted for Portland cement up to the following maximum amount. Only one SCM is permitted in a mix design.

## **501.8-MIXING CONCRETE:**

ADD THE FOLLOWING TO THE END OF THE SUBSECTION:

Mix fibers as recommended by the manufacturer such that the addition of the fibers does not create balling. Notify the Engineer in writing of the dedicated personnel for this task, the procedure for distributing fibers into the concrete mixture, and the mixing method. Any of the following fiber addition methods are acceptable on all jobs:

- Open bag and distribute fibers on aggregate belt at ready-mix concrete plant.
- Open bag, break apart any fiber clumps, and introduce fibers into ready-mix concrete truck in a well-distributed manner (i.e., "chicken feed").

A minimum of 70 revolutions at mixing speed after all the fibers are added is required for proper mixing and dispersion of fibers in trucks. Allowing bags of fiber to dissolve in the ready-mix concrete trucks or mixers will not be allowed. Fibers shall never be the first material added in any mixing process.

## **501.9-PLACING CONCRETE:**

ADD THE FOLLOWING TO THE END OF THE SUBSECTION:

Any fiber balls should be removed immediately with a hoe or rake. The contractor should adjust the batching and mixing procedure to avoid the further creation of fiber balls as soon as they are noticed on a project.

## **501.12-FINAL STRIKE-OFF, CONSOLIDATION AND FINISHING:**

### **501.12.5- Floating:**

ADD THE FOLLOWING PARAGRAPH TO THE END OF THE SUBSECTION:

When placing concrete containing fibers, in order to provide consolidation and bury surface fibers, open slab surfaces should be struck off with a vibrating screed or laser screed. Magnesium floats in the form of a bullfloat, channel radius float, or highway straightedge should be used to establish a surface and close tears or open areas. The use of wood floats is not permitted. Care should be taken to avoid tilting the blades of any float at too great of an angle which could expose the fibers to the surface.

### **501.12.7-Final Finish:**

ADD THE FOLLOWING SUBSECTION:

**501.12.7.1-Final Finish Containing Fibers for Portland Cement Concrete:** The final finish selected for concrete pavement or overlay containing fibers shall be an artificial grass carpet drag followed by tining. The tining tool selected must meet the groove and all other requirements of section 501.12.7. Caution must be used to avoid significant disturbance and removal of fibers from the surface. The tining rakes should be held at a

small angle to the horizontal surface to prevent lifting or exposing the fibers. Texturing should also be done only in one direction and should never pull against the established pattern. The artificial grass carpet shall meet the following requirements:

- 1) Mounted on a Work Bridge or Paver
- 2) Width equal to the concrete placed
- 3) Artificial grass type
- 4) Molded polyethylene pile face
- 5) Blade length of from 5/8 inch to 1 inch
- 6) Total weight of at least 70 ounces per square yard

The roadway will be textured as accepted by the Engineer. The use of burlap sack for texturing shall not be permitted. All texturing should be accomplished with a single pass of the tool.

## **SECTION 502 APPROACH SLABS**

### **502.5-JOINTS:**

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH FOLLOWING:

Approach slabs shall have longitudinal joints in line with the longitudinal joints of the adjacent pavement. Longitudinal joints shall be sawed to a minimum depth of one-fourth of the plan depth of the slab plus 1/4 inch; the width shall be 1/4 inch, with a tolerance of plus or minus 1/16 inches. Sawing shall be performed within five days after the slab is placed and prior to opening to construction traffic. Joints shall be sealed in accordance with the requirements of Sections 501.16 and 503.

**DIVISION 600  
INCIDENTAL CONSTRUCTION**

**SECTION 601  
STRUCTURAL CONCRETE**

**601.2-MATERIALS:**

ADD THE FOLLOWING TO THE TABLE:

MATERIAL	SECTION OR SUBSECTION
Fibers	715.3

**601.3-PROPORTIONING:**

DELETE THE FOLLOWING SECTION AND REPLACE WITH FOLLOWING:

The proportions for any concrete designated as modified shall be submitted by the Contractor to the Engineer for approval. The Design 28 Day Compressive Strength shall be as shown in the plans. The contractor's mix design shall utilize Table 601.3.1, except the Target Cement Factor may be revised to obtain the modified strength.

Establishment of mixture proportions shall be coordinated with the manufacturer of the silica fume admixture.

Design mixture testing for Class H concrete shall be in accordance with MP 711.03.23 and shall include air content, slump, compressive strength, and rapid chloride permeability tests. For establishment of mixture proportions, rapid chloride permeability tests shall be made on representative samples prepared and tested in accordance with AASHTO T 277. The rapid chloride permeability test specimens shall be tested at an age of 90 days (or at any time prior to 90 days), and the results of this test shall not exceed 750 coulombs. Specimens shall be moist cured for 56 days prior to the start of specimen preparation unless specimens are to be tested prior to 56 days, in which case the specimens shall be moist cured until the time of test. The 28-day compressive strength of the test mix that satisfies the 750 coulomb threshold shall be used as the basis for acceptance of Class H concrete per Section 601.4.5. The cost of all test mix requirements shall be considered incidental to the cost of Class H concrete.

For establishment of mixture proportions, as an alternative to the curing methods for rapid chloride permeability testing outlined in the previous paragraph, 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. This method of curing shall be noted as the accelerated RCPT curing method.

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.

**601.3.1-Mix Design Requirements:**

DELETE TABLE 601.3.1D AND REPLACE WITH THE FOLLOWING:

**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. <sup>Note 1</sup>	lb. of water/lb. of cement <sup>Note 2</sup>	Inches	Percent
A	3,500	642	0.51	½ or ⅜	7.5
K	4,000	618	0.44	1 or ¾	7.0
B	3,000	524	0.49	1 or ¾	7.0
C	2,500	454	0.58	1 or ¾	6.0
D	2,000	360	0.62	1 or ¾	5.5
H	4,000	See Table 601.3.1E	0.40	1 or ¾	6.5
DC <sup>Note 3</sup>	4,500	665	0.44	½ or ⅜	6.0

<sup>Note 1</sup> 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.

<sup>Note 2</sup> When using a SCM, masses of these materials shall be considered as cement for purposes of establishing maximum water content.

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

**601.3.2-Field Tolerances and Adjustments:**

**601.3.2.4-Total Solids  $\bar{A}$ :**

**601.3.2.4.1-Optimized Aggregate Gradation:**

DELETE TABLE 601.3.2.4.1B AND REPLACE WITH THE FOLLOWING:

**Table 601.3.2.4.1B**

Sieve Size	Allowable variation from Combined % Retained in Design Mix <sup>Note 1</sup>
1 in	± 10% of the % retained on this sieve in the Design Mix
¾ in	± 10% of the % retained on this sieve in the Design Mix
½ in	± 10% of the % retained on this sieve in the Design Mix
⅜ in	± 10% of the % retained on this sieve in the Design Mix
No. 4	± 5% of the % retained on this sieve in the Design Mix
No. 8	± 5% of the % retained on this sieve in the Design Mix
No. 16	± 4% of the % retained on this sieve in the Design Mix
No. 30	± 4% of the % retained on this sieve in the Design Mix
No. 50	± 4% of the % retained on this sieve in the Design Mix



**Table 601.3.2.4.1B**

<b>Sieve Size</b>	<b>Allowable variation from Combined % Retained in Design Mix</b> <sup>Note 1</sup>
No. 100	± 3% of the % retained on this sieve in the Design Mix
No. 200	± <u>2</u> % of the % retained on this sieve in the Design Mix

Note 1 The maximum and minimum allowable % retained on each sieve size noted in Table 601.3.2.4.1A shall not be exceeded during production. For example, if the ½” sieve has a combined % retained of 15% in design mix, then the allowable % retained on ½” sieve during production would be 5% to 20%.

**601.7-MIXING:**

ADD THE FOLLOWING TO THE END OF THE SUBSECTION:

**601.7.1 Mixing of Fibers into Concrete:** Mix fibers as recommended by the manufacturer such that the addition of the fibers does not create balling. Notify the Engineer in writing of the dedicated personnel for this task, the procedure for distributing fibers into the concrete mixture, and the mixing method. Any of the following fiber addition methods are acceptable on all jobs:

- Open bag and distribute fibers on aggregate belt at ready-mix concrete plant.
- Open bag, break apart any fiber clumps, and introduce fibers into ready-mix concrete truck in a well-distributed manner (i.e., "chicken feed").

A minimum of 70 revolutions at mixing speed after all the fibers are added is required for proper mixing and dispersion of fibers in trucks. Allowing bags of fiber to dissolve in the ready-mix concrete trucks or mixers will not be allowed. Fibers shall never be the first material added in any mixing process.

**601.10-PLACING CONCRETE:**

**601.10.2-Chutes and Troughs:**

ADD THE FOLLOWING PARAGRAPH TO THE END OF THE SUBSECTION:

When discharging the concrete containing fibers into a hopper assembly on a pump truck, the chute shall be raised 12 to 18 in. above the grate (if grate is present) on the pump to allow the fibers to pass through the grate.

ADD THE FOLLOWING SUBSECTION TO THE END OF THE SECTION:

**601.10.6-Placing Concrete Containing Fibers:** To provide consolidation and bury surface fibers, open slab surfaces should be struck off with a vibrating screed or laser screed. Magnesium floats in the form of a bullfloat, channel radius float, or highway straightedge should be used to establish a surface and close tears or open areas. The use of wood floats is not permitted.

## **601.11- FINISHING CONCRETE SURFACES:**

ADD THE FOLLOWING SUBSECTION:

**601.11.5-Texturing & Grooving Bridge Decks Containing Fibers for Portland Cement Concrete:** Where a texture finish is required, an artificial grass carpet drag longitudinally, or broom finish transversally shall be selected. The use of burlap for texturing shall not be permitted. The artificial grass carpet shall meet the following requirements:

- 1) Mounted on a Work Bridge
- 2) Width equal to the concrete placed
- 3) Artificial grass type
- 4) Molded polyethylene pile face
- 5) Blade length of from 5/8 inch to 1 inch
- 6) Total weight of at least 70 ounces per square yard

All texturing equipment should be pulled in one direction only and never against the established pattern. 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 texturing equipment 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 using a broom finish 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 artificial grass carpet 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 texturing equipment shall be done in a manner to prevent ridges or gouges from forming in the concrete surface. The artificial grass carpet may be weighted, and the contact area changed as necessary 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 bridge decks. Grooving bridge deck containing fibers for Portland cement concrete shall follow the requirements of section 601.11.4.4.

**SECTION 606  
UNDERDRAINS**

**606.2-MATERIALS:**

DELETE MISCELLANEOUS CONCRETE FROM THE TABLE:

MATERIAL	SUBSECTION	TYPE OR GRADATION
Concrete for Miscellaneous Uses	715.12	

**SECTION 607  
GUARDRAIL**

**607.2-MATERIALS:**

DELETE CONCRETE FOR FOOTERS FROM THE TABLE AND DELETE MISCELLANEOUS CONCRETE AND REPLACE WITH THE FOLLOWING:

MATERIAL	SUBSECTION
Concrete for Miscellaneous Uses	715.12

**SECTION 615  
STEEL STRUCTURES**

**615.3-MATERIALS:**

**615.3.3-Welded Stud Shear Connectors:**

DELETE THE FIRST PARAGRAPH OF SECTION 615.3.3 AND REPLACE WITH THE FOLLOWING:

When design requires the use of welded stud shear connectors, they shall meet the requirements of Section 7 of the ANSI/AASHTO/AWS D1.5, Bridge Welding Code and be sampled and tested in accordance with MP 615.20.01.

**SECTION 623  
PNEUMATICALLY APPLIED MORTAR OR CONCRETE (SHOTCRETE)**

**623.3-QUALIFICATIONS:**

**623.3.2-Quality Control Personnel:**

DELETE THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

**Shotcrete Inspector:** For every project in which shotcrete is included, the Contractor is required to have a Shotcrete Inspector with a current ACI Shotcrete Inspector Certification. The Shotcrete Inspector must have verifiable work experience in one of the following areas: 1. Testing, inspection, and quality control of shotcrete. 2. Supervision of shotcrete construction work. 3. Design of shotcrete structures. The Shotcrete Inspector is required to be at the place of shotcrete placement while shotcrete placement is occurring. The Shotcrete Inspector shall also submit a daily written report to the Engineer detailing where the shotcrete placement occurred and that the shotcrete placement was performed correctly according to the Specification and in reasonably close conformity with the Plans or as established by the Engineer. The Shotcrete Inspector shall stop shotcrete placement immediately if the shotcrete placement does not satisfy the requirements of the Specification or if it is not in reasonably close conformity with the Plans or as established by the Engineer. The reason for stopping shall be documented and included in the daily written report. The work shall resume after all issues are resolved satisfactorily.

## **SECTION 625 ROCK SOCKETED DRILLED SHAFT**

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

### **625.1-DESCRIPTION:**

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

### **625.2-SUBMITTALS:**

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

#### **625.2.1-Experience:**

1. A satisfactory record of experience in rock socketed drilled shaft construction is of the utmost importance in obtaining a satisfactory rock socketed drilled shaft installation. The installation of drilled shafts is required to be performed by a Contractor, or specialty subcontractor specializing in installing and having experience with rock socketed drilled shafts of similar length, diameter, and subsurface conditions as those shown in the contract documents.
2. The Contractor shall submit data on at least two projects performed during the past ten years, for which the Contractor, or Contractor's key personnel who will be the on-site supervisor, have installed rock socketed drilled shafts of a range of diameters and lengths similar to those shown in the plans, in similar quantities, and under similar subsurface conditions. The list of projects shall contain names and phone numbers of owners' representatives who can verify the participation in those projects.
3. The Engineer shall review and approve the Contractor's qualifications. If in the

opinion of the Engineer the Contractor's qualifications are not adequate, the Contractor shall submit to the Engineer a proposed method of obtaining the necessary qualifications.

4. The installation of all components of the drilled shaft and any other work required to complete the rock socketed drilled shaft, shall be performed by the approved Contractor.

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

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

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

The Contractor shall provide a projected schedule of work to the Technical Support Division, [DOHDrilledShafts@wv.gov](mailto:DOHDrilledShafts@wv.gov), thirty (30) days in advance of construction of drilled shafts.

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

**625.3:** Blank

#### **625.4-DIMENSIONAL REQUIREMENTS:**

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

#### **625.5-MATERIALS:**

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

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

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

**625.5.2-Reinforcing Steel:** Reinforcing steel for main vertical bars and ties shall conform

to Section 709.1, deformed type, grade 60. Reinforcing steel for use as spirals shall conform to Section 709.1, plain type, grade 60.

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

Casing pipe used for permanent applications shall be new material and conform to ASTM A252, Grade 2. When used for temporary applications only, casing pipe shall conform to ASTM A252, Grade 2.

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

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

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

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

## **625.6-CONSTRUCTION:**

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

- a. Contractor shall provide suitable access to the "Preinstallation Core Hole" location at each rock socketed drilled shaft.
- b. Drilling of a "Preinstallation Core Hole", as specified in subsection 625.7.2.1.
- c. Drilling of cased hole through the soil overburden down to top of competent rock. Seating bottom of casing to minimize entry of ground water.
- d. Drilling of rock socket to the minimum diameter shown in the plans and to an elevation shown on the drawings or otherwise directed by the Engineer.
- e. Determination of wet or dry hole condition, as specified in subsection 625.7.2.2.
- f. Inspection of drilled hole for plumbness, as specified in subsection 625.7.2.3.
- g. Cleaning of the drilled hole by the Contractor, particularly the rock socket and the inside face of the casing, as specified in subsection 625.7.2.5.

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

**625.6.1-Excavation:**

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

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

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

The top elevation of competent rock must be confirmed as the socket drilling is started. The effective "top elevation" is based on observation of the boundary zone where broken or weathered rock becomes competent rock and is also influenced by the presence of any shale or coal seams. Based on that elevation, and the information from the preinstallation core hole, the Engineer will determine the final depth of socket and bottom elevation.

Upon completion of each rock socket excavation, the Engineer may (1) accept the socket, or (2) order deeper excavation based upon preinstallation core hole data or general inspection

of the socket. The adequacy of each socket will depend on the soundness of its bottom surface and on the soundness of its underlying layers.

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

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

#### **625.6.1.4-Blank.**

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

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

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

- a. Any required equipment within an excavation shall be operated by air or electricity. The use of gasoline-driven engines or diesel engines within an excavation will not be permitted. All lighting shall be electric, and precautions shall be taken regarding potential short circuits of electric current within ground water.
- b. The Contractor will take precautions to assure that no explosive or noxious gases are present. Fresh air shall be supplied into the excavation and foul air shall be removed whenever any personnel are present in the hole.
- c. A safety harness or chair lift, with separate safety line, protective cage, and two-way radio communication shall be used for any entry into an excavation.
- d. No open excavation shall be left unattended. During non-working hours, excavations shall be protected using solid, safe covers that are firmly fastened in place.



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

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

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

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

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

Prior to placing the reinforcement cage, the Contractor shall demonstrate to the satisfaction of the Engineer that the fabrication and handling methods to be used will result in a reinforcing cage placed in the proper position, with the proper clearances, and without permanent bending or racking of the reinforcement cage.

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

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

**TABLE 625.6.2.1**

<b>Drilled Shaft Diameter</b>	<b>Number of CSL Tubes</b>	<b>Number of TIP wires</b>	<b>Tube / Wire Spacing</b>
Less than 42"	3	0	120°
42" to ≤ 60"	4	0	90°
> 60" to ≤ 96"	6	6	60°
Greater than 96"	8	8	45°

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

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

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

After placement of the cage, and before placement of concrete, the tubes shall be filled with clean water and the tube tops shall be capped or sealed to keep debris or other foreign matter out of the tubes. Care shall be exercised in the removal of caps or plugs so as not to apply excess torque, hammering, or other stresses that could break the bond between the tubes and the concrete.

The TIP wires shall be per subsection 625.5.5.

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

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

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

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

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

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

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

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

## **625.7-INSPECTION AND TESTING OF SOCKETS:**

### **625.7.1-Inspection:**

The Contractor shall make each drilled shaft excavation available to the Engineer for

inspection, providing tools, equipment, and safety measures.

The Contractor shall comply with the notification requirements for drilled shaft construction outlined in Section 625.2.3, as well as five (5) working day prior notification to the Technical Support Division via e-mail ([DOHDrilledShafts@wv.gov](mailto:DOHDrilledShafts@wv.gov)) of the following testing:

1. Preinstallation core hole
2. Plumbness
3. Rock socket sidewall inspection
4. Shaft bottom cleanliness
5. In-place concrete quality testing

### **625.7.2- Drilled Shaft Testing:**

#### **625.7.2.1-Preinstallation Core Holes:**

A preinstallation test boring will be drilled by the Contractor at each rock socketed drilled shaft location, or as shown on the plans, to determine the character of the material that the rock socketed drilled shaft extends through and the material that is at the base of the shaft in order to ensure the material along and below the tip of the rock socket is capable of carrying the load that will be imposed on it. The preinstallation borings are to be drilled prior to beginning excavation for each representative rock socketed drilled shaft.

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

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

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

**625.7.2.2-Wet or Dry Hole Determination:** The Contractor and Engineer shall check the depth of water at the bottom of the drilled shaft. If the depth does not increase by more than twelve (12) inches over a 1-hour period, the hole will be considered dry. Otherwise, the hole will be considered wet. The Contractor shall coordinate with the Engineer when this determination is being made.

#### **625.7.2.3-Plumbness:**

Plumbness of the rock socketed drilled shaft/rock socket shall be measured by the

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

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

**625.7.2.4-Rock Socket Sidewall Inspection:**

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

**625.7.2.5-Shaft Bottom Cleanliness:**

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

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

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

**625.7.2.6.1-Crosshole Sonic Logging (CSL):** The nondestructive testing method known as CSL shall be used on all rock socketed drilled shafts. The testing shall not be conducted until at least three (3) calendar days after placement of concrete is concluded in the drilled shaft and will be completed within fourteen (14) calendar days after such placement.

The CSL tests shall be conducted in conformance with ASTM D6760.

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

**625.7.2.6.1.2-Evaluation of CSL Test Results:**

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

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

Flaw or defect zones as indicated in Table 625.7.2.6.1.2 will be indicated on the logs and listed in a table within the report. The flaw or defect zones and their horizontal and vertical extent will be discussed in the report text. Flaws shall be addressed by the Contractor if they affect more than 50% of the tested tube pairs at the same depth. Defects will be addressed by the Contractor if they affect two or more of the tested tube pairs at the same depth. At a minimum, addressing flaws and defects will include Crosshole Tomography (CT). If it is determined that the rating is less than Questionable, based on the results of the CSL and CT testing, the Contractor shall core and sample for further evaluation of the flaw or defect at no additional cost to the Division. The diameter, number, depth, and location of cores shall be as directed by the Engineer.

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

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

Satisfactory (s) = 0 to 6% effective radius reduction and cover criteria met

Anomaly (a) = effective radius reduction > 6% or cover criteria not met

When a tested shaft is categorized as anomaly (a), slices modeled at the area of question may be provided so that a structural evaluation of the shaft can be performed prior to implementing any corrective measures. Core drilling shall be performed to investigate problem areas found during TIP testing at no additional cost to the Division.

**625.7.3-Evaluation by Core Drilling:** A rock socketed drilled shaft that is found to be unacceptable, shall be core drilled by the Contractor in accordance with ASTM C42. Cores shall be four (4) inch nominal diameter. An accurate log of the core shall be kept, and the core shall

be crated and properly marked showing the drilled shaft depth at each interval of core recovery. The core and one copy of the coring log shall be provided to the Engineer.

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

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

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

#### **625.8-METHOD OF MEASUREMENT:**

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

Preinstallation core hole shall be measured by the linear foot based upon actual length drilled. The plan quantity will be based on one core hole, per drilled shaft, measured from the top shaft elevation to two drilled shaft diameters below the bottom of rock socket unless otherwise noted in the plans. No payment shall be made for additional length of preinstallation core hole drilled above the top of the drilled shaft.

All Drilled Shaft testing of each rock socketed drill shaft, shall be measured per each shaft tested, including all applicable tests required in subsection 625.7.2. However, preinstallation core drilling shall be paid separately.

#### **625.9-BASIS OF PAYMENT:**

The accepted quantities of rock socketed drilled shaft foundations, measured as provided above, will be paid for at the contract unit price per linear foot; complete in place including excavation, slurry if required, temporary or permanent metal casing, steel reinforcing, concrete, curing, and any

required forming and finishing. No additional payment will be made for temporary casing that remains in place and pressure grouting due to the Contractor's inability to stabilize a drilled excavation, for the need to place concrete by tremie or pumping, for the need to use slurry for drilling, or for extra excavation and concrete that may be required due to drilling diameters larger than the minimum diameters specified. No additional payment will be made for methods employed to gain access to rock socketed drilled shaft construction or for means required to provide a dry working environment within the drilled shafts.

The quantity of Preinstallation Core Hole drilling, measured as provided above, will be paid for at the contract unit price per linear foot.

The quantity of Drilled Shaft Testing, measure as provided above, will be paid for at the contract unit price per each shaft tested. Tubes for CSL testing, TIP wires, and other responsibilities related to testing and inspection assistance are incidental, with no separate payment being made.

**625.10-PAY ITEMS:**

ITEM	DESCRIPTION	UNIT
625001-*	"D" Diameter Drilled Shaft	Linear Foot
625003-*	"D" Diameter Rock Socket	Linear Foot
625005-*	Preinstallation Core Hole	Linear Foot
625007-*	Drilled Shaft Testing	Each

\* Sequence number  
D = Diameter of shaft or socket, in inches

**SECTION 636  
MAINTAINING TRAFFIC**

**636.11-FLAGGER OR TRAFFIC DIRECTOR:**

**636.11.1-Flagger:**

DELETE THE CONTENTS OF SUBSECTION 636.11.1 AND REPLACE WITH THE FOLLOWING:

All flaggers shall be furnished by the Contractor, and it shall be the Contractor's responsibility to provide flaggers at locations necessary to assure the safety of the travelling public. No flaggers are allowed on Interstate mainline; however, they may be allowed on ramps and/or Expressways mainline, when approved by the Traffic Engineering Division. Hand signaling devices and high visibility apparel meeting the requirements of the WVDOH Traffic Control Manual shall be used by the Contractor's personnel assigned to traffic control responsibilities. Approved headgear, if worn, and vests worn by the Contractor's personnel shall not bear the Division symbol. Wireless two-way communication shall be provided to the flaggers when they are out of sight of each other.

Flaggers must be certified by passing an American Traffic Safety Service Association (ATSSA) training. The Contractor may use noncertified flaggers for their benefit, ease of operations, or other activities not receiving payment.



**636.24-BASIS OF PAYMENT:**

DELETE THE FIRST PARAGRAPH AND REPLACE WITH THE FOLLOWING:

The quantities, determined as provided above, will be paid for at the contract unit price bid for the items listed below, which prices and payment shall be full compensation for furnishing all the materials and doing all the work prescribed in a workmanlike and acceptable manner, including all labor, tools, equipment, supplies and incidentals necessary to complete the work. When aggregate for maintaining traffic, dust palliatives, flagger, traffic director, pilot truck, cleaning of traffic control devices, or the electric arrow are contained in the contract as pay items, payment for such pay items shall not exceed the plan quantity for use after the contract completion date.

**SECTION 679  
OVERLAYING OF PORTLAND CEMENT CONCRETE BRIDGE DECKS**

**679.2-MATERIALS:**

**679.2.1-General:**

ADD THE FOLLOWING SECTION:

**679.2.1.9-Fibers:** Fibers shall meet the requirements of section of 715.3.

**679.2.2- Specialized Concrete Mix Design and Testing:**

DELETE THE FIRST AND SECOND PARAGRAPHS OF THE SUBSECTION AND ADD 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.

**679.2.3-Equipment:**

**679.2.3.3-Portioning and Mixing Equipment:**

DELETE THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

Unless fibers are used handling, measuring, and batching of materials shall conform to the requirements specified in 501.7. Mix fibers as recommended by the manufacturer such that the addition of the fibers does not create balling. Notify the Engineer in writing of the dedicated personnel for this task, the procedure for distributing fibers into the concrete mixture, and the mixing method. Any of the following fiber addition methods are acceptable on all jobs except for mobile mixers:

- Open bag and distribute fibers on aggregate belt at ready-mix concrete plant.
- Open bag, break apart any fiber clumps, and introduce fibers into ready-mix concrete truck in a well-distributed manner (i.e., “chicken feed”).

A minimum of 70 revolutions at mixing speed after all the fibers are added is required for proper mixing and dispersion of fibers in trucks. Allowing bags of fiber to dissolve in the ready-mix concrete trucks will not be allowed. Fibers shall never be the first material added in any mixing process. When using a mobile mixer unit, fibers should be mixed as recommended by the mobile mixer manufacturer and fiber manufacturer such that the addition of the fibers does not create balling and distributes the proper dosage of fibers into the concrete matrix. Notify the Engineer in writing of the dedicated personnel for this task, the procedure for distributing fibers into the concrete mixture, and the mixing method. The Engineer may require a trial batch to be placed by the mobile mixer unit before any concrete placement can occur.

Proportioning and Mixing Equipment shall consist of the following:

**679.2.3.4-Mobile Mixer Units:**

DELETE THE TABLE AND REPLACE WITH THE FOLLOWING:

Coarse Aggregate	±2%
Fine Aggregate	±2%
Cement + fly ash	0% to +4%
Water	±1%
Cement + microsilica powder	1%
Fibers	1%
Latex Admixture	1%
Other Admixtures	3%

**679.2.3.6-Placing and Finishing Equipment:**

ADD THE FOLLOWING PARAGRAPH TO THE END OF THE SUBSECTION:

When using fibers for Portland cement concrete, in order to provide consolidation and bury surface fibers, open slab surfaces should be struck off with a vibrating screed or laser screed. Magnesium floats in the form of a bullfloat, channel radius float, or highway straightedge should be used to establish a surface and close tears or open areas. The use of wood floats is not permitted.

### **679.3-CONSTRUCTION METHODS:**

#### **679.3.7-Placing and Finishing Specialized Concrete Overlay**

##### **679.3.7.4-Surface Texturing:**

ADD THE FOLLOWING SUBSECTION:

**679.3.7.4.1-Surface Texturing Concrete Containing Fibers for Portland Cement Concrete:** Where a texture finish is required, an artificial grass carpet drag longitudinally, or broom finish transversally shall be selected. The use of burlap for texturing shall not be permitted. The artificial grass carpet shall meet the following requirements:

1. Mounted on a Work Bridge
2. Width equal to the concrete placed
3. Artificial grass type
4. Molded polyethylene pile face
5. Blade length of from 5/8 inch to 1 inch
6. Total weight of at least 70 ounces per square yard

All texturing equipment should be pulled in one direction only and never against the established pattern. 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 texturing equipment over the finished area will be permitted. Texturing shall be in strict accordance with the time requirements of 679.3.7.5 for applying wet burlap.

If texturing is done in the transverse direction, the Contractor shall texture using a broom finish 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 artificial grass carpet 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 texturing equipment shall be done in a manner to prevent ridges or gouges from forming in the concrete surface. The artificial grass carpet may be weighted, and the contact area changed as necessary 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. Grooving bridge deck containing fibers for Portland cement concrete shall follow the requirements of section 679.5.2.

ADD THE FOLLOWING:

**SECTION 697**  
**SAFETY INSPECTION OF IN-SERVICE BRIDGES**  
**DURING CONSTRUCTION**

**697.1–DESCRIPTION:**

The work shall consist of performing all bridge safety inspection requirements of the Federal Highway Administration’s current National Bridge Inspection Standards (NBIS) for normally scheduled inspections, temporary structures, and for any structure or portion thereof that utilizes staged construction until the construction project is fully complete. The inspection team leader shall meet the minimum requirements of a team leader as specified by the NBIS, shall be approved by WVDOH Operations Division, and shall be on site during the duration of all inspection activities. Operations Division shall be notified of the times and dates that any field inspection activities will be occurring.

**697.1.1–Inspection Requirements for Normally-Scheduled Inspections:** A list of upcoming scheduled bridge safety inspections and the respective inspection types required for the existing structure, or any portion(s) of the existing structure that remain(s) open to traffic, shall be noted in the construction plans. Each inspection shall be performed and completed during the month and year as noted in the plans in accordance with the department’s requirements for the noted inspection type as described in the current edition of the WVDOH Bridge Inspection Manual. In cases where an inspection and inspection type are scheduled but no portion(s) of the existing structure remain(s) open to traffic, the Pay Item for that particular inspection will be non-performed. An inspection report, in accordance with the WVDOH Bridge Inspection Manual for the given inspection being performed, shall be compiled and submitted to the District Bridge Engineer within sixty (60) calendar days of completing the inspection utilizing the Department’s inspection data software. The inspection and the finalized inspection report must meet the approval of WVDOH Operations Division. The District Construction Engineer shall be notified in writing once the inspection report has been finalized and approved by Operations Division.

**697.1.2–Inspection Requirements for Temporary Structures:** An initial inspection shall be performed immediately prior to opening any temporary structure or portion thereof to public traffic. The initial inspection shall be in accordance with current NBIS requirements and in accordance with the department’s requirements for an Inventory Inspection as described in the current edition of the WVDOH Bridge Inspection Manual. An In-Depth Routine Inspection, in accordance with the WVDOH Bridge Inspection Manual, shall be performed concurrently with the Inventory Inspection. An Inventory Inspection Report and an In-Depth Routine Inspection Report shall be compiled and submitted to the District Bridge Engineer within sixty (60) calendar days of completing the inspection utilizing the Department’s inspection data software. The inspection and the finalized inspection reports must meet the approval of WVDOH Operations Division. The District Construction Engineer shall be notified in writing once the inspection reports have been finalized and approved by Operations Division.

A Bridge Rating Submission in accordance with Design Directive 202, meeting the requirements for Rating by District Bridge Engineer, shall be attached to the Inventory Inspection Report for the temporary structure. It will not be necessary to include a title sheet with a proposed sheet index. However, all other required items listed for the submission shall be supplied. Load rating of the temporary structure will be performed by WVDOT evaluation personnel once the Inventory Inspection Report has been submitted.

If a temporary structure or portion thereof is open to traffic twenty-four (24) months after the inspection date of the initial inspection, a routine inspection shall be performed in accordance with current NBIS requirements and in accordance with the department's requirements for a Routine Inspection as described in the current edition of the WVDOT Bridge Inspection Manual. A Routine Inspection Report shall be compiled and submitted to the District Bridge Engineer within sixty (60) calendar days of completing the inspection utilizing the Department's inspection data software. The inspection and the finalized inspection report must meet the approval of WVDOT Operations Division. The District Construction Engineer shall be notified in writing once the inspection report has been finalized and approved by Operations Division.

In cases where a panel-type bridge is being utilized, such as those bridges manufactured by Mabey, Acrow, or Bailey, a Special Inspection shall be performed at a maximum interval of every six (6) months, beginning at the inspection date of the initial Inventory Inspection, for the entire period that the structure is open to traffic. This inspection shall be in accordance with the WVDOT Bridge Inspection Manual and shall consist of a hands-on inspection of all truss members, connections, pins, and retainer clips. A Special Inspection Report shall be compiled and submitted to the District Bridge Engineer within sixty (60) calendar days of completing the inspection utilizing the Department's inspection data software. The inspection and the finalized inspection report must meet the approval of WVDOT Operations Division. The District Construction Engineer shall be notified in writing once the inspection report has been finalized and approved by Operations Division. If a panel-type bridge is anticipated and a pay item has been included on the project to accommodate the inspection(s), the pay item will be non-performed if a panel-type bridge is not ultimately used.

**697.1.3–Inspection Requirements for Structures Utilizing Staged Construction:** An initial inspection shall be performed on each individual construction stage immediately prior to opening each stage or portion thereof to public traffic. A revised initial inspection will be required for each additional phase prior to opening each phase to public traffic. The initial inspection shall be in accordance with current NBIS requirements and in accordance with the department's requirements for an Inventory Inspection as described in the current edition of the WVDOT Bridge Inspection Manual. An In-Depth Routine Inspection, in accordance with the WVDOT Bridge Inspection Manual, shall be performed concurrently with each Inventory Inspection. An Inventory Inspection Report and an In-Depth Routine Inspection Report shall be compiled and submitted to the District Bridge Engineer within sixty (60) calendar days of completing the inspection utilizing the Department's inspection data software. The inspection and the finalized inspection reports must meet the approval of WVDOT Operations Division. The District Construction Engineer shall be notified in writing once the inspection reports have been finalized and approved by Operations Division.

If a construction stage, subsequent construction stages, or portions thereof are open to traffic twenty-four (24) months after the inspection date of the most recently performed In-

Depth Routine Inspection, a routine inspection shall be performed in accordance with current NBIS requirements and in accordance with the department’s requirements for a Routine Inspection as described in the current edition of the WVDOH Bridge Inspection Manual. A Routine Inspection Report shall be compiled and submitted to the District Bridge Engineer within sixty (60) calendar days of completing the inspection utilizing the Department’s inspection data software. The inspection and the finalized inspection report must meet the approval of WVDOH Operations Division. The District Construction Engineer shall be notified in writing once the inspection report has been finalized and approved by Operations Division.

**697.2–Blank**

**697.3–METHOD OF MEASUREMENT:**

Bridge safety inspection work will be paid for per each inspection and inspection type performed for each individual bridge or construction stage.

**697.4–PENALTIES FOR LATE PERFORMANCE OR NON-PERFORMANCE:**

In order for West Virginia to be compliant with the National Bridge Inspection Standards (NBIS), all bridge safety inspections are required to be performed and completed within the given month and year they are due. Therefore, if an inspection is not performed and completed within the month and year it comes due, all work shall be suspended on the project and all payments withheld until the inspection has been fully completed and the complete inspection report has been delivered to the Division. In addition, liquidated damages will be assessed to the Contractor in accordance with the amounts depicted in Section 108.7, beginning with the first day of the subsequent month that the inspection was due until the inspection report is received from the Contractor. If the Division is required to perform the inspection, or hire a separate entity to perform the inspection, the Contractor shall be responsible for all costs incurred by the Department. No extensions shall apply or be applicable for any reason, regardless of extensions that might be given for other work being performed on the project.

**697.5–BASIS OF PAYMENT:**

Payment for the above described work, including all materials, equipment, labor, and any other incidental work necessary to complete this item, will be considered completely covered by the contract unit price for the item below.

**697.6–PAY ITEM:**

ITEM	DESCRIPTION	UNIT
697001-*	NBIS Bridge Safety Inspection, “designation”, “type”	Each

- \* Sequence number
- “designation” Bridge, temporary bridge, or stage name designation
- “type” Inspection type, typically Inventory Inspection or In-Depth Routine Inspection

Note 1: Each individual bridge inspection should be added as separate line item in project proposal.

Example:  
 697001-001, NBIS Bridge Safety Inspection, Temporary Bridge, Inventory Inspection, Each  
 697001-001, NBIS Bridge Safety Inspection, Stage One, In-Depth Routine Inspection, Each

**DIVISION 700  
MATERIALS DETAILS**

**SECTION 702  
FINE AGGREGATE**

**702.1-FINE AGGREGATE FOR PORTLAND CEMENT CONCRETE:**

**702.1.5-Mortar Strength (Determined by AASHTO T71)**

DELETE THE TITLE AND CONTENTS OF SUBSECTION 702.1.5 AND REPLACE WITH THE FOLLOWING:

**702.1.5-Mortar Strength (Determined by MP 702.01.25):** Fine aggregate failing the organic impurities test shall be subjected to the test for mortar making properties. The fine aggregate shall develop a compressive strength at the age of seven days; using Type II cement, of not less than 90 percent of the strength developed by a mortar prepared in the same manner with the same cement and graded Ottawa sand having a fineness modulus of 2.4 plus or minus 0.10.

**SECTION 703  
COARSE AGGREGATE**

**703.1-CRUSHED STONE:**

**703.1.5-Limestone Anti-Skid Aggregates:**

**703.1.5.2-Dolomite Limestone:**

DELETE AND REPLACE THE CONTENTS OF THE FOLLOWING SUBSECTION:

When produced for anti-skid, shall be sampled from the stockpile by the Division. The stockpile shall meet the requirements for Section 703.1, with the addition of ASTM C1271 or ASTM C1301. Dolomite shall contain a minimum of 10% elemental magnesium.

**SECTION 707  
CONCRETE ADMIXTURES, CURING AND COATING MATERIALS**

**707.1-AIR ENTRAINING ADMIXTURES FOR CONCRETE:**

**707.1.1-Acceptance Requirements for Air Entraining Admixtures:**

**707.1.1.1-**

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

In the event that the Contractor elects to use an air-entraining admixture, evidence based on evaluation by AASHTO Product Evaluation and Audit Solutions shall be submitted to the Division to show that the material conforms to the requirements of

AASHTO M 154. Tests for bleeding, bond strength and volume change will not be required unless specifically called for in the Plans.

**707.2-WATER-REDUCING AND RETARDING ADMIXTURES FOR CONCRETE:**

**707.2.1-Acceptance Requirements for Approval of Retarders:**

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

Water reducing and retarding admixtures for concrete shall be evaluated by AASHTO Product Evaluation and Audit Solutions. The results shall meet the requirements of AASHTO M 194, Type D or Type G.

**707.2.2-Performance Requirements for Concrete Retarders:**

**707.2.2.1-**

DELETE THE THIRD PARAGRAPH IN THE SUBSECTION:

**707.3-WATER-REDUCING ADMIXTURES FOR CONCRETE:**

**707.3.1-Acceptance Requirements for Approval of Water Reducers:**

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

Water-reducing admixtures for concrete shall be evaluated by AASHTO Product Evaluation and Audit Solutions. The results shall meet the requirements of AASHTO M 194, Type A or Type F.

**707.9-LIQUID MEMBRANE-FORMING COMPOUNDS FOR CURING CONCRETE:**

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

Curing compounds shall conform to the requirements of ASTM C309, Type 2, Class A and must be evaluated by AASHTO Product Evaluation and Audit Solutions.

**707.12-CONCRETE SEALER:**

DELETE THE CONTENTS OF SUBSECTION 707.12 AND REPLACE WITH THE FOLLOWING:

**707.12.1-General:** The material shall be a one component, water repellent penetrating sealer, meeting the criteria listed in section 707.12.2. The material shall be capable of meeting the criteria with a single coat and shall not alter the color of the treated surfaces.



**707.12.2-Acceptance:** Concrete sealers shall be evaluated by AASHTO Product Evaluation and Audit Solutions and shall meet the requirements of AASHTO M 224.

**707.13-ACCELERATING ADMIXTURES FOR CONCRETE:**

**707.13.1-Acceptance Requirements for Approval of Accelerators:**

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

Accelerating admixtures for concrete shall be non-chloride and shall be evaluated by AASHTO Product Evaluation and Audit Solutions. The results shall meet the requirements of AASHTO M 194, Type C.

**707.14-WATER-REDUCING AND ACCELERATING ADMIXTURES FOR CONCRETE:**

**707.14.1-Acceptance Requirements for Approval of Water-Reducing and Accelerating Admixtures:**

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

Water-reducing and accelerating admixtures for concrete shall be evaluated by AASHTO Product Evaluation and Audit Solutions. The results shall meet the requirements of AASHTO M 194, Type E.

**707.15-HYDRATION CONTROL STABILIZING ADMIXTURES FOR CONCRETE:**

**707.15.1-Acceptance Requirements for Approval of Hydration Control Stabilizing Admixtures:**

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

Water-reducing and accelerating admixtures for concrete shall be evaluated by AASHTO Product Evaluation and Audit Solutions. The results shall meet the requirements of AASHTO M 194, Type B or D.

**707.17- SPECIFIC PERFORMANCE ADMIXTURES FOR CONCRETE:**

**707.17.1-Acceptance Requirements for Approval of Specific Performance Admixtures:**

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

Specific performance admixtures for concrete shall be evaluated by AASHTO Product Evaluation and Audit Solutions. The results shall meet the requirements of AASHTO M 194, Type S.

## **SECTION 708 JOINT MATERIALS**

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

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

This material shall meet the requirements of ASTM D6690 and shall be evaluated by AASHTO Product Evaluation and Audit Solutions. Unless otherwise specified, Type II sealant shall be used.

### **708.4-SILICONE JOINT SEALANT; JOINT BACK-UP MATERIAL:**

#### **708.4.1-Silicone Joint Sealant:**

##### **708.4.1.2-Test Requirements:**

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

The sealant shall meet the following requirements and shall be evaluated by AASHTO Product Evaluation and Audit Solutions.

## **SECTION 709 METALS**

### **709.1-STEEL BARS FOR CONCRETE REINFORCEMENT:**

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

All plain and deformed bar reinforcement shall meet the requirements of AASHTO M31. The manufacturer shall also be actively compliant in the AASHTO Product Evaluation and Audit Solutions program as well as conform to the requirements of MP 709.01.55.

#### **709.1.2-High Chromium Steel Bars for Concrete Reinforcement:**

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

For corrosion resistant high chromium steel, the material shall meet testing requirements of tensile, yield, elongation, and bend requirements listed in ASTM A1035 and meet requirements set forth in MP 709.01.50 unless otherwise stated in the project plans.

**709.46-STEEL POSTS, POST BRACES AND GATE FRAMES FOR RIGHT-OF-WAY FENCE:**

ADD THE FOLLOWING TO THE END OF THE SUBSECTION:

Studded tee post producers to be considered for inclusion on the studded tee post producers Approved Product List (APL) must follow the procedures specified in MP 709.46.50.

**SECTION 711  
PROTECTIVE COATINGS, STAINS, AND TRAFFIC PAINTS**

**711.5-CONCRETE PROTECTIVE COATINGS AND STAIN:**

**711.5.3-Approval:**

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

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

**711.23-MATERIAL/SYSTEM APPROVAL:**

**711.23.1-**

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

The Division will develop an approved list of products meeting this specification. This list will be placed on the Division's website. The list may be based upon previous testing performed by the Division, or the Division may choose evaluated by AASHTO Product Evaluation and Audit Solutions and/or the North East Protective Coating Committee (NEPCOAT) tested materials. Upon approval by the Division, further testing may not be required. The Division may request random samples to assure compliance with specification requirements.

Any materials not previously tested and or evaluated by MCS&T Division, AASHTO Product Evaluation and Audit Solutions, or NEPCOAT shall be submitted for evaluation and approval testing. Paints and coatings submitted for approval testing shall be furnished to the MCS&T Division in appropriate containers not holding more than one gallon of material. Each component shall be labeled appropriately, and the following information shall be provided with

the sample:

- i. Name and address of Manufacturer
- ii. Trade Name or Trademark
- iii. Type of Paint
- iv. Lot or Batch number
- v. Date of manufacturing
- vi. All SDS/PDS information pertaining to the material
- vii. Reference to the Division's Standard Specifications
- viii. One (1) one-gallon kit of product/thinner

## **SECTION 712 GUARDRAIL AND FENCE**

### **712.4-GALVANIZED STEEL DEEP BEAM GUARDRAIL, FASTENERS AND ANCHOR BOLTS:**

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

Galvanized steel deep beam guardrail, fasteners and anchor bolts shall be evaluated by AASHTO Product Evaluation and Audit Solutions. The AASHTO Product Evaluation and Audit Solutions testing results shall meet the requirements of AASHTO M 180. The rail shall be Type II, Class A.

### **712.5-ZINC-ALUMINUM-MAGNESIUM ALLOY COATING GUARDRAIL, FASTENERS AND ANCHOR BOLTS:**

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

Zinc-aluminum-magnesium alloy-coating deep beam guardrail shall be evaluated by AASHTO Product Evaluation and Audit Solutions. The AASHTO Product Evaluation and Audit Solutions testing results shall meet the requirements of AASHTO M 180, Type V or VI, Class A.

## **SECTION 715 MISCELLANEOUS MATERIALS**

### **715.3-BLANK**

DELETE SUBSECTION 715.3 AND REPLACE WITH THE FOLLOWING:

### **715.3-FIBERS FOR PORTLAND CEMENT CONCRETE:**

Fibers for Portland cement concrete shall be pre-approved fibers from the WVDOH approved list of fibers for Portland cement concrete. The requirements for shotcrete fibers are separate and are addressed in Section 623.2. Product submittals shall include: a completed Form HL-468 (available on the WVDOH Materials Division Web Page), a copy of the technical data

sheet, the current Material Safety Data Sheet (MSDS), and the independent AAHSTO accredited laboratory testing data meeting the requirements of 715.3.3. Any incomplete submittals will not be evaluated for inclusion on WVDOH approved list of fibers for Portland cement concrete.

**715.3.1-Definitions:**

**Micro Fibers:** Fibers with diameters less than 0.012 inch.

**Macro Fibers:** Fibers with diameters equal to or greater than 0.012 inch.

**Equivalent Diameter:** Diameter of a circle having an area equal to the average cross-sectional area of a fiber.

**Balling:** A 1-inch diameter or greater conglomerate of fibers at the point of placement.

**Aspect Ratio:** Length/Equivalent Diameter, Ratio.

**Hybrid Fibers:** The combination of macro and micro fibers in a mix design containing fibers for Portland cement concrete.

**715.3.2-Materials:** Fibers shall be synthetic Type III in accordance with ASTM C1116 and ASTM D7508. Hybrid fibers shall be required for use in bridge decks.

**715.3.3 Fibers for Post Crack Tensile and Flexural Capacity, and Plastic Shrinkage Cracking Control:** Fibers shall meet the requirements of Table 715.3.3 unless solely intended for plastic shrinkage cracking control which shall only be required to meet the requirements of the crack reduction ratio of Table 715.3.3.

**TABLE 715.3.3**

<b>Required Hardened Fiber-Reinforced Concrete Properties</b>	<b>Specification</b>	<b>Requirement</b>
Equivalent Flexural Strength $f_e^{150}$ , min. <sup>a</sup>	ASTM C1609 <sup>b</sup>	150 psi.
Equivalent Flexural Strength Ratio $R_{T,150}^{150}$ , min. <sup>a</sup>	ASTM C1609 <sup>b</sup>	25%
Crack Reduction Ratio, (CRR), min. reduction	ASTM C1579	≥ 85%

<sup>a</sup> The specimens shall be tested when the concrete ultimate flexural strength at peak stress ( $f_p$ ) is a minimum of 650 psi. For 6 inch by 6 inch by 20 inch beam containing fibers the maximum allowable net deflection value of  $L/150$  of the 18 inch span length is 0.12 inches.

<sup>b</sup> ASTM C1609 will use roller supports that meet the requirements of ASTM C1812.

**715.4-CONCRETE REPAIR MATERIALS:**

**715.4.1-Cementitious and Polymer-Modified Materials for Concrete Repairs:**

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

Material to be used in concrete repair applications shall be evaluated through AASHTO Product Evaluation and Audit Solutions and meet the requirements in Table 715.4.1. In addition, their audit status must remain active with the AASHTO Product Evaluation and Audit Solutions policy regarding periodic re-testing as required by the program. Product submittals shall include: a completed Form HL-468 (available on the WVDOH Materials Division Web Page), a copy of the technical data sheet, the current Material Safety Data Sheet (MSDS), and the results of AASHTO Product Evaluation and Audit Solutions evaluation. Any incomplete

submittals will not be evaluated for inclusion on WVDOH approved list of concrete patching Materials.

#### **715.4.2-Polymer Concrete Materials for Concrete Repairs:**

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

A Polymer Product is a composite material formed by polymerization of a monomer and an aggregate mixture, in which the polymerized monomer acts as the sole binder for the aggregate. Polymer concrete uses a polymer binder in place of Portland cement. These materials are required to be evaluated through AASHTO Product Evaluation and Audit Solutions and meet the requirements in Table 715.4.2. In addition, their audit status must remain active with AASHTO Product Evaluation and Audit Solutions policy regarding periodic re-testing as required by the program. Product submittals shall include: a completed Form HL-468 (available on the WVDOH Materials Division Web Page), a copy of the technical data sheet, the current Material Safety Data Sheet (MSDS), and the results of AASHTO Product Evaluation and Audit Solutions evaluation. Any incomplete submittals will not be evaluated for inclusion on WVDOH approved list of patching Materials.

#### **715.9-WARNING DEVICES:**

##### **715.9.2-Signs:**

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

All references herein to ASTM specification D4956 shall be interpreted as referencing version D4956-11a. Any portion of this specification which is in contradiction to ASTM D4956 shall supersede ASTM D4956. All references herein to AASHTO specification M268 shall be interpreted as referencing version M 268-10. Any portion of this specification which is in contradiction to AASHTO M 268 shall supersede AASHTO M 268. All retroreflectivity values referenced herein shall be in units of cd/fc/ft<sup>2</sup>. All “matched component” references herein shall be interpreted as referencing the retroreflective sheeting manufacturer’s recommended inks and overlay films to be used for manufacturing purposes with the manufacturer’s sheeting. All APL references herein shall be interpreted as referring to the Division’s Approved Products List (APL) for Retroreflective Sheeting. All CSS references herein shall be interpreted as referring to the Division’s Central Sign Shop (CSS) internal sign manufacturing facility in Charleston, WV.

##### **715.9.2.9-Approval Processes:**

###### **715.9.2.9.1-Retroreflective Sheeting Materials & Matched Components**

###### **715.9.2.9.1.1-Independent Test Results:**

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

In order for the material to be evaluated and considered for approval, independent test results must be supplied by the manufacturer demonstrating the sheeting material's conformance with the requirements specified within the applicable Section 715.9.2.1, 715.9.2.2, 715.9.2.3, or 715.9.2.4, with the exception of the requirements specified in the "Shelf Life", "Backing Class", and "Durability" subsections. The independent test results shall include accelerated outdoor weathering test results conducted in conformance with ASTM D4956. Artificial accelerated lab weathering shall not be accepted except for materials intended for work zone applications. Materials intended for work zone applications shall include all Type ASTM-VI materials and shall include, but may not be limited to, other "Type" materials intended for use on plastic posts, tubes, barricades, drums, cones, and channelizer cones, including "permanently" installed plastic posts and tubes. However, any approval granted based on the results of artificial accelerated lab weathering shall be provisional in nature and noted as such on the APL. As a condition of the acceptance of artificial accelerated lab weathering results in lieu of accelerated outdoor weathering results, the accelerated outdoor weathering process shall be ongoing at the time of issuance of the provisional approval. In addition, the material manufacturer shall submit the standard outdoor weathering test results to the WVDOT within nine (9) months after the effective date of the provisional approval for Type 852 ASTM- VI materials, and within fifteen (15) months after the effective date of the provisional approval for all other material "Types". AASHTO Product Evaluation and Audit Solutions results shall be considered acceptable for meeting the accelerated outdoor weathering test results requirement.

### **715.9.3-Channelizing Devices:**

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

Devices which are included as part of the AASHTO Product Evaluation and Audit Solutions, and for which an APL is maintained, shall be evaluated as part of the AASHTO Product Evaluation and Audit Solutions in order to be considered for approval.

### **715.9.3.9-Product Submission and Approval:**

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

The manufacturer should include all relevant documentation and information, including but not limited to product data sheets, product flyers, manufacturer product specifications and recommendations, product bulletins, engineering drawings, AASHTO Product Evaluation and Audit Solutions results, and crash testing performance documentation.

### **715.9.6-Portable Sign Stands:**

#### **715.9.6.1-Product Submission and Approval:**

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE

**FOLLOWING:**

Stands to be considered for inclusion on the Division's Approved Products List (APL) shall be submitted to the Materials Division following the current procedures specified in MP 106.00.02. The Division maintains an APL of MASH compliant stands only. Stands utilized based on compliance with NCHRP-350 are not required to be listed on an APL.

The manufacturer should include all relevant documentation and information, including but not limited to Product Data Sheets, Product Flyers, Manufacturer Product Specifications, Product Bulletins, Engineering Drawings, and crash testing performance documentation. The crash testing performance documentation to be submitted shall be in accordance with official guidance issued by the WVDOH.

The stands shall be evaluated as per MP 715.09.20, "Standard Method for Determining the Stability of Portable Sign Stands."

Approvals of stands may be rescinded based on performance on Division projects determined to be non-compliant with these specifications.

**715.11-ENGINEERING FABRIC:**

**715.11.2-Acceptance:**

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

All engineering fabric shall be approved before use. AASHTO Product Evaluation and Audit Solutions data shall be furnished for the engineering fabric to be approved. The data must be for the current 3-year cycle for the manufacturer or private labeler providing the material. The engineering fabric shall have a manufacture date within the current three-year AASHTO Product Evaluation and Audit Solutions evaluation cycle of the manufacturer's, or private labeler's facility providing the material. The manufacturer or private labeler must be listed as AASHTO Product Evaluation and Audit Solutions compliant for the current calendar year or be listed as compliant for the previous calendar year and have an application for audit during the current year.

**715.14-ELASTOMERIC BEARING PADS:**

**715.14.2-Approval for Bearing Pads Without Shims:**

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

Bearing pads that do not include shims or internal stiffeners will only be accepted using AASHTO Product Evaluation and Audit Solutions results and a certificate of compliance.



**715.40-PAVEMENT MARKING MATERIAL:**

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

**715.40.2.3-Approved Products Listing:**

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

Material approvals are based on results from AASHTO Product Evaluation and Audit Solutions evaluation program and/or WVDOH field evaluation tests. Approvals may also be granted or rescinded based on actual performance on WVDOH projects. A list of approved materials, code numbers, and approved Contractor personnel may be obtained by contacting:

**715.40.4-Temporary Pavement Marking Tape (Types VIIB and VIIC):**

**715.40.4.2-Temporary Pavement Markings (Type VIIB):**

**715.40.4.2.1-Requirements:**

DELETE THE FIRST PARAGRAPH IN BULLET xi OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

- xi. **Approved Products Listing (APL):** Approvals are based on results from AASHTO Product Evaluation and Audit Solutions evaluation program and/or WVDOH field evaluation tests. Approvals may also be granted or rescinded based on actual performance on WVDOH projects. A list of approved suppliers and their code numbers may be obtained by contacting:

**715.40.4.3-Temporary Pavement Markings (Type VIIC):**

**715.40.4.3.1-Requirements:**

DELETE THE FIRST PARAGRAPH IN BULLET xii OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

- xii. **Approved Products Listing (APL):** Approvals are based on results from AASHTO Product Evaluation and Audit Solutions evaluation program and/or WVDOH field evaluation tests. Approvals may also be granted or rescinded based on actual performance on WVDOH projects. A list of approved suppliers and their code numbers may be obtained by contacting:

**715.40.6-Raised Pavement Markers (RPM's):**

**715.40.6.1-Type P-2 Markers:**

**715.40.6.1.1-Casting Requirements:**

DELETE THE FIRST PARAGRAPH IN BULLET j OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

- j. Castings shall have fully completed evaluation on the AASHTO Product Evaluation and Audit Solutions test deck in a location having a similar climate to West Virginia.

Upon review, the performance of the castings on the test deck shall meet or exceed the historical performance of other industry standard castings approved by the WVDOH. This determination shall be made solely by the WVDOH.

**715.40.6.1.2-Lens Requirements:**

DELETE THE FIRST PARAGRAPH IN BULLET m OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

- m. Lenses shall have fully completed evaluation on the AASHTO Product Evaluation and Audit Solutions test deck in a location having a similar climate to West Virginia. Upon review, the performance of the lenses on the test deck shall meet or exceed the historical performance of other industry standard lenses approved by the WVDOH. This determination shall be made solely by the WVDOH.

**715.40.6.1.4-Product Submission and Approval:**

DELETE THE CONTENTS OF SUBSECTION AND REPLACE WITH THE FOLLOWING:

Type P-2 marker castings and/or lenses to be considered for inclusion on the WVDOH Approved Products List (APL) shall be submitted to the Materials Division following the current procedures specified by the Materials Division. The manufacturer may contact the Traffic Engineering Division for verification. The manufacturer should include all relevant documentation and information with this form, including but not limited to Product Data Sheets, Product Flyers, Manufacturer Product Specifications, Product Bulletins, Engineering Drawings, AASHTO Product Evaluation and Audit Solutions results, and the independent testing facility test results described herein.

In addition to the above, the WVDOH may also require that the casting and/or lens product(s) submitted for evaluation be field tested in one or more locations in West Virginia in order to validate the acceptable performance of the product(s). This field testing shall typically be a minimum of six months to one year in duration including a full winter season. Specific details related to this testing, such as locations and quantities, shall be determined by the WVDOH.

All submitted information will be forwarded to the WVDOH Traffic Engineering Division, which will in turn contact and work directly with the manufacturer during the evaluation process. The Traffic Engineering Division will evaluate all submitted literature and documentation for compliance with the specified requirements as well as satisfactory performance on the AASHTO Product Evaluation and Audit Solutions test deck. The Traffic Engineering Division may also arrange for the manufacturer to furnish test samples and arrange for the product to be installed for field testing as previously described. After the evaluation is complete, the Traffic Engineering Division will inform the Materials Division in writing of the outcome of its evaluation.

**715.40.6.2-Type R-4 Markers:**

DELETE THE FIRST PARAGRAPH IN BULLET q OF THE SUBSECTION AND

REPLACE WITH THE FOLLOWING:

- q. The markers shall have fully completed evaluation on the AASHTO Product Evaluation and Audit Solutions test deck. Upon review, the performance of the markers on the test deck shall meet or exceed the historical performance of other industry standard Type R-4 markers approved by the WVDOH. This determination shall be made solely by the WVDOH.

**715.40.6-Raised Pavement Markers (RPM's):**

**715.40.6.2-Type R-4 Markers:**

**715.40.6.2.2-Product Submission and Approval:**

DELETE THE CONTENTS OF SUBSECTION AND REPLACE WITH THE FOLLOWING:

Type R-4 markers to be considered for inclusion on the WVDOH Approved Products List (APL) shall be submitted to the Materials Division following the current procedures specified by the Materials Division. The manufacturer may contact the Traffic Engineering Division for verification. The manufacturer should include all relevant documentation and information with this form, including but not limited to Product Data Sheets, Product Flyers, Manufacturer Product Specifications, Product Bulletins, Engineering Drawings, AASHTO Product Evaluation and Audit Solutions results, and the independent testing facility test results described herein.

In addition to the above, the WVDOH may also require that the markers submitted for evaluation be field tested in one or more locations in West Virginia in order to validate the acceptable performance of the product(s). This field testing shall typically be a minimum of six months to one year in duration including a full winter season. Specific details related to this testing, such as locations and quantities, shall be determined by the WVDOH.

All submitted information will be forwarded to the WVDOH Traffic Engineering Division, which will in turn contact and work directly with the manufacturer during the evaluation process. The Traffic Engineering Division will evaluate all submitted literature and documentation for compliance with the specified requirements as well as satisfactory performance on the AASHTO Product Evaluation and Audit Solutions test deck. The Traffic Engineering Division may also arrange for the manufacturer to furnish test samples and arrange for the product to be installed for field testing as previously described. After the evaluation is complete, the Traffic Engineering Division will inform the Materials Division in writing of the outcome of its evaluation.