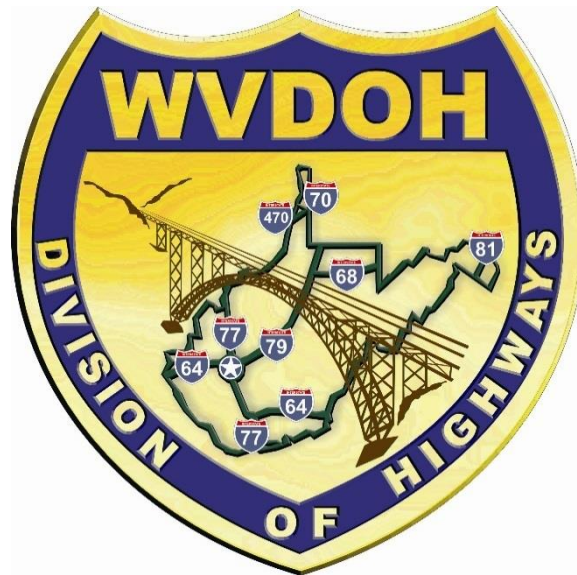


**WEST VIRGINIA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS**



2018 SUPPLEMENTAL SPECIFICATIONS

**To accompany the 2017 Edition of the
Standard Specifications Roads and Bridges**

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

TABLE OF CONTENTS

DIVISION 100-GENERAL PROVISIONS

Section		Page
107	Legal Relations and Responsibility to Public	1
	107.21.2 Pollution	

DIVISION 200-EARTHWORK

204	Mobilization	3
	204.5 Basis of Payment	

DIVISION 400-ASPHALT PAVEMENTS

401	Asphalt Base, Wearing, and Patching & Leveling Courses	5
	401.7.2 Surface Tolerance	
	401.10.6 Safety Edge	
	401.12 Method of Measurement	
405	Chip Seals	6
410	Asphalt Base and Wearing Courses, Percent Within Limits (PWL)	11
	410.10.2 Safety Edge	
	401.12 Method of Measurement	

DIVISION 500-RIGID PAVEMENT

501	Portland Cement Concrete Payment	13
	501.9.1 Safety Edge	
	501.13 Surface Tolerance	
	501.22 Method of Measurement	

DIVISION 600-INCIDENTAL CONSTRUCTION

601	Structural Concrete	15
	601.7 Mixing	
	601.11.4.3 Straightedge Testing of Hardened Bridge Decks	
	601.15.2 Price Adjustments	
603	Prestressed Concrete Members	16
	603.2 Materials	
	603.2.1 Inspection and Testing	
	603.6.2 Mix Design	
614	Piling Walls	17
	614.5 Corrosion Protection	
	614.7 Lagging & Backfilling	
620	Three-Sided Reinforced Concrete Bridge/Culvert	18
	620.3.2 Precast Three-Sided Bridge/Culvert	

Section		Page
626	Retaining Wall Systems	19
	626.5.1.1.1 Reinforced Concrete Facing Elements	
	626.5.1.1.2.1 Modular Block Mix Design	
636	Maintaining Traffic	19
	636.2.1 Materials Certification	
	636.9 Traffic Control Devices	
	636.14.1 Materials	
	636.14.2 Installation	
651	Furnishing and Placing Topsoil	23
	651.2 Materials	
679	Overlaying of Portland Cement Concrete Bridge Decks	23
	679.3.7.1 General	
	679.5.1 Straightedge Test	
	679.5.2 Finished Desk Grooving	
	679.5.2.1 Transverse Grooving	
	679.5.2.2 Longitudinal Grooving	

DIVISION 700- MATERIALS DETAILS

703	Coarse Aggregate	27
	703.4 Grading of Coarse Aggregates	
704	Stone and Crushed Aggregate	27
	704.8 Shot Rock	
705	Asphalt Materials	28
	705.5 Performance Graded Asphalt Binders	
707	Concrete Admixtures, Curing and Coating Materials	28
	707.9 Liquid Membrane-Forming Compounds for Curing Concrete	
714	Concrete, Clay, Fiber and Plastic Pipe	29
	714.2 Reinforced Concrete Culvert, Storm Drain and Sewer Pipe	
	714.23 Precast Reinforced Concrete Box Culverts	
715	Miscellaneous Materials	29
	715.19 Precast Concrete Units for Manholes and Inlets	
	715.22.2 Materials	
	715.42.8 Cabinets	
	715.42.11.2 Type H-Heavy Duty	
720	Smoothness Testing	38

**DIVISION 100
GENERAL PROVISIONS**

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

107.21-PROTECTION OF RIVERS, STREAMS, AND IMPOUNDMENTS:

107.21.2-Pollution:

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

The Contractor shall exercise every reasonable precaution throughout the life of the Project to prevent pollution of rivers, streams, or impoundments. Pollutions such as chemicals, fuels, lubricants, bitumen, raw sewage, products associated with bridge cleaning and painting, and other harmful wastes shall not be discharged into or alongside of rivers, streams, impoundments, or into natural or man-made channels leading thereto. The quality of the surface waters affected by construction shall meet the requirements of the West Virginia Code, Volume 8A, Chapter 22, Article 11.

DIVISION 200 EARTHWORK

SECTION 204 MOBILIZATION

204.5-BASIS OF PAYMENT:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Partial payments will be made as the work progresses in accordance with the following schedule.

- i. 2.5% of the original contract amount or 50% of the amount bid for mobilization, whichever is less, will be released to the Contractor as the first estimate payable, not less than 15 days after the start of work at the project site.
- ii. 2.5% of the original contract amount or the remaining 50% of the amount bid for mobilization, whichever is less, shall be released with the estimate payable 30 days after the first estimate.

When the project is deemed substantially complete, any remaining amount bid for mobilization will be released for payment.

Nothing herein shall be construed to limit or preclude partial payments otherwise provided for by the contract.

No deduction will be made, nor will any increase be made, in the lump sum mobilization item amount regardless of decreases or increases in the final total contract amount or for any other cause.

**DIVISION 400
BITUMINOUS PAYMENTS**

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

401.7-ACCEPTANCE TESTING:

401.7.2-Surface Tolerance:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Final smoothness testing of all new Asphalt surfaces shall be in accordance with Section 720.

When compaction is completed on the course, it shall present a uniform surface, true line and grade, conforming to the cross section shown on the Plans. When tested with a straightedge of approximately 10 feet (3 meters) in length and a template of the specified dimensions, the finished base course shall not show a deviation greater than ¼ inch (6 mm) and the finished wearing course shall not show a deviation from the required surface greater than 3/16 inch (5 mm).

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

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

401.10-PAVING OPERATIONS:

ADD THE FOLLOWING:

401.10.6-Safety Edge: When the total specified lift thickness of pavement is 1.5 inches or greater, asphalt safety edge shall be constructed on the outside pavement edge. The device utilized shall be a model listed on Division Approved Product Listing.

The resulting finished surface of the safety edge shall be sufficiently consolidated so as to show no segregation, or raveling of the aggregate and shall have the same surface profile and texture of the compacted mat surface.

Safety edge is not to be used through intersections, against curb or barrier, or when directed by the Engineer. The paving operation shall allow for automatic and/or manual transitions at cross roads, driveways, and intersections. The Engineer may allow short sections of handwork for transitions at driveways, intersections, interchanges, and bridges.

401.12-METHOD OF MEASUREMENT:

ADD THE FOLLOWING TO THE END OF THE SECTION:

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

**SECTION 405
SURFACE TREATMENTS**

DELETE THE ENTIRE CONTENTS AND HEADING AND REPLACE WITH THE FOLLOWING:

**SECTION 405
CHIP SEALS**

405.1-DESCRIPTION:

This work shall consist of the construction of a wearing course, composed of asphalt emulsion immediately followed by a single layer of aggregate, in one or more applications, followed by a fog seal. The type of Chip Seal will be indicated on the Plans.

The contractor shall notify the Engineer a minimum of two weeks prior to starting any Chip Seal operation. In addition, the contractor shall submit proposed sources of all materials.

405.2-MATERIALS:

405.2.1-Aggregate: The aggregate shall be from a WVDOT approved source and shall conform to the requirements of the Standard Specifications Section 703.1-4. It is expected that the aggregate will be washed to reduce dust content. The aggregates shall be crushed with a minimum of 80% two face fracture. Aggregates shall meet the following gradations when specified in section 405.12:

**Table 405.2.1
Design Aggregate Gradation Requirements for Chip Seal**

Sieve Size	Type A	Type B	Type C
	Nominal Maximum Size		
	1/2 in (12.5 mm)	3/8 in (9.5 mm)	No. 4 (4.75)
1 in (25 mm)	–	–	–
3/4 in (19 mm)	100	–	–
1/2 in (12.5 mm)	90-100	100	–
3/8 in (9.5 mm)	5-30	90-100	100
No. 4 (4.75 mm)	0-10	5-30	90-100
No. 8 (2.36 mm)	–	0-10	5-30
No. 16 (1.18mm)	0-2	–	0-10
No. 30 (600 µm)	–	0-2	–
No 50 (300 µm)	–	–	0-2
No. 200 (75 µm)	0-2	0-2	0-2

405.2.2-Asphalt Emulsion: The asphalt emulsion for Chip Seals and the emulsion for the fog seal shall be from a WVDOT approved source and shall meet the requirements of AASHTO M316, Table 1. Other asphalt emulsions may be used with testing and approval prior to construction. Testing shall be done a minimum of two weeks prior to the projected start date and follow the process outlined in Materials Procedure 401.02.25 Certification of Asphalt and Tar Shipping Terminals.

405.3-WEATHER RESTRICTIONS:

Chip Seal shall be constructed only when the condition of the existing surface is satisfactory to the Engineer, when the temperature of the existing pavement is 50° F (10° C) or above, and when other weather conditions are satisfactory for construction. The temperature may be waived but only when approved by the Engineer. No Chip Seal shall be performed between October 1 and May 1.

Chip Seal operations shall be suspended immediately when rain begins or when the Engineer determines that a rain event is imminent.

405.4-EQUIPMENT:

Equipment shall include equipment for emulsion distribution, aggregate spreading, compaction, and sweeping before and after application. Equipment shall also include scrapers, hand brooms, shovels, and other items as may be necessary to thoroughly clean the existing surface.

405.4.1-Emulsion Distributor: The distributor shall be so designed, equipped, maintained and operated that asphalt material may be applied uniformly on variable widths up to 16 ft. (4.6 m) at readily determined and controlled rates from 0.05 to 2.0 gal. per sq. yd. (0.22 to 9.3 liters sq. m) with uniform pressure and with an allowable variation from any specified rate not to exceed 0.02 gal. per sq. yd. (0.09 liter sq. m).

The distributor shall also have a cab-metering system that will automatically adjust the flow of the asphalt material as the speed of the truck changes and allow the operator to adjust the rate of application from the cab of the truck.

Distributor equipment shall include a tachometer, pressure gages, and a thermometer for measuring temperatures of tank contents.

Distributors shall be equipped with a power unit for the pump, and full circulation spray bars adjustable laterally and vertically. A manifold connection shall be provided and hand spraying equipment shall be available to cover areas and patches inaccessible to the distributor.

Verification of distributor truck calibration within the past 12 months shall be available on the project site, preferably located within the cab of the truck.

405.4.2-Aggregate Spreader: The aggregate spreader shall be self-propelled with front discharge capable of adjusting to evenly and accurately distribute at the required placement rates.

405.4.3-Compaction Equipment: A minimum of two self-propelled pneumatic tire rollers shall be used, at a minimum of 12 tons each. Roller tires shall have a minimum pressure of 60 psi.

405.4.4-Sweepers: Power sweepers, pickup sweepers, or rotary brooms shall be used for surface preparation as well as removing any loose aggregate after compaction. Steel bristles shall not be used on the Chip Seal after compaction.

405.5-PREPARING AND REPAIRING EXISTING SURFACE:

No chip seal shall be applied until breaks, holes, depressions, and other irregularities in the existing surface have been repaired and cured sufficiently to permit the asphalt material to be placed in a uniform application. Patching and leveling material shall be plant mixed. Hand patching will be permitted where necessary. Remove all existing thermoplastic markings and raised pavement markers. Protect any drains or other utility covers. Apply a light fog seal to asphalt patched surfaces less than 2 months old, using an asphalt emulsion that is compatible with the emulsion being used for the chip seal.

405.6-CLEANING AND SWEEPING:

Immediately prior to construction, the existing surface shall be swept and thoroughly cleaned to remove all mud, dirt, dust, vegetation, and other caked or loose foreign material. Cleaning shall be done to a minimum width of one foot on each side beyond the width of the surface to be placed excluding the shoulder. Materials collected in the cleaning operation shall be removed and disposed of as directed.

405.7-APPLICATION OF ASPHALT MATERIAL:

After the existing surface has been cleaned, and is in a dry condition, the asphalt material shall be applied by means of a pressure distributor. The spray bar shall be raised to a sufficient height so as to uniformly and completely coat the entire surface. The rate of application of asphalt material shall be in accordance with section 405.12, or as modified by the plans. Application temperatures of the asphalt material shall be within the range specified in Subsection 705 for the particular material being used, or as documented by the manufacturer.

Except when required to maintain traffic, Chip Seal operations shall be done upon the full width of the section.

After application, asphalt material shall completely and uniformly cover the underlying pavement and be free of streaks, voids, and puddles.

405.8-APPLICATION OF AGGREGATE:

Immediately following each application of asphalt material, aggregate at the rate or rates called for in 405.12 shall be spread with the spreader in such a manner that the entire area being treated is uniformly covered. No traffic, construction or otherwise, shall be allowed on the asphalt material before placing aggregate. Additional aggregate shall be spread if necessary, and hand spreading shall be done to cover areas inaccessible to the spreading equipment. The aggregate shall be dried or moistened as required in order to obtain a near Surface Saturated Dry condition.

If the process must stop during that application any asphalt material that has been applied to the surface shall be covered with aggregate to prevent breaking of the emulsion prior to embedment of the aggregate.

405.9-ROLLING AND SWEEPING:

Immediately following spreading of the aggregate, the entire surface of the aggregate shall be rolled until the aggregate is keyed into the asphalt material. Any area that ravels shall be repaired

and rerolled. Rolling shall be parallel to the centerline and shall begin at the edges of the treatment and progress toward the center, each trip uniformly overlapping the preceding trip. There shall be at least three passes made with a pneumatic tire roller.

Rolling shall cease before the aggregate is crushed to any appreciable extent. Rollers shall be the type and weight specified in 405.4.3. To ensure aggregate embedment before the emulsion has set, the minimum number of rollers shall be two (2). More rollers may be used to obtain compaction to the satisfaction of the Engineer.

The roller speed shall not exceed 10 miles per hour to prevent aggregate pick up and ensure embedment. Water, to prevent adhesion of the asphalt material to the roller wheels, shall not be used in excessive amounts. The use of fuel oil, paraffin oil, and kerosene on rollers or other equipment, for the purpose of preventing material from picking up or sticking, is prohibited.

After the emulsion has cured, sweeping can commence. The status of being cured shall be determined by the ability to sweep all loose aggregate from the surface without removing any aggregate adhered to the asphalt emulsion.

405.10-JOINTS:

The longitudinal construction joints between adjacent lanes shall be kept clean of material foreign to the surface being treated. The joints shall be constructed without overlaps or gaps between the materials.

The beginning of the project and all transverse joints shall be covered with paper to prevent overlapping of the seal and provided a uniform joint. Following its use, the paper shall be removed and disposed of satisfactorily.

405.11-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 sweeping has been completed. The applicable provisions of 636 shall apply for regulating traffic.

405.12-SEQUENCE OF OPERATIONS AND QUANTITIES OF MATERIALS:

The quantities and kinds of materials to be used and the sequence of applications and operations for the various treatments shall be as follows. Maximum quantities of asphalt emulsion may be used only when the old surface is open or porous. Sweep each layer when applying multiple layers. The rates of aggregate and asphalt emulsion may be adjusted by the Engineer. The contractor may suggest different application rates to the Engineer for consideration by submitting a project specific Chip Seal design based on McLeod or Modified Kearby Design Methods.

Table 405.12.1

Type	Layer	Asphalt Emulsion (gal/SY)	Aggregate (lb/SY)	Gradation Type
Light	First	0.15 to 0.25	8 to 10	C
Single	First	0.25 to 0.40	15 to 25	B
Double	First	0.25 to 0.40	25 to 35	B
	Second	0.25 to 0.35	10 to 20	C
Triple	First	0.30 to 0.50	25 to 45	A
	Second	0.30 to 0.50	25 to 35	B
	Third	0.25 to 0.35	10 to 20	C

405.13-FOG SEAL:

Unless otherwise specified, a fog seal shall be applied on the final surface. This shall be done no less than 3 but no more than 7 calendar days after the application of the Chip Seal. The surface must be dry before application, and the surface shall be swept to remove loose material. An asphalt emulsion shall be applied uniformly at a rate of 0.09 ± 0.03 gallons per square yard to the surface. Any raveled areas, flushed areas, or other defects in the chip seal shall be repaired prior to the application of the fog seal.

405.14-TESTING AND ACCEPTANCE:

405.14.1-Quality Control Testing: Quality Control is the responsibility of the Contractor, as specified in 106.1. The contractor shall design and submit a quality control plan in accordance with applicable section of MP 307.00.50 detailing the methods by which the quality control program will be conducted.

405.14.2-Acceptance Testing: Acceptance sampling and testing is the responsibility of the Division. Acceptance for aggregate will be based on the uniformity of the aggregate and the dust content. Samples shall be taken from the conveyor belt of the aggregate spreader, in accordance with MP 700.00.06. A subplot shall be defined as one lane mile. Fractions of a mile less than 0.5 will be included in the previous subplot, and fractions of a mile greater than 0.5 and greater will be a separate subplot.

405.14.2.1-Acceptance of Aggregate Uniformity: The more uniform the material, the better performance potential of the chip seal. Uniformity of the aggregate will be measured by the Coefficient of Uniformity, C_u , as defined in ASTM D2487. Adjustments per subplot will be as follows.

Table 405.14.2.1

Adjustment of Contract Item Price for Aggregate Uniformity

C_u	Percent Adjustment
<1.7	1% incentive per 0.1 below
1.7 – 3.0	No Adjustment
3.1 – 4.0	2% disincentive per 0.1 above
>4.1	*Special evaluation to consider remove and replace

405.14.2.2-Acceptance of Aggregate Dust Content: Dust content will be determined by AASHTO T11. Adjustments per subplot will be as follows.

Table 405.14.2.2
Adjustment of Contract Item Price for Dust Content

% Dust	Percent Adjustment
0 – 1.0	2% incentive
1.1 – 2.0	No Adjustment
2.1 – 3.0	2% disincentive
3.1 – 3.5	5% disincentive
3.6 – 4.0	8% disincentive
4.1 – 4.5	12% disincentive
>4.5	*Special evaluation to consider remove and replace

405.15-METHOD OF MEASUREMENT:

The quantity of “Asphalt Emulsion Material” and “Asphalt Emulsion Material, Fog Seal” shall be the number of gallons (liters) incorporated into the completed work, which volume will be measured as described in 109.1.

Chip Seal aggregate shall be paid for by the Square Yard (Square Meter), measured by the total length of the area times the average applied width of treated area.

405.16-BASIS OF PAYMENT:

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

405.17-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
405007-*	Chip Seal Aggregate, Type **	Square Yards (Square Meters)
405010-*	Asphalt Emulsion Material	Gallon (Liter)
405011-*	Asphalt Emulsion Material, Fog Seal	Gallon (Liter)

* Sequence number

** Type of Aggregate Gradation from Section 405.2.1, either A, B, or C

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

410.10-PAVING OPERATIONS:

ADD THE FOLLOWING:

410.10.2-Safety Edge: When the total specified lift thickness of pavement is 1.5 inches or greater, asphalt safety edge shall be constructed on the outside pavement edge. The device utilized shall be a model listed on Division Approved Product Listing.

The resulting finished surface of the safety edge shall be sufficiently consolidated so as to show no segregation, or raveling of the aggregate and shall have the same surface profile and texture of the compacted mat surface.

Safety edge is not to be used through intersections, against curb or barrier, or when directed by the Engineer. The paving operation shall allow for automatic and/or manual transitions at cross roads, driveways, and intersections. The Engineer may allow short sections of handwork for transitions at driveways, intersections, interchanges, and bridges.

410.12-METHOD OF MEASUREMENT:

ADD THE FOLLOWING TO THE END OF THE SECTION:

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

**DIVISION 500
RIGID PAVEMENT**

**SECTION 501
PORTLAND CEMENT CONCRETE PAVEMENT**

501.9-PLACING CONCRETE:

ADD THE FOLLOWING:

501.9.1-Safety Edge: Concrete safety edge shall be constructed on the outside pavement edge using a wedge shape meeting the requirements of the plan details.

Safety edge is not to be used through intersections, against curb or barrier, or when directed by the Engineer. The paving operation shall allow for automatic and/or manual transitions at cross roads, driveways, and intersections. The Engineer may allow short sections of handwork for transitions at driveways, intersections, interchanges, and bridges.

501.13-SURFACE TOLERANCE:

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

The smoothness of the riding surface will be determined using the procedures outlined in Section 720. When corrective action is needed, the diamond grinding operations shall be in accordance with section 508.

501.22-METHOD OF MEASUREMENT:

ADD THE FOLLOWING TO THE END OF THE SECTION:

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

DIVISION 600 INCIDENTAL CONSTRUCTION

SECTION 601 STRUCTURAL CONCRETE

601.7-MIXING:

DELETE THE THIRD PARAGRAPH IN THE SUB-SECTION AND REPLACE WITH THE FOLLOWING:

When a truck mixer or agitator is used for transporting concrete, the concrete shall be delivered to the site of work and discharge completed within one and one-half hours after the addition of the cement to the aggregates. Each batch of the concrete delivered at the job site shall be accompanied by a batch ticket that contains complete batching information, including the batch weights (or batch volume, in the case of water) of all materials in that batch of concrete. In adverse weather or under other conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 85° F (30° C) or above, the time between the introduction of the cement to the aggregates and the discharge shall not exceed one hour. When a truck mixer is used for the complete mixing of the concrete, the mixing operation shall begin within one hour after the cement has been added to the aggregate.

ADD THE FOLLOWING AFTER THE FIFTH PARAGRAPH IN THE SUBSECTION:

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

601.11-FINISHING CONCRETE SURFACES:

601.11.4-Finishing Concrete Bridge Decks:

601.11.4.3-Straightedge Testing of Hardened Bridge Decks:

DELETE THE CONTENTS OF SUBSECTION AND REPLACE WITH THE FOLLOWING:

When finishing has been completed and the concrete has hardened sufficiently, the surface shall be given a further test for trueness with a rolling straightedge or a certified inertial profiler and operator (see Section 720.2.). When using a rolling straight edge, areas showing high spots of more than 1/8 inch (3 mm) shall be marked by the Engineer. When an inertial profiler is used, the data shall be analyzed by using the rolling straight edge simulation on the most recent version of ProVal Software. Areas showing more than 1/8

inch (3mm) on the rolling straight edge simulation will be mapped showing locations. Only when directed by the Engineer, such areas that are higher than 1/8 inch (3 mm) shall be ground with an approved grinding tool, utilizing carborundum stones or industrial diamond wheels; grinding shall be done to an elevation where the area or spot will not show a surface deviation in excess of 1/8 inch (3 mm) when tested with the 10 feet (3.048 meter) rolling straightedge, except that the maximum depth of grinding shall not exceed 1/4 inch (6 mm). The ground areas shall be treated as directed by the Engineer. Where the initial deviation from the straightedge is 1/2 inch (13 mm) or more, the Contractor will be required to remove and replace the complete pour in which the areas not meeting the required tolerance are located.

After grinding, all areas either high or low, not meeting the requirements of 1/8 inch (3 mm) tolerance will be measured and disposition of these areas will be as set forth in 601.15.2

601.15-BASIS OF PAYMENT:

601.15.2-Price Adjustments:

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

The Contractor will be assessed equitable deductions of twenty-five dollars (\$25.00) per square foot (two-hundred- seventy dollars (\$270.00) per square meter) for areas of bridge decks not meeting the specified 1/8 in (3mm) tolerance and not specified to be removed nor directed to be ground, and for any areas that have been ground but do not meet the specified tolerance. Deviations will be tested with a 10 foot (3.048 meter) rolling straightedge or using certified inertial profiler and operator (See Section 720.2). Inertial profiler data will be analyzed by using the rolling straight edge simulation on ProVal Software.

Concrete not found in compliance with the requirements of 601.4.4 for compressive strength will be paid for at a reduced contract price in accordance with the following formula:

$$\text{Percent Reduction} = \frac{f'_c - X}{0.6f'_c - \sigma}$$

Where:

- f'_c = Design Strength, psi (MPa)
- X = Observed Strength, psi (MPa)
- σ = Standard Deviation

The percent reduction shall be applied to the subplot with the low strength.

**SECTION 603
PRESTRESSED CONCRETE MEMBERS**

603.2-MATERIALS:

ADD THE FOLLOWING SENTENCE AT THE END OF THE SUBSECTION:

Component materials used in the fabrication of precast and prestressed concrete members, and any ship loose materials pertaining to precast and prestressed concrete items, shall be approved in accordance with MP 603.02.10.

603.2.1-Inspection and Testing:

DELETE PARAGRAPH ONE AND REPLACE WITH THE FOLLOWING:

A representative of the Engineer shall have free entry at all times, while the work on the Contract is being performed, to all parts of the manufacturer's works which concern the manufacture of the materials ordered. The manufacturer shall afford the representative of the Engineer, without charge, all reasonable facilities to satisfy themselves that the material is being furnished in accordance with these specifications. Inspection and acceptance procedures for prestressed concrete bridge members shall be in accordance with MP 603.10.40.

603.6-CONCRETE:

603.6.2-Mix Design:

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

Concrete mixtures shall be established initially by methods in accordance with ACI 301, Chapter 4. Class S-P concrete mixtures shall be developed in accordance with MP 711.03.23 and the requirements of this Section, not the ACI methods. Mixes may be designed either by a commercial laboratory or by PCI certified concrete plant personnel. Prior to adoption of a mix design as a plant standard, it shall be field tested by use of the production plant batching and mixing equipment, construction methods, and curing to be used in production of the members.

**SECTION 614
PILING WALLS**

614.5-CORROSION PROTECTION:

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

Piles will be protected from corrosion and sealed by the placement of concrete or grout, from the bottom of the hole to the bottom of the lagging or as directed by the Engineer. Vibration of the concrete or grout is not required. The Contractor shall complete all concrete or grout operations for holes drilled during the work day.

The drilled hole shall be pumped free of water and shall be reasonably free of fall-in soil or other debris prior to the placement of the concrete or grout. When unable to remove the water, the concrete or grout shall be pumped or tremied through a pipe beginning at the bottom of the drilled hole. The pipe shall be slowly raised ensuring the pipe end remains at least 2 feet (600 mm) below the surface of the concrete or grout. A means of positively measuring the elevation of

the concrete or grout as it is placed shall be provided by the Contractor. After placing the concrete or grout below water table, the Contractor has the option of either pumping or pouring directly into the hole the remainder of the concrete or grout provided the hole can be pumped to remove remaining water. Placing the concrete or grout from the bottom of the hole to the bottom of the lagging shall be accomplished in one continuous operation.

The Contractor will inform the Engineer, at the preconstruction conference, as to the type of corrosion protection that will be used. Intermixing of concrete and grout will not be allowed, unless approved by the Engineer.

Concrete shall be in accordance with Section 601, Class B. The job site testing is waived.

Grout will be furnished and placed in accordance with the requirements specified herein. The acceptance sampling and testing of the grout is the responsibility of the Division.

Quality Control of the concrete or grout is the responsibility of the Contractor as designated in Materials Procedure MP 601.03.50. The Contractor shall maintain equipment and qualified personnel, who shall direct all field inspection, sampling, and testing necessary to determine the magnitude of the various properties of the concrete and grout governed by the Specifications and shall maintain these properties within the limits of this Specification. The Quality Control Plan designated in MP 601.03.50 shall be submitted to the Engineer at the pre-construction conference. Work shall not begin until the Plan is reviewed for conformance with the contract documents.

The required 7-day compressive strength of the grout shall be a minimum of 1,600 psi (11 MPa). Piling which has been installed with grout which does not attain the 1,600 psi (11 MPa) strength in 7 days shall be paid for at a reduced unit price equal to 80% of the unit bid price for steel pile. The penalty would include the entire length of each pile which has been installed with failing grout. Grout with compressive strength of less than 1,000 psi (7 MPa) shall be evaluated by the Engineer as to the adequacy for the use intended. All grout evaluated as unsatisfactory for the use intended shall be removed and replaced or otherwise corrected by and at the expense of the Contractor as required in 105.3.

A grout strength test shall consist of testing three 6 in x 12 in (150 mm x 300 mm) cylindrical specimens. The test results shall be the average of the three specimens. A minimum of one set of three specimens shall be made for each day's operations.

614.7-LAGGING AND BACKFILLING:

DELETE PARAGRAPH ONE AND REPLACE WITH THE FOLLOWING:

Lagging of the type and size as specified on the Plans shall be installed between the piles. Backfilling and restoration of the roadway template shall be as shown on the Plans. Precast concrete lagging shall be fabricated in accordance with the requirements of MP 604.02.40.

SECTION 620 THREE-SIDED REINFORCED CONCRETE BRIDGE/CULVERT

620.3-DESIGN CRITERIA:

620.3.2-Precast Three-Sided Bridge/Culverts:

DELETE PARAGRAPH ONE AND REPLACE WITH THE FOLLOWING:

The bridge/culvert unit dimension and reinforcement details shall be as prescribed in the plan and the shop drawings provided by the manufacturer. The minimum concrete compressive strength shall be 4000 psi (28MPa). The minimum steel yield strength shall be 60 ksi (414 MPa). The minimum required strength for form removal and handling shall be 70% of Design Strength unless otherwise specified by the Designer. The precast three-sided bridge/culvert unit shall also conform to MP 604.02.40.

SECTION 626 RETAINING WALL SYSTEMS

626.5-MATERIALS:

626.5.1-Mechanically Stabilized Earth Components:

626.5.1.1-Facing Elements:

626.5.1.1.1-Reinforced Concrete Facing Elements:

DELETE THE LAST PARAGRAPH OF THIS SUBSECTION 626.5.1.1.1 AND REPLACE WITH THE FOLLOWING:

All reinforcing steel shall be in accordance with Section 602 and shall be epoxy coated. Precast concrete Mechanically Stabilized Earth wall facing elements shall also conform to MP 604.02.40.

626.5.1.1.2-Modular Block Facings:

626.5.1.1.2.1-Modular Block Mix Design:

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

Each manufacturing facility shall provide a copy of their mix design, including test results and material sources, to MCS&T Division for each type of block that they manufacture. A separate mix design shall be required for each type of block, as the compaction of each type of block may vary and affect the various test results. An approved independent laboratory shall perform the testing when establishing the mix design. After initial approval, each mix design shall remain approved for a period of three years after the date of initial approval. If there are any changes in the mix, such as changes in material sources, any materials such as pigments are added, or the pigment color is changed, then a new mix design shall be required. The modular block units shall conform to the following:

SECTION 636 MAINTAINING TRAFFIC

636.2-MATERIALS:

ADD THE FOLLOWING SUBSECTION:

636.2.1-Materials Certification: The Contractor will furnish a notarized Letter of Certification for all traffic control items.

This letter shall state that the Contractor has inspected all materials upon arrival and that where applicable the materials are supplied from pre-approved DOH sources with respective lab numbers included on all invoices. The Contractor's letter shall state that all traffic control devices, flaggers, pilot trucks, signs, temporary pavement marking materials, materials for temporary structures, aggregate for temporary roads, and dust palliatives all conform to the requirements specified in Section 636 of the Standard Specifications and all related Contract Documents.

This Letter of Certification is not allowed to be from any Subcontractor, nor will the Division accept any pass-through letters.

636.9-TRAFFIC CONTROL DEVICES:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Traffic control devices for work areas include, but may not be limited to, signs, barricades, drums, cones, channelizer cones, delineators, and flashers. They shall be installed in accordance with standards detailed in the manual "*Manual on Temporary Traffic Control for Streets and Highways*", latest version, published by the Division, or as shown on the plans.

If the Total Contact Bid Amount is over \$500,000 or otherwise noted on the plans Traffic Control Devices also include work area signs indicating fines. These signs shall be installed 500' (150 m) after the first maintenance of traffic sign installed for each project. The signs shall be installed in both directions on the road under construction. The sizes, messages, and designs shall as shown in the Sign Fabrication Manual or as directed by the Engineer. With the larger size used for four lane expressway roadways with speeds of 55 MPH or greater and the smaller sign used for two lane roadways with speeds of 50 MPH or greater and with an ADT at 3,000 or greater. A 12' x 6' expressway sign (Item 636011-* - 300 units) placed behind guardrail on 3-4 #BB U-Channel or on 3 - 4" x 4" wood post or 8' x 4' - two lane highway sign (Item 636011-* - 180 units) placed behind guardrail on 2 - 4 #BB U-Channel or on 2 - 4" x 4" wood post. The u-channel supports used shall be from the Division Approved Products List.

If the project is on an Interstate Highway, an APD (Appalachian Highway Corridor), a controlled access highway with posted speed limit of 40 Miles Per Hour (MPH) or greater, or if otherwise noted on the plans, Traffic Control Devices shall include work area signs designated "GIVE 'EM A BRAKE" (GEAB). The sign size, message, and design shall be as shown on Sign Fabrication G30-1 or as directed by the Engineer.

The sign (Item 636011-*, 300 units) shall be installed 500'-1500' after the first lead-in work area sign unless the work zone is greater than one (1) mile, in length, in which case the GEAB sign shall be installed approximately ¼ mile in advance of the active work area. At no time shall the GEAB sign be closer than 500' from any other work area signing. The sign shall be installed in both directions on the right side of the highway. All GEAB signs not behind guardrail shall be installed on three, 3 pound per foot u-channel posts driven to a depth of 3 ½ feet. The posts shall utilize stubs driven to a depth of 3-1/2 feet and shall not extend above ground level more than four (4) inches. An appropriate length upper support u-channel shall be connected to each stub using a breakaway mechanism, appropriate for the operating speed of the roadway, recommended by the u-channel manufacturer which will result in the assembly meeting the crashworthiness

requirements of either NCHRP-350 or AASHTO-MASH, latest edition. If the assembly is installed behind guardrail, the supports may be direct driven without a splice, or stubs may be used with the upper supports connected using a method approved by the Engineer, or 2 – 4 #BB U-channel supports may be used. The u-channel supports used shall be from the Division Approved Products List.

GEAB sign shall only be installed in active work areas where workers are present and visible to passing motorists. During periods of inactivity in the work area, the GEAB sign(s) shall be covered or removed.

All traffic control devices manufactured on or before December 31, 2019 shall meet the crash testing performance requirements of National Cooperative Highway Research Program Report 350 (NCHRP-350) and/or the American Association of State and Highway Transportation Officials publication Manual for Assessing Safety Hardware (AASHTO-MASH), 2009 or 2016. With the exception of Category 1 (as defined by FHWA) work zone devices, all devices shall have a supporting NCHRP-350 and/or AASHTO-MASH eligibility letter from the FHWA. Category 1 devices shall have a supporting NCHRP-350 self-certification letter from the device manufacturer or a AASHTO-MASH eligibility from FHWA. Devices, including portable barriers, manufactured after December 31, 2019 must have been successfully tested to the 2016 edition of AASHTO-MASH. Such devices manufactured before this date may continue to be used throughout their normal service lives.

All devices shall be assembled and utilized in a manner that is consistent with the crash testing of the devices. For example, portable sign stands shall only be used within the parameters of the crash testing of the stands unless otherwise allowed for in the FHWA eligibility letter or by other official guidance or policy from FHWA regarding NCHRP-350 or AASHTO regarding MASH. In the case of portable sign stands for example, these parameters include, but are not necessarily limited to sign mounting height, sign substrate material, maximum sign size, and the application of warning lights. Unless included as part of the testing of the device or allowed for as part of the manufacturer's self-certification for Category 1 devices, additional ballast added to devices shall only be as allowed for in the FHWA acceptance letter or by other official guidance or policy, as described previously.

Devices shall be a model listed on the Division's Approved Products List (APL), as applicable. Devices compliant with NCHRP-350 or MASH Test Level 3 may be utilized on all roadways. Devices compliant with NCHRP-350 or MASH Test Level 2 shall not be utilized on roads having a normal posted speed limit greater than forty (40) MPH. Devices compliant with NCHRP-350 or MASH Test Level 1 shall not be utilized on roads having a normal posted speed limit greater than twenty-five (25) MPH.

636.14-TEMPORARY BARRIER:

636.14.1-Materials:

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

Temporary Barrier manufactured before December 31,2019 shall meet the requirements of NCHRP Report 350 and/or MASH-09 for the different test levels as shown in Table 3.1 "Test Matrix for Longitudinal Barriers" in NCHRP Report 350. Temporary Barrier manufactured after December 31, 2019, must have been successfully tested to the 2016 edition of MASH.

Specific types of temporary barrier will not be used unless crash tested and approved by the Engineer. Historical performance will help determine use of a product. Poor performance may be grounds for non-acceptance.

Temporary Barriers shall have adequate drainage slots to allow runoff to pass through.

Temporary Barrier shall have 8" x 12" Type B-1 Delineators (white or yellow as appropriate) facing traffic at 40 foot centers.

636.14.2-Installation:

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

This barrier type shall conform to the details on the Plans, set as directed on the Plans, with the barrier sections securely connected together by satisfactory fastening devices to provide a more stable structure against impact.

A Temporary Barrier Installation Plan shall be approved according to Section 105.2.1.2 "Contractor Approval Method". It shall have information adequate to ensure it meets the installation conditions below and shall include barrier type, barrier connection type, NCHRP/MASH test approval and data, individual segment length, anchorage details, end treatments, and transition details.

The temporary barrier shall be placed to match test conditions as determined by the Engineer. These conditions may include, but not be limited to, anchorages, total length of barrier, individual segment length and connection details. Only one type of temporary barrier shall be used for any one continuous run of barrier in a project. To clarify, the entire length of temporary barrier shall not be intermixed in regard to type of barrier, connection type, or individual barrier length unless that configuration has been tested.

Anchorage spacing and installation, if required, shall be per manufacturer subject to shop drawing review and approval and meet or exceed test conditions. Shop drawing information shall include details for anchor removal and patching and /or repair of pavement or bridge deck.

Where temporary barrier adjoins guardrail barrier, regardless if one is temporary and the other is permanent (newly constructed or previously in existence) or if both are temporary, they must be connected with a Temporary Guardrail Connector conforming to 636.16.2.

Where temporary barrier adjoins bridge parapet or other essentially non-yielding barrier or obstacle, they must be joined in a manner to maintain barrier continuity and prevent vehicle snagging during impact. If they cannot be joined in this manner, a connection device must be used to assure barrier continuity and to prevent vehicle snagging during impact.

When the temporary barriers are no longer needed, they will become the property of the Contractor, unless otherwise noted on the Plans.

J-J Hook connections shall be tensioned by pulling the barrier segments apart to make this type connection "tight".

Vehicles, materials or any other equipment shall not be stored in the Temporary Barrier buffer area. Unless required as a part of the contract, vehicles and equipment shall not work in the Temporary Barrier buffer area and if required, shall be limited to that time that it is necessary to be in that area.

SECTION 651 FURNISHING AND PLACING TOPSOIL

651.2-MATERIALS:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Topsoil shall consist of the uppermost layers of fertile and friable soil that contains humus material. This material varies in thickness in accordance with soil groups and usually possesses a darker color than the subsoil. The texture of the topsoil may vary within the range of natural loam, silty clay loam, and sandy loam. Acceptable topsoil shall contain organic matter in the range of 2% to 20% and be sampled at least once per project using AASHTO T267 method; multiple sources or change of sources shall also be sampled.

SECTION 679 OVERLAYING OF PORTLAND CEMENT CONCRETE BRIDGE DECKS

679.3-CONSTRUCTION METHODS:

679.3.7-Placing and Finishing Specialized Concrete Overlay:

679.3.7.1-General:

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

The following requirements shall apply for specialized concrete overlay placements:

- a) The overlay thickness shall be determined in accordance with Section 679.3. The Contractor shall restore the concrete overlay in a uniform manner to match existing grade unless otherwise directed by the Engineer. Under no circumstance, the overlay thickness shall not be less than 1 ¼ inches.
- b) The prepared surface of the structural slab shall be protected from contamination by any source and shall be in a saturated surface dry condition immediately prior to concrete placement.
- c) Concrete may be mixed at the point of deposition.
- d) When placing Specialized Concrete Overlays on a newly placed deck, the deck concrete shall be a minimum of 28 days old. The sidewalks, parapets, or curbs shall be a minimum of 7 days old.

679.5-FINAL BRIDGE DECK FINISH:

679.5.1-Straightedge Test:

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

After defective or damaged concrete has been repaired and cured in accordance with 679.4.9 and before opening to traffic, the bridge deck shall be grooved as set forth in 679.5.2.

Prior to grooving, the entire deck shall be checked by the Contractor in the presence of the Engineer with an approved rolling straightedge as outlined in section 601.11.4.

679.5.2-Finished Deck Grooving:

DELETE THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

679.5.2-Finished Deck Grooving:

679.5.2.1-Transverse Grooving: After corrective grinding and before opening to traffic, grooves shall be cut into the concrete using a mechanical saw. These grooves shall be 0.10 inch (2.5 mm) wide and 0.25inch (6 mm) deep. Groove spacing shall be 1.5 inches (37 mm) center to center. No later than one week prior to grooving operations, the Contractor shall provide the Engineer with two accurate, easily readable gauges with which to verify groove dimensions. Groove depth and spacing tolerances are limited to $\pm 1/16$ inch (1.5 mm). Groove width tolerances are +0.02 inch (0.5 mm) and -0.0 inch (0 mm). Grooves shall be cut continuously across the deck to within 1 ft. (300 mm) of gutter lines or drainage structures. Grooves shall also be continuous across the full width of the deck surface including construction joints. Grooves shall terminate within 1 in. (25 mm) of any exposed metal component or elastomeric concrete of an expansion joint. When the deck is skewed and the contractor is using gang blades to saw the grooves, the maximum distance (measured perpendicular to the centerline of the expansion joint) from the last groove termination in the pass to the expansion joint shall be 1ft., 8 inches (200 mm). Radial grooving shall be performed in increments limited to 12 ft. (3.6 m) of bridge length.

679.5.2.2-Longitudinal Grooving: Use diamond blades mounted on a multi-blade arbor on self-propelled machines that were built for grooving of concrete surfaces. The groove machines shall have depth control devices that detect variations in the pavement surface and adjust the cutting head height to maintain the specified depth of the groove. The grooving machines shall have devices to control alignment. Do not use flailing or impact type grooving equipment. More than one size grooving machine may be required in order to saw the grooves as specified.

Provide an experienced technician to supervise the location, alignment, layout, dimension, and grooving of the surface.

Saw grooves parallel to the bridge centerline in a continuous pattern across the surface. Begin and end sawing 9 to 12 inches (220 to 300 mm) from any device in place in a bridge deck, such as scuppers or expansion joints. Stop sawing a minimum of 2 inches (50 mm) to a maximum of 24 inches (600 mm) from skewed expansion joints. Maintain a clearance of a minimum of 2 inches (50 mm) and a maximum of 4 inches (100 mm) from the grooves to longitudinal joints in the deck. Maintain a minimum clearance of 9 inches (220 mm) to a maximum of 30 inches (750 mm) clearance between the grooves and the curb or parapet toe. However, at no point shall un-grooved portions of deck extend beyond edge line and into the temporary or permanent travelled lanes. Saw grooves in a uniform pattern spaced at 3/4 inch minus 1/4 inch or plus 0 inches (19 mm minus 6 mm or plus 0 mm). Saw grooves 0.15 inches (4 mm) deep and 0.10 inches (3 mm) wide. Groove tolerances for depth are +0.0625 inches (2 mm) and minus 0 inches (0 mm). Groove tolerances for width are +0.02 inches (0.5 mm) and minus 0 inches (0 mm).

For staged, or phased bridge deck work, saw the grooves parallel to the final, permanent bridge centerline. If the different stages or phases of the bridge deck work occur within one construction season, any stage opened to traffic shall receive an interim coarse broom finish during placement, then saw the longitudinal grooves after the final stage. The interim broom finish will not be allowed as a surface texture when opened to traffic over a winter season. Saw longitudinal grooves in the deck prior to opening to traffic for a winter season.

For bridge decks that widen from one end to the other, saw the longitudinal grooves parallel to the centerline of the roadway. On the side of the bridge that widens, saw the longitudinal grooves to follow the edge line. Saw longitudinal grooves in the gore areas, avoiding the overlapping of grooves.

At the beginning of each work shift, furnish a full complement of grooving blades with each saw that are capable of cutting grooves of the specified width, depth, and spacing.

If during the work, a single grooving blade on a machine becomes incapable of cutting a groove, continue work for the remainder of the work shift. The Contractor is not required to cut the groove omitted because of the failed blade. Should two or more grooving blades on a machine become incapable of cutting grooves, cease operating the machine until it is repaired.

Continuously remove all slurry and remaining residue from the grooving operation and leave the deck surface in a clean condition. Prevent residue from grooving operations from flowing across shoulders or across lanes occupied by public traffic or from flowing into gutters or other drainage facilities. Remove solid residue before the residue is blown by passing traffic or by wind.

Provide water as necessary to saw grooves according to this subsection.

DIVISION 700 MATERIALS DETAILS

SECTION 703 COARSE AGGREGATE

703.4-GRADING OF COARSE AGGREGATES:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Coarse aggregate shall be uniformly graded to conform to the requirements of Table 703.4. The gradations for coarse aggregates required by AASHTO M 43 shall be determined in accordance with AASHTO T 27.

The gradation of coarse aggregates in the production of concrete shall be controlled by the \bar{A} value as specified in 501.3 and 601.3. In addition, coarse aggregates to be used in Portland cement concrete shall have no more than one percent by weight passing the No. 200 (75 μm) sieve, except that this percentage may be increased to 1.5 in the case of crushed aggregate if the material finer than the No. 200 (75 μm) sieve consists of the dust of fracture, essentially free from clay or shale. The gradation shall be determined in accordance with AASHTO T 27 and T 11.

When the coarse aggregate is to be used in Portland cement concrete, larger percentages passing the No. 200 (75 μm) sieve in the coarse aggregate fraction will be permitted if the percent passing the No. 200 (75 μm) sieve in the fine aggregate fraction (702.1) is less than the specified maximum. In no event, however, shall the percent passing the No. 200 (75 μm) sieve in the total concrete aggregate be greater than an amount which would exist if both aggregate fractions contained their specified maximum percentage passing the No. 200 (75 μm) sieve.

SECTION 704 STONE AND CRUSHED AGGREGATE

704.8-SHOT ROCK:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Shot rock shall be limestone, sandstone, or other inorganic material acceptable to the Division, having dimensions similar to that which exists after final blasting at the quarry site and prior to crushing. It shall contain material that would generally be retained on a 6 inch (150 mm) sieve, and not larger than that which could be tailgated from a single axle 8 to 10 ton (7 to 9 Mg) dump truck. In addition, some 10 inch to 12 inch (250 to 300 mm) material shall be represented as an intermediate size. Shot rock shall have a maximum weighted loss of 30 percent when subjected to five cycles of the Sodium Sulfate Soundness test, MP 703.00.22.

Acceptance shall be by visual inspection; a written explanation of the manufacturing process shall be provided if requested by the Engineer.

SECTION 705 ASPHALT MATERIALS

705.5-PERFORMANCE GRADED ASPHALT BINDERS:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Performance Graded (PG) Asphalt Binders shall conform to the requirements in Table 1 of AASHTO M-332, with the following deviations:

- Manufacturers are not required to meet the requirements of AASHTO T-314 in Direct Tension.
- For Binders grades with a $J_{nr\ 3.2}$ max requirement of 0.5 kPa^{-1} the manufacturer is not required to meet the 75% requirements for J_{nr} Diff.
- The indication of elastic response for PG 64E – 22 binders shall be determined using the Appendix X1-Indications of Elastic Response in AASHTO M 332.
- For Standard Testing Temperatures see Table 705A below.

Table 705A – Performance Graded Asphalt Binders

Binder Grade Designations	Testing Temperature	Non-recoverable creep compliance at 3.2kPa, J_{nr} (3.2), kPa^{-1} , Max	% Difference in Non-Recoverable Creep Compliance, $J_{nr}(\text{diff})$, %, Max
PG 58S – 28	58°C	4.5	75%
PG 64S – 22	64°C	4.5	75%
PG 64H – 22	64°C	2.0	75%
PG 64E – 22	64°C	0.5	-

A certified producer or distribution terminal will be the last source to handle/manipulate a PG binder before being shipped to an asphalt concrete plant or project. The producer or terminal will provide the PG binder certification report with the shipment.

SECTION 707 CONCRETE ADMIXTURES, CURING AND COATING MATERIALS

707.9-LIQUID MEMBRANE-FORMING COMPOUNDS FOR CURING CONCRETE:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Curing compounds shall conform to the requirements of ASTM C309, Type 2, Class A.

All curing compound must be tested by NTPEP and shown to meet the specification listed in the paragraph above.

**SECTION 714
CONCRETE, CLAY, FIBER AND PLASTIC PIPE**

714.2-REINFORCED CONCRETE CULVERT, STORM DRAIN AND SEWER PIPE:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

This pipe shall conform to the requirements of AASHTO M 170 or ASTM C 76 and MP 714.03.30.

714.23-PRECAST REINFORCED CONCRETE BOX CULVERTS:

DELETE PARAGRAPH ONE AND REPLACE WITH THE FOLLOWING:

Precast reinforced concrete box culverts shall conform to the requirements of AASHTO M259 where depth of cover is 2 feet (600 mm) or more and AASHTO M273 where depth of cover is less than 2 feet (600 mm). Interstate live load design shall be provided for Interstate highway facilities: and HS20 live load design shall be provided for other locations. Precast reinforced concrete box culverts shall also conform to MP 604.02.40.

**SECTION 715
MISCELLANEOUS MATERIAL**

715.19-PRECAST CONCRETE UNITS FOR MANHOLES AND INLETS:

DELETE PARAGRAPH ONE AND REPLACE WITH THE FOLLOWING:

Precast concrete units for manholes shall conform to the requirements in AASHTO M 199 and MP 604.02.40. In addition, air entrainment in the concrete shall be seven percent plus or minus two percent.

715.22-PRECAST CONCRETE MEDIAN BARRIERS (PERMANENT):

715.22.2-Materials:

DELETE THE LAST SENTENCE IN THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

Sampling and testing of materials shall be in accordance with the minimum frequency stated in MP 603.02.10.

715.42-TRAFFIC SIGNAL MATERIALS AND EQUIPMENT:

715.42.8-Cabinets:

DELETE SECTION 715.42.8 AND REPLACE WITH THE FOLLOWING:

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

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

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

All seams that are not welded shall be sealed with RTV sealant or equivalent material on the interior of the cabinet. All cabinets shall be supplied with a minimum of two (2) removable shelves manufactured from 5052-H32aluminum. Shelves shall be a minimum of 10 inches deep. Shelves to be designed to accommodate a minimum 50 pound loading.

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

The main door and police door-in-door shall close against a weatherproof and dust-proof, closed-cell neoprene gasket seal. The gasket material for the main door shall be a minimum of 0.250 inches thick by 1.00 inch wide. The gasket material for the police door shall be a minimum of 0.250 inches thick by 0.500 inches wide. The gaskets shall be permanently bonded to the cabinet. The cabinet shall be equipped with a louvered air entrance. The air inlet shall be large enough to allow sufficient air flow per the rated fan capacity. Louvers must satisfy the NEMA rod entry test for 3R ventilated enclosures. A non-corrosive, vermin- and insect-proof, removable air filter shall be secured to the air entrance. The filter shall fit snugly against the cabinet door wall. The roof of the cabinet

shall incorporate an exhaust plenum with a vent screen. Perforations in the vent screen shall not exceed 0.125 inches in diameter.

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

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

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

Pole Mounted Cabinets	Ground Mounted Cabinets
Height - 50 Inches	Height – 55 Inches
Width – 36 Inches	Width – 44 Inches
Depth – 17 Inches	Depth – 26 Inches
Dimensions shall not exceed these minimum dimensions by more than 2 inches.	

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

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

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

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

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

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

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

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

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

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

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

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

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

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

- a. A minimum of one (1) 40-amp main breaker for 16 position cabinets. This breaker shall supply power to the controller, MMU, signals, cabinet power supply and auxiliary panels. Breakers shall be at minimum, a thermal magnetic type, UL listed for HACR service, with a minimum of 10,000 amp interrupting capacity.
- b. A minimum of one (1) 15-amp auxiliary breaker. This breaker shall supply power to the fan, light and GFI utility outlet.
- c. An EDCO model SHP-300-10 or exact approved equivalent surge arrester.
- d. A 50 amp, 125 VAC radio interference line filter.
- e. A normally-open, 50-amp, Solid State Relay (SSR). Shall be Crydom Model Number HA4875H or approved equal.

- f. A minimum of one (1) 8-position neutral bus bar is capable of connecting three #12 wires per position.
- g. A minimum of one (1) 6-position ground bus bar capable of connecting three #12 wires per position.
- h. A minimum of one (1) NEMA type 5-15R GFI utility outlet.
- i. The cabinet shall have a roll-out/swing-out concealable shelf/platform that can be used as platform for a laptop computer or other tools when the cabinet door is opened.

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

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

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

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

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

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

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

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

Lightning protection device mounting holes shall be provided to accommodate the potential usage of an EDCO LCA-6, lightning protection device. A cable consisting of 20 AWG twisted pair wires shall be wired directly from the interface panel to the detector rack. The twisted pair wires shall be color coded red and white wire. No connectors shall be used to connect the interface panel to the detector rack.

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

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

- a. Signals On/Off Switch - In the OFF position, power shall be removed from signal heads in the intersection. The controller shall continue to operate. When in the OFF position, the MMU shall not conflict or require reset.
- b. Auto/Flash Switch - When in the flash position, power shall be maintained to the controller and the intersection shall be placed in flash. The controller shall not be stop timed when in flash. Wired according to NEMA-TS2-2003 the MMU forces the controller to initiate the start-up sequence when existing flash.
- c. Stop Time Switch - When applied, the controller shall be stop timed in the current interval.
- d. Control Equipment Power On/Off - This switch shall control the controller, MMU, and cabinet power supply AC power. The TS2 controller to be provided with the cabinet assembly shall provide vehicular and pedestrian call inputs from its keyboard while in the standard status display.

The police door switch panel shall contain the following:

- a. Signals On/Off Switch - In the OFF position, power shall be removed from signal heads within the intersection. The controller shall continue to operate. When in the OFF position, the MMU shall not conflict or require reset.

- b. Auto/Flash Switch – When in the flash position, power shall be maintained to the controller and the intersection shall be placed in flash. The controller shall be stop timed when in flash. Wired according to NEMA-TS2-1998 the MMU forces the controller to initiate the start-up sequence when exiting flash.
- c. Auto/Manual Switch - Cabinet wiring shall include provisions for an Auto/Manual switch and a momentary push button or hand cord. The Auto/Manual switch and push button or hand cord shall not be provided unless it is called for in the Customer Specification.

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

715.42.8.8-Auxiliary Devices:

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

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

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

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

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

715.42.8.8.5-Bus Interface Units (BIU): All BIUs shall meet the requirements of Section 8 of the NEMA TS2 Standard. A full complement of BIUs meeting Section 5.3.1.4

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

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

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

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

715.42-TRAFFIC SIGNAL MATERIALS AND EQUIPMENT:

715.42.11-Junction Boxes:

715.42.11.2-Type H-(Heavy Duty):

DELETE PARAGRAPH TWO OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING PARAGRAPH.

Precast concrete junction boxes shall be fabricated in accordance with the requirements of MP 604.02.40.

ADD THE FOLLOWING SECTION:

SECTION 720 SMOOTHNESS TESTING

720.1-DESCRIPTION:

To measure and evaluate the ride quality of pavement surfaces in accordance with the International Roughness Index (IRI), as well as the most recent forms of AASHTO R-56, AASHTO M328, and AASHTO R-57.

720.2-EQUIPMENT:

720.2.1-High-Speed or Low Speed Inertial Profiler: Provide a high-speed or low speed inertial profiler for measuring and evaluating the ride quality of pavement surfaces. The inertial profiler shall be certified at a facility approved by the Materials Control, Soils and Testing Division (MCS&T). Certification facilities should conduct the evaluation in accordance with the most recent edition of AASHTO R-56 “Standard Practice for Certification of Inertial Profiling Systems”. All inertial profilers shall be maintained in accordance with the most recent edition of AASHTO M328 “Standard Specifications for Inertial Profiler”. The Contractor shall submit equipment certification documentation after becoming certified or after recertification. A current decal provided by the certification facility shall be displayed on the inertial profiler to indicate equipment certification compliance.

720.2.2-Inertial Profiler Operator Certification: Certification through the Material Control, Soils and Testing Division shall be required to operate an inertial profiler in the State of West Virginia. The operator shall pass a written exam administered by MCS&T. All operators receiving a passing score on the written exam will be placed on the Material Division’s Approved Source List “WVDOH Certified Profilers”. Certification shall be for a period of four years. Certified operators shall submit an application for certification renewal to MSC&T. After reviewing the certification renewal application, MCS&T may issue the operator a new four-year certification or may require the operator to retest for certification renewal.

720.3-RIDE QUALITY TESTING

720.3.1-Quality Control (QC) Testing: QC testing on NHS routes is the responsibility of the Contractor. QC testing shall be completed no later than ten (10) calendar days after all lanes are continuously open to traffic. Data collection shall be done by a certified inertial profiler and certified inertial profiler operator (See 720.2.1 and 720.2.1.). Collected profile data shall be submitted via email to dohmcsntroadway@wv.gov within five (5) calendar days of testing. Profile data shall be collected and submitted in accordance with the most recent edition of AASHTO R-57.

720.3.2-Quality Assurance (QA) Testing: QA testing is the responsibility of the Division. The Engineer shall submit a “Bridge and Pavement Testing Request Form” form to MCS&T via email, within five (5) calendar days after all stages of paving are completed. Within ten (10) working days from receiving the request, the Division will conduct QA testing. The Division shall use a certified inertial profiler and certified operator for QA testing.

720.3.3-Quality Assurance Verification (QAV) Testing: QAV testing is the responsibility of the Division. The Division’s profile data and the Contractor’s profile data will be compared to determine the IRI differences. Final project price adjustments will be made using the Contractor’s profile data if the IRI differences are within the allowable limits outlined in Table 720.3.3.

**TABLE 720.3.3
QAV Testing Allowable IRI Differences**

Contractor’s IRI Mean (in/mi)	Maximum Allowable Differences
50.0 or Less	8.5% of Contractor’s IRI Mean
50.1 to 150.0	6.0% of Contractor’s IRI Mean
150.1 or Greater	7.0% of Contractor’s IRI Mean

720.3.4-Referee Testing: Referee testing is the responsibility of the Division. If the QAV testing IRI differences does not meet the maximum allowable difference from Table 720.4.3, the Division will perform referee testing using a certified inertial profiler and a certified inertial profiler operator in accordance with the most recent edition of AASHTO R56 “Standard Practice for Certification of Inertial Profiling Systems”. The profile data from the referee test shall be used in determining the final project price adjustments.

720.3.4.1-Referee Data: If the referee test data still does not meet the allowable IRI differences MCS&T can recommend the Contractor recertify their inertial profiler and inertial profiler operator that was used on the project.

720.3.5-Testing After Repairs: Should repairs be needed to the surface from the defects in the pavement prior to project closeout, QA and QAV testing shall be conducted after all repairs are made. This will be the final tested value for the lot.

720.4-RIDE QUALITY ANALYSIS

720.4.1-Data Location: The average IRI number used in ride quality analysis shall be the average international roughness number of the two wheel paths.

720.4.2-Omitted Sections: Bridge Structures and any sections tested which are not included in the pavement project shall be removed from the Smoothness Analysis. These removed bridges and sections shall also include a Lead-In and Lead-Out distance to be removed from the Ride Quality Analysis. The Lead-In distance shall be two hundred (200) feet and the Lead-Out distance shall be two hundred (200) feet.

720.4.3-Sampling Lots: The pavement shall be divided into sampling lots of one-tenth (0.1) lane mile each. Each Lot shall have t a smoothness measurement, expressed in inches per mile (in./mi.).

720.4.3.1-Special Cases for Sampling Lots Less Than One-Tenth (0.1) Lane Mile: In some cases, sampling, lots of one tenth (0.1) lane mile will not be attainable. These cases include areas at the end of the project as well as areas that are before the ‘lead in’ length of bridges. If these areas are less than five-hundredths (0.05) of a lane mile that will be eliminated from Smoothness analysis. If these areas are more than five-hundredths (0.05 mile) lane mile

these areas will be included in analysis and pay adjustments will be prorated to the nearest one hundredth (.01) mile. This shall apply to all projects governed by Section 720.

720.4.4-Rounding: IRI numbers shall be rounded to the nearest whole number. Rounding of IRI shall be done in accordance with MP 109.01.01, “Rounding of Numbers”.

720.5-NATIONAL HIGHWAY SYSTEM (NHS) PAVEMENT PROJECT:

Pavement projects located on any NHS route and greater than 0.2 miles of continuous new pavement shall be tested with a high-speed or low speed inertial profiler certified in accordance with Section 720.2.

720.5.1-Determining National Highway System Routes- The “West Virginia NHS Routes by County” Section of the most recent Annual Roadway Inventory Statistics document should be used when determining if a route is on the National Highway System. This document can be found online at:

http://www.transportation.wv.gov/highways/programplanning/gti/Highway_Data_Services/Pages/DataResources.aspx

720.5.2-Schedule 1 NHS Pavement Projects: NHS pavement projects with a pavement thickness of four (4) inches or greater shall be classified as Schedule 1 NHS Pavement Projects. The final price adjustments for Schedule 1 NHS Pavement Projects shall be determined using the calculations shown in Table 720.5.2.

**TABLE 720.5.2
Schedule 1 NHS Pavement Projects**

IRI for each 0.1-mile section (in/mi)	Price Adjustment (\$)
30.0 or Less	+600
30.1 to 60.0	-20(IRI) + 1,200
60.1 to 65.0	0
65.1 to 95.0	-20(IRI) + 1,300
95.1 or Greater	Corrective Action Required

720.5.2.1-Corrective Action for Schedule 1 NHS Pavement Projects: Corrective action shall be required for Schedule 1 NHS Pavement Projects having an IRI greater than 95.1 in/mi. Corrective action shall be performed using diamond grinding, micro milling, or other work methods approved by the Engineer.

720.5.3-Schedule 2 NHS Pavement Projects: NHS pavement projects with a pavement thickness three (3) inches or greater and less than four (4) inches shall be classified as Schedule 2 NHS Pavement Projects. The final price adjustments for Schedule 2 NHS Pavement Projects shall be determined using the calculations shown in Table 720.5.3.

**TABLE 720.5.3
Schedule 2 NHS Pavement Projects**

IRI for each 0.1-mile section (in/mi)	Price Adjustment (\$)
46.0 or Less	+600
46.1 to 76.0	-20(IRI) + 1,520
76.1 to 80.0	0
80.1 to 120.0	1,200 - 15(IRI)
120.1 or Greater	-600

720.5.4-Schedule 3 NHS Pavement Projects: NHS pavement projects with a pavement thickness less than three (3) inches and more than one (1) inch shall be classified as Schedule 3 NHS Pavement Projects. The final price adjustments for Schedule 3 NHS Pavement Projects shall be determined using the calculations shown in Table 720.5.3.

**TABLE 720.5.4
Schedule 3 NHS Pavement Projects**

IRI for each 0.1-mile section (in/mi)	Price Adjustment (\$)
46.0 or Less	+300
46.1 to 76.0	-10(IRI) + 760
76.1 or Greater	0

720.6-NON-NATIONAL HIGHWAY PAVEMENT PROJECTS:

Pavement projects located on any Non-NHS routes shall be tested with equipment outlined in 720.2.1, 720.2.2 and 720.3 if the project meets all four of the following requirements:

1. Greater than 0.2 miles of continuous pavement,
2. Sixteen (16) feet or wider
3. Thickness of one inch (1) or more of new pavement (including scratch if used)
4. Minimum Average Daily Traffic (ADT) of one hundred (100)

720.6.1-Ride Quality Analysis Before Project Completion: Non-NHS pavement projects shall be tested before the pavement project begins the pavement project is completed.

720.6.1.1-Data Source Collection Before Beginning Project: The data collection before project begins may be collected from one of the following sources: (a) The Division’s highspeed or low speed inertial profiler, (b) The Contractor’s data if the data was collected with a certified inertial profiler and certified inertial profiler operator, (c) The Division’s data base.

720.6.2-Data Source Collection After Project Completion: The data source collection after project completion shall be collected by the Division’s high-speed or low speed inertial profiler. On non-NHS routes Quality Control Testing is optional for the contractor.

720.6.3-Final Price Adjustments: Final price adjustment incentives shall be calculated using percent improvement. 0.1-mile sections of after project completion data with an IRI of 170 in/mi or greater will be ineligible for final price adjustment. The final price adjustments for Non-NHS Pavement Projects shall be determined using the calculations shown in Table 720.6.5.

**TABLE 720.6.3
Non-NHS Pavement Projects**

Percent Improvement (%)	Price Adjustment Incentive (\$ per 0.1-mile Section)
75.0 or Greater	+450
50.1 to 74.9	18 (Percent Improvement) - 900
50.0 or Less	0
Where: $\text{Percent Improvement (\%)} = \frac{\text{Before IRI of Lot} - \text{After IRI of same Lot}}{\text{Before IRI of Lot}} \times 100$	

720.7-PROJECT THAT DO NOT FALL UNDER PREVIOUS CHARACTERIZATIONS:

At the discretion of the Engineer pavement projects not falling into any of the other classifications shall be measured and evaluated for ride quality analysis under the direction of the Engineer. If recommended by the Engineer this shall be done by the Contractor with a 10-foot straightedge. There will not be any pay adjustments based on Smoothness for these projects.

720.7.1-New Pavement That is One (1) Inch or Less in Thickness: Pavement projects that are less than one (1) inch of new pavement will not be tested for Smoothness.