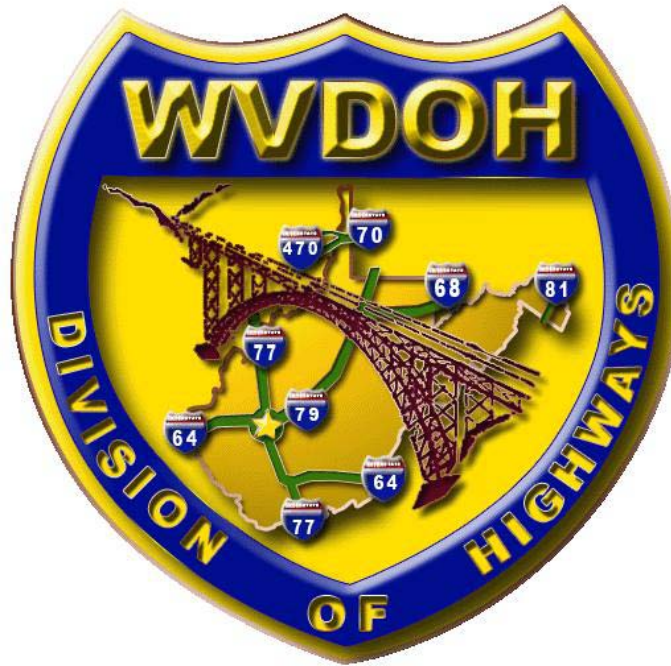


WEST VIRGINIA DIVISION OF HIGHWAYS



SUPPLEMENTAL SPECIFICATIONS

TO ACCOMPANY THE 2010 EDITION OF
THE STANDARD SPECIFICATIONS
Roads and Bridges

ISSUED JANUARY 1, 2011

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DIVISION 100 GENERAL PROVISIONS

SECTION 107 LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

107.1-LAWS TO BE OBSERVED:

DELETE THE LAST SENTENCE AND REPLACE WITH THE FOLLOWING:

The Contractor shall at all times observe and comply with all such laws, ordinances, regulations, orders and decrees; and shall protect and indemnify, defend and hold DOH harmless from any and all claims, liabilities and causes of action for any fines or penalties imposed on DOH by any state or federal agency because of violation by CONTRACTOR or any of its subcontractors and/or consultants of any state or federal law or regulation.

107.2-PERMITS, LICENSES, AND TAXES:

ADD THE FOLLOWING PARAGRAPH TO THE SECTION:

The Contractor shall provide the Division with sufficient documentation that all applicable taxes have been paid within 120 days of the project acceptance as provided for in 105.16. The Division shall have the right to revoke the Contractor's Prequalification until the Contractor provides sufficient documentation that all taxes have been paid or are the subject of a timely filed dispute currently pending in a court or other body having legal authority and jurisdiction to hear the dispute.

107.14 – RESPONSIBILITY FOR DAMAGE CLAIMS:

DELETE THE SECTION AND REPLACE WITH THE FOLLOWING:

107.14-RESPONSIBILITY FOR DAMAGE CLAIMS:

The Contractor shall indemnify and save harmless the Division, its officers and employees, from all suits, actions, or claims of any character brought because of any injuries or damage received or sustained by any person, persons, or property on account of the operations of the Contractor, its subcontractors and/or consultants; or on account of or in consequence of any neglect in safeguarding the work; or through use of unacceptable materials in constructing the work; or because of any act or omission, neglect, or misconduct of the

Contractor its subcontractors and/or consultants; or because of any claims or amounts recovered from any infringements of patent, trademark, or copyright; or from any claims or amounts arising or recovered under the "Worker's Compensation Act," or any other law, ordinance, order, or decree; and so much of the money due the Contractor under and by virtue of their Contract as may be considered necessary by the Division for such purpose may be retained for the use of the Division or, in case no money is due, their surety may be held until such suit or suits, action or actions, claim or claims for injuries or damages as aforesaid shall have been settled and suitable evidence to that effect furnished to the Division; except that money due the Contractor will not be withheld when the Contractor produces satisfactory evidence that the Contractor is adequately protected by public liability and property damage insurance.

107.21-PROTECTION OF RIVERS, STREAMS, AND IMPOUNDMENTS:

107.21.1-Erosion and Siltation Control:

DELETE THE ENTIRE SUB-SUBSECTION AND TITLE AND REPLACE WITH THE FOLLOWING:

107.21.1-Erosion and Sedimentation Control:

The Contractor shall be responsible for water quality throughout the duration of construction in accordance with the National Pollutant Discharge Elimination System (NPDES) permit registration with the West Virginia Department of Environmental Protection Agency (WVDEP). The Contractor will responsible for the following:

- i. Developing and implementing an effective erosion and sediment control plan.
- ii. Directing the construction, operation, maintenance and dismantling of temporary erosion and sediment control features.
- iii. Implementing remedial action to correct and/or repair failing erosion and sediment control features.
- iv. Implementing storm and winter shutdown procedures.
- v. Shaping the earthwork prior to the suspension of grading operations each day in a manner that will permit storm runoff with minimum erosion.
- vi. Installing, operating and maintaining erosion and sediment control features in an acceptable condition.
- vii. Cleaning out and restoring to original conditions any erosion or sediment control feature that has reached half of its capacity. For sediment basins, one half of its capacity is considered as wet volume storage.

The Contractor shall prepare a Spill Prevention, Control and Countermeasures (SPCC) plan that itemizes specific measures that will be

implemented to prevent and clean up chemical and petroleum product spills that may occur during all phases of construction. Fuel storage and refueling activities, equipment maintenance activities and equipment washing will be kept at least 500 feet away from any watercourse or wetland.

Any details not shown in the plans shall be in accordance with the latest version of the West Virginia Division of Highways Erosion and Sediment Control Manual. In the event that temporary erosion and sediment control measures are necessary due to the Contractors negligence, carelessness or failure to install permanent controls as part of the work as scheduled, such work shall be performed by the Contractor at his own expense.

In addition to the above, the Contractor shall make themselves familiar with all requirements contained within the WVDEP's General Water Pollution Control Permit, Stormwater Associated with Construction Activities Permit Number WV0115924. A copy of this permit can be found at the following internet address:

<http://www.dep.wv.gov/WWE/Programs/stormwater>

Noncompliance with permit conditions constitutes a violation of the Clean Water Act and State Code and is subject to enforcement action by the WVDEP.

At the Project's Pre-Construction Conference, the Contractor shall submit to the Department in addition to the appropriate number of Erosion and Sediment Control Plans, the Co-Applicant #1 signature page (Exhibit 1) and the Contractor's E&S Manager Contact.

The Contractor's E&S Contact shall contain the following information: the name, title, mailing address and telephone number of the person who will be responsible for the Erosion and Sediment Control plans, implementation, maintenance, etc., for the life of the NPDES registration.

Upon completion of the Pre-Construction Conference, the Department will modify the existing NPDES registration for this project to make the Contractor the number one Co-Applicant to the permit. Once this has been completed, the Contractor shall be responsible for any and all fees, violations and fines assessed against the project that is a result of the Contractor's negligence, carelessness, or failure to install permanent controls as part of the work as scheduled.

Once the project is complete, the Contractor will still bear responsibility for the NPDES registration until either a Notice of Termination (NOT) is received from the WVDEP or the Contractor has received final payment for the project. If an NOT has not been received by the time the final payment is made, the Department will modify the NPDES registration to remove the Contractor's name from the registration.

The exhibit can be located online at:

<http://www.transportation.wv.gov/highways/contractadmin/specifications/107.21.1EnSExhibit1/Pages/default.aspx>

**SECTION 107.21.1 EXHIBIT 1
COAPPLICANT #1 SIGNATURE PAGE**

	Co-Applicant #1: 	New NPDES Storm Water Construction
	Co-Applicant #1 Signature Page	Project Name:

BY COMPLETING AND SUBMITTING THIS APPLICATION, I HAVE REVIEWED AND UNDERSTAND AND AGREE TO THE TERMS AND CONDITIONS OF THE GENERAL PERMIT ISSUED ON NOVEMBER 5, 2007. I UNDERSTAND THAT PROVISIONS OF THE PERMIT ARE ENFORCEABLE BY LAW. VIOLATION OF ANY TERM AND CONDITION OF THE GENERAL PERMIT AND/OR OTHER APPLICABLE LAW OR REGULATIONS CAN LEAD TO ENFORCEMENT ACTION.

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED ON THIS FORM AND ALL ATTACHMENTS AND THAT, BASED ON MY INQUIRING OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, THE INFORMATION SUBMITTED IS, TO THE BEST OF MY KNOWLEDGE AND BELIEF, TRUE, ACCURATE, AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT.

(CO-APPLICANT #1 SIGNATURE)

Print Name:

Print Title:

Date:

PRIOR TO FILING THIS APPLICATION, YOU MAY WISH TO OBTAIN A COPY OF THE LEGISLATIVE RULES OF THE DEPARTMENT OF ENVIRONMENTAL PROTECTION, TITLE 47, SERIES 26, WATER POLLUTION CONTROL PERMIT FEE SCHEDULE IN ORDER TO DETERMINE THE APPROPRIATE PERMIT APPLICATION FEE REQUIRED TO ACCOMPANY YOUR SUBMISSION OF THIS APPLICATION. YOU CAN OBTAIN A COPY OF THE REGULATION FROM THE SECRETARY OF STATE'S OFFICE, STATE CAPITOL BUILDING, CHARLESTON, WV 25305. HOWEVER, YOU MAY WISH TO USE THE TABLE FOUND IN ITEM V. OF THE ATTACHED INSTRUCTIONS.

ALL SPILLS OR ACCIDENTAL DISCHARGES ARE REQUIRED TO BE REPORTED IMMEDIATELY TO THE EMERGENCY RESPONSE SPILL ALERT SYSTEM TOLL FREE TELEPHONE NUMBER 1-800-642-3074. CALLS FROM OUT OF STATE SHOULD BE MADE TO 304-348-8899.

DIVISION 200 EARTHWORK

SECTION 211 BORROW EXCAVATION

211.2-MATERIALS:

ADD THE FOLLOWING:

211.2.4-Impervious Core: Materials shall meet the requirements specified in Section 211.3.3.

CONSTRUCTION METHODS

211.3-GENERAL:

DELETE ALL AND REPLACE WITH THE FOLLOWING:

The Contractor shall locate and furnish all borrow sites to obtain materials in the amounts directed, by the methods and subject to the same provisions as prescribed in 207 except as modified or amended within. Borrow excavation should not be obtained or placed until after all available roadway excavation has been utilized in the embankments and there is no likelihood of slip or excess material. The Contractor will have the option to borrow within the WVDOH right-of-way limits (R/W) or on private property located outside the R/W. If the Contractor chooses to borrow within the R/W, the following procedure must be adhered to before any borrow will be allowed:

211.3.1-Borrow within WVDOH R/W Limits: The Contractor shall submit copies of a site plan for any borrow within the R/W and each page/sheet of all submittals shall be signed by a professional Engineer Registered in the State of West Virginia. The submittals and the approving Engineers' signature block shall be as per Section 105.2.1.2 for shop drawing submittals.

The plan for the site shall include, but not be limited to:

1. The location and approximate boundaries of the borrow site, including any adjacent landowner property information;
2. Topographical features including existing and final ground slopes, drainage structures, etc;
3. Storm water features, roads, access to properties, utilities, etc;

4. An erosion and sediment control plan utilizing the best management practices consistent with all phases of operation of the borrow site;
5. Restoration or cover vegetation plan of the site;
6. If the borrow site requires the modification of an existing US Army Corps of Engineers permit, the Contractor shall provide the necessary revised permit drawings to show the proposed changes to the DOH in order to modify the existing 404 permit and to obtain a 401 Water Quality Certification if necessary. A minimum of 2 months may be required to get approval.

Steepening of slopes will not be allowed for borrow sites within the R/W without a geotechnical analysis.

Upon receipt of the Contractor's complete borrow site submission, the Engineer shall follow the guidelines as set forth in the latest edition of the Erosion and Sediment Control Manual for review and acceptance by the Division. The Contractor may be required to revise the site plan prior to acceptance by the Division. The Contractor's borrow site plan must be approved as per section 105.2.1.2 and the West Virginia Department of Environmental Protection before any borrow material can be obtained from the site.

The DOH will bear the cost of all features associated with the borrow site except for necessary revisions to drainage structures (i.e. lengthening of culverts, etc.).

Upon completion of work, all borrow sites shall be neatly trimmed and drained and all debris and spoil disposed of in accordance with the approved plan. No material shall be borrowed from places other than those approved, except as provided. Slopes shall be trimmed neatly to present a uniform surface, free from hollows or protrusions and loose or overhanging rocks. The Contractor shall take precautions by benching or other methods to prevent slides and slip outs. Borrow areas shall be graded by the Contractor then fertilized, seeded and mulched in accordance with the applicable Specifications and will be paid for in accordance with the pay items within the contract.

The Contractor shall minimize pollution or sedimentation of rivers, streams, lakes, ponds, and other bodies of water while conducting borrow operations.

211.3.2-Borrow outside of WVDOH R/W Limits: For borrow sites outside the R/W, the Contractor and/or property owner shall bear all costs and responsibilities associated with the site. Appropriate Traffic Control items within the Project Limits will be paid accordingly. The Contractor and/or property owner shall comply with existing laws and/or regulations to include approval from the State Historic Preservation Officer and save the State harmless from any claims for damages which may result from the borrow.

The Contractor shall minimize pollution or sedimentation of rivers, streams, lakes, ponds, and other bodies of water while conducting borrow operations.

Borrow pits shall not be excavated below the level of the natural drainage for the area, and the drainage ditches required to keep the pit free from standing water during the progress of the work and upon completion and shall be constructed without extra compensation.

211.3.3-Impervious Core: Imperious cores shall be constructed for all sediment dams built of rock, gravel, and pervious soils.

The impervious core shall have a minimum dimensions as set forth in Item 5, par. 20.3.4.3.1 *Erosion and Sediment Control Manual*, West Virginia Division of Highways, latest edition.

When a key is necessary for the sediment dam, the impervious core shall be made an integral part of the key. When the impervious core is not constructed of soil, the core shall be anchored into the key by trenching for a minimum depth of 2 feet (610 mm).

The impervious core may be constructed using one of the following methods:

- a) **Soil Impervious Core:** Soil impervious cores may be shaped to facilitate placement and compaction. The coefficient of permeability of the soil used for the impervious core must be 10^{-4} cm per sec or less. A key, a minimum of 4 feet (1.2 m) in depth, must be constructed into the original ground. The compaction of the impervious core shall be as in accordance with Section 716.3.
- b) **Concrete Impervious Core:** When concrete is used for the impervious core, Class B Concrete shall be used. The requirements of Section 601, Structural Concrete shall control the mixture and placement of the concrete. The Engineer may waive the testing of the Class B Concrete if the concrete is from an approved plant.
- c) **HDPE or LLDPE Impervious Core:** When the impervious core is constructed of High Density Polyethylene (HDPE) or Low Linear Density Polyethylene (LLDPE), the liner shall be manufactured to be suitable for buried conditions and may be either smooth or textured. The Contractor shall obtain recommendations from a liner manufacturer for the material best suited for impervious cores, handling, storage, and construction procedures. The manufacturer of the liner shall furnish the Engineer a Letter of Certification stating the liner is suitable for the intended use.

- d) Other Methods for an Impervious Core:** The Contractor may design and use other methods of preventing the seepage of water from the wet area. The Engineer must approve the design of the alternative method.

When the impervious core is not constructed used the Soil Impervious Core method the Contractor shall submit a plan containing construction details and materials to be used for the impervious core(s) for the approval of the Engineer prior to the start of work and the purchase of any materials. This submittal will be part of the temporary and permanent pollution control schedules and methods required by Section 642.3-Preconstruction Conference, Construction Methods, Section 642, Temporary Pollution Control, of the *West Virginia Division of Highways Standard Specifications Roads and Bridges*, latest edition.

DIVISION 300 BASES

SECTION 311 OPEN GRADED FREE DRAINING BASE COURSE

311.4-COMPOSITION OF OPTIONAL STABILIZING MIXTURES:

DELETE THE SECOND PARAGRAPH AND REPLACE WITH THE FOLLOWING:

If the Portland cement stabilized alternative is chosen, the cement shall be Type 1 and shall have a minimum cement content of 150 ± 5 pounds per cubic yard (90 ± 2 kg per cubic meter). This base course shall be capable of withstanding construction operations without showing any detrimental effects.

311.11-CURING:

DELETE THE SECTION AND REPLACE WITH THE FOLLOWING:

No curing is required for Portland cement stabilized based.

DIVISION 500 RIGID PAVEMENT

SECTION 501 UNBONDED CONCRETE OVERLAY

501.1-DESCRIPTION:

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

This work shall consist of a pavement or an unbonded overlay pavement composed of portland cement concrete, with or without reinforcement as shown on the Plans, constructed on a prepared subgrade, base course, or existing pavement in accordance with these Specifications and in reasonably close conformity with the lines, grades, thicknesses, and typical cross sections shown on the Plans or established by the Engineer.

501.4-TESTING:

501.4.5 – Compressive Strength Tests for Acceptance:

ADD THE FOLLOWING PARAGRAPH AT THE END OF THE SUBSECTION:

Compressive strength of concrete overlays less than 8 inches (200 mm) in thickness shall be determined in accordance with Section 601.4.4, with one set of test specimens representing a maximum of 500 yd³ (380 m³) of concrete.

501.6-PREPARATION OF GRADE, SETTING FORMS, AND CONDITIONING OF SUBGRADE OR BASE:

ADD THE FOLLOWING SUBSECTION:

501.6.3.1-Conditioning of Surfaces Receiving an Unbonded Concrete Overlay: If required, the bond breaker/leveling course for unbonded concrete overlays shall be constructed as shown on the Plans.

Construct any specified hot-mix asphalt base, bond breaker, or patching and leveling course in accordance with Section 401. Remove all loose materials from the existing pavement prior to placing the asphalt.

If required on the Plans, mill the surface before concrete placement in accordance with Section 415. After milling, tight blade the surface to remove ridges and loose material. Prior to placement of the overlay, the milled surface shall be swept clean. The Engineer shall be notified if

milling operations expose underlying concrete pavement. All areas where the underlying concrete pavement is exposed shall be repaired, regardless of size. The Contractor shall first determine, in the presence of the Engineer, if the remaining asphalt surrounding the area of exposed concrete is sound. This asphalt shall be considered sound if it cannot be easily removed by prying it loose with a shovel. If it can be easily removed in such a manner, the Contractor shall continue to remove all such unsound asphalt until sound asphalt is encountered. If the asphalt surrounding the exposed concrete area is less than 2 inches (50 mm) thick, greater than 50 square feet (4.6 square meters) or are wider than 6 feet (1.8 meters) in the transverse direction, spray exposed concrete with tack coat meeting the requirements of Section 408 and cover with engineering fabric meeting the requirements of Section 715.11.8. If the asphalt surrounding the exposed concrete area is 2 inches (50 mm) or more in thickness, repair the exposed concrete area with an asphalt patch of the same thickness as the surrounding asphalt with either a Base-II or 19 mm mix in accordance with Section 401.

501.9-PLACING CONCRETE:

ADD THE FOLLOWING PARAGRAPHS TO THE END OF THE SUBSECTION:

When placing an unbonded concrete overlay, place the concrete when the base temperature is below 115° F (46° C). Reduce the temperature by spraying a fine water fog on the base. Ensure water does not pond in front of the plastic concrete. The application of white curing compound or a lime slurry shall be permitted as temperature control measures when waterproof bases are encountered. Concrete shall not be placed if frost exists in the base or if the base temperature is below 35° F (2° C).

When placing unbonded concrete overlays, concrete should be placed on the grade to the nominal thickness shown on the Plans. Any deviations for profile adjustments, and/or cross section adjustments, should be above the nominal thickness. When adjustments are necessary for grade or yield improvement, the thickness shall not, in any case, be less than the minimum thickness shown on the Plans.

501.11-JOINTS:

DELETE THE ENTIRE SECTION AND ADD THE FOLLOWING:

Joints shall be constructed of the type and dimensions and at the locations shown on the approved Joint Layout Plan(s). The Contractor shall submit for approval a Joint Layout Plan for all intersections on the project in general accordance with the following: "Street Jointing Criteria: Ten Rules Of Practice" as suggested by the Portland Cement Association (PCA), Skokie, Illinois; the

American Concrete Pavement Association's Intersection Joint Layout Guidelines; the West Virginia Division Of Highways' Standard Specifications, dated 2010 and the latest issue of any subsequent Supplemental Specifications; the West Virginia Division Of Highways' "Standard Details Book Volume 1 – Drainage, Guardrail, Pavement, Fence, and Markers" hereinafter referred to as "Standard Details Volume 1"; or as directed by the Engineer.

The "Street Jointing Criteria: Ten Rules of Practice" suggested by the PCA are paraphrased and revised for the West Virginia Division of Highways' needs as follows:

- i. Joints are used in concrete pavement to aid construction and to minimize random cracking. Avoid odd-shaped areas of pavement.
- ii. Space longitudinal joints not to exceed 12.0 ft. (3.8 m). The contractor shall decide on the type of longitudinal joint as shown on Standard Detail Sheet PVT1 of "Standard Details Volume 1" needed depending on the type of construction. Type D joints will be used for full-width construction. Type D joints with a projecting tie bar for the following lane/shoulder pour are acceptable. Type E joints without the key are acceptable for lane-at-a-time construction. Type F joints are not acceptable at any location on the project.
- iii. Space transverse joints at regular intervals of 15.0 ft. (4.6 m) or less.
- iv. Thinner slabs tend to crack at closer intervals than do thicker slabs. Long narrow slabs tend to crack more than square ones.
- v. All contraction and expansion joints must be continuous through any Combination Concrete Curb and Gutter or Integral Concrete Curb (Standard Sheet PVT6, Sheet 1 of 2 of Standard Details Volume 1). See Standard Specification Section 610.3.4.
- vi. Longitudinal construction joints should be butt-type joints with tiebars (Types D or E joints based on construction method) as shown on Standard Detail Sheet PVT1 of Standard Details Volume 1. The purpose of these tiebars is to hold adjacent slabs in vertical alignment. The normal backfill behind any integral curb or curb and gutter constrains the slabs and holds them together. With separate curb and gutter built on fill, use Type E Joints as shown on Standard Detail Sheet PVT1 of Standard Details Volume 1.
- vii. Offsets at radius points should be at least 2.0 ft. (0.60 m) in width. Angles of less than 60° shall be avoided.
- viii. Make minor adjustments in joint locations to meet all structures projecting through, into or against the pavement. Minor adjustments should not make any joint spacing greater than that specified in ii. and iii. in this list.
- ix. (Deleted)

- x. Manhole and inlet frames, as well as any other metal structure projecting through, into or against the pavement shall be isolated in accordance with 501.11.6.

The Contractor shall submit a Joint Layout Plan for each intersection on the Project to the Engineer for approval a minimum of 10 working days before ordering materials. No work on or ordering of materials for the intersections shall be performed until the Engineer has approved the Joint Layout Plan(s). These Submittals are not required to be signed and sealed by a Registered Professional Engineer.

501.11.1-Longitudinal Joints: Deformed steel tie bars (Type D joint) or tie bolt assemblies (Type E joint) shall be placed perpendicular to the longitudinal joints. They shall be placed by suitable mechanical equipment or rigidly secured by suitable supports to prevent displacement. Tie bars shall be epoxy coated and free of grease, oils, dirt, paint or other foreign materials, and shall not be enclosed in tubes or sleeves.

All longitudinal joints shall be sawed normal to the surface of the pavement with a suitable concrete saw. Construction of longitudinal joints shall be in accordance with the appropriate requirements, as follows:

- i. When the longitudinal joint separates adjacent pavement lanes or slabs that are poured at the same time (full-width construction: Type D joint), sawing of longitudinal joints shall be performed between 4 and 24 hours after the pavement is placed and before any equipment and vehicles are allowed on the pavement. The saw cut shall be to a minimum depth of one-third of the plan depth of pavement; the width shall be 1/8 in. (3 mm), with a tolerance of plus or minus 1/16 in. (2 mm).
- ii. When the longitudinal joint separates adjacent pavement lanes or slabs that are poured separately (lane-at-a-time construction: Type D or E joint), the longitudinal joint shall be sawed. The saw cut shall be to a depth of 1 in. (25 mm), plus 1/4 in. (6 mm); the width shall be 1/8 in. (3 mm) plus or minus 1/16 in. (2 mm).

501.11.2-Transverse Expansion Joints (Type B or Type C joint): The expansion joint filler shall be one piece, continuous from form to form, shaped to the subgrade and to the cross section of concrete. The filler shall be depressed 1/2 in. (13 mm) below the surface of the pavement.

The expansion joint filler shall be held in a vertical position. Finished joints shall not deviate more than 1/4 in. (6 mm) in the horizontal alignment from a straight line at right angles to the centerline of the pavement. No plugs of concrete will be permitted anywhere within the expansion space.

501.11.3-Transverse Contraction Joints: Transverse contraction (Type A) joints shall consist of planes of weakness created by sawing or forming grooves, normal to the grade, in the surface of the pavement as shown on the approved Joint Layout Plan(s). These contraction joint grooves shall be centered, within 1 in. (25 mm) of the mid-length of the dowels, over the coated dowel bars specified.

Unless otherwise specified or authorized, all transverse contraction joint grooves shall be constructed as described, resulting in the dimensions detailed on the approved Joint Layout Plan(s) and at the spacing and locations shown on the Plans.

As soon as feasible after placing the concrete, the contraction joints shall be sawed to the dimensions shown on the approved Joint Layout Plan(s). Sawing of joints shall commence as soon as the concrete has hardened sufficiently to permit sawing without excess raveling, usually 4 to 24 hours. All joints shall be sawed before uncontrolled shrinkage cracking takes place, but no later than 24 hours after placement of concrete. If necessary, sawing operations shall be continuous, through day and night, regardless of weather conditions. In general, all joints should be sawed in sequence. The sawing of any joint shall be omitted if cracking occurs at or near the joint location prior to the time of sawing. Sawing of a joint shall be discontinued when a crack develops ahead of the saw. If extreme conditions exist which make it impractical to prevent erratic cracking by early sawing, the contraction joints shall be formed in the plastic concrete.

All joint repair work shall be done at the Contractor's expense and to the satisfaction of the Engineer.

When formed joints are permitted, they shall be effected by an approved mechanically operated device to the dimensions specified and while the concrete is still in the plastic state.

Random cracking at transverse contraction joints, as described in 501.11.7, shall be sealed with silicone sealant.

501.11.4-Transverse Construction Joints: Transverse construction joints shall be installed when there is an interruption of more than 30 minutes in the concreting operations. No construction joint shall be installed within 10 ft. (3 meters) of an expansion or contraction joint. If sufficient concrete has not been placed to form a slab at least 10 ft. (3 meters) long, the excess concrete back to the last proceeding joint shall be removed.

Construction joints shall be constructed in a manner similar to transverse contraction joints utilizing a Type A joint. The groove shall have the same dimensions as for transverse contraction joints.

501.11.5-Coated Dowel Bars: Coated dowel bars (load transfer reinforcement) shall be used across all transverse Type A joints as shown on the approved Joint Layout Plan(s). Dowels shall be located at mid-depth of the pavement with a tolerance of placement within plus or minus 1 in. (25 mm) of the lateral and vertical positions shown on the approved Joint Layout

Plan(s). Dowels shall be aligned parallel to the centerline and surface of the pavement with a tolerance for such alignments within plus or minus ¼ in. (6 mm) per dowel.

Dowels shall be held in position in the pavement by means of metal supports that remain in the pavement, except as noted. The combination of dowel bars and all the various components of the metal supports at a joint is commonly referred to as the dowel assembly or load transfer unit. Welding of dowels to the supports, to achieve a fixed end condition, shall be performed in accordance with the details shown on the approved Joint Layout Plan(s). For dowel assemblies at contraction and construction joints, welding of dowels to any member of the supports will not be permitted within the middle one-third of the dowel's length. The longitudinal misalignment of one end of a dowel assembly with respect to the other end in achieving a perpendicular alignment with the centerline of the pavement shall not exceed 1 in. (25 mm). Acceptance of a type of dowel assembly by the Division in no way relieves the Contractor of their responsibility for furnishing, as part of the assembly, coated dowel bars that meet the requirements of 709.15, nor does it relieve the Contractor of the Contractor's responsibility for placing and maintaining the assembly in its proper position and alignment during paving operations.

The mechanical implanting method of placing dowels bars is permitted if the contractor can show, by the method outlined below or other approved methods, that the dowel bars can be placed within the required tolerance with no adverse effects to the finished concrete pavement.

Prior to, or on the first day of the paving operation, the Contractor shall use non-destructive testing methods, such as the MIT Scan-2 technique, approved by the Engineer, to confirm dowel placement and alignment.

Dowel bars shall be placed to within 5% tolerance of the depth shown on the plans, and parallel to the traffic lane centerline and top of roadway surface within a tolerance of ¼ inch (6 mm) per 12 inches (300 mm) of dowel bar length.

Suspend paving operations if dowels are installed improperly and dowel alignment does not meet the specified tolerances. Paving operations shall not be resumed until the Contractor demonstrates to the Engineer that the problem has been corrected.

For coated dowel bar types that require a bond breaker, the bond breaking material, prequalified for use with that particular type coating, shall be carefully applied over the entire length of the bar just prior to placement of concrete unless an approved bondbreaker lubricant has been applied in the shop.

The free end of expansion joint dowels utilized in a Type B joint shall be provided with a close fitting metal cap or sleeve equipped with a stop to prevent closing during paving operations. A clearance of 1 in. (25 mm) shall be maintained between the closed end of the cap and the end of the dowel to accommodate future movement of the concrete slab.

501.11.6-Expansion Joints Around Structures: Expansion joints shall be formed by placing pre-molded expansion joint material about all structures and features projecting through, into or against the pavement. Unless otherwise indicated, such joints shall be ½ in. (13 mm) in width.

501.11.7-Random Cracks: Random cracks falling within 3 inches (75 mm) of the center of the transverse contraction joint's dowel bars shall be sawed for the full width, widening and deepening the crack to the dimensions of sawing for transverse contraction joints.

If any random or uncontrolled crack occurs outside 3 inches (75 mm) from a doweled joint, the entire pavement within the lane where such crack occurs shall be removed for the entire 15ft panel between joints.. The dowel assembly or bars, as the case may be, shall be replaced with a new dowel assembly with drilling. The new joint over the dowel assembly shall be initially formed by the use of a removable insert or by sawing. The tie bars shall be replaced with a Modified Type E joint. The above described work shall be done at no additional cost to the Division.

501.11.9-Transverse Joints in Concrete Shoulders: Dowel bars are not required in paved shoulders except where turning traffic may use the shoulders as a lane.

501.14-CURING:

501.14.4-White Pigmented Impervious Membrane:

ADD THE FOLLOWING PARAGRAPH AFTER THE SECOND PARAGRAPH:

For unbonded concrete overlays, the curing compound application rates noted below shall be doubled.

501.16-SEALING JOINTS:

ADD THE FOLLOWING PARAGRAPH TO THE END OF THE SECTION:

Cleaning and sealing of all joints in unbonded concrete overlays is not required unless shown on the Plans.

501.22-METHOD OF MEASUREMENT:

ADD THE FOLLOWING PARAGRAPHS AFTER THE FIRST PARAGRAPH:

When Item 501009-* is specified in the project plans, the quantity of concrete overlay placement to be paid for will be the number of square yards (meters) complete in place and accepted. The width for measurement will be the width of the pavement or overlay shown on the typical cross section of the Plans and additional widening where called for or as otherwise directed in writing by the Engineer. The length will be measured on the surface along the centerline of each roadway and each roadway ramp.

When Item 501011-* is specified in the project plans the quantity of concrete used in concrete overlays to be paid for will be the number of cubic yards (meters) in place and accepted. The Engineer will measure the volume of concrete used in concrete overlays using the Contractor's certified batch tickets or other approved documentation.

501.23-BASIS OF PAYMENT:

501.23.1-General:

DELETE THE SECTION AND REPLACE WITH THE FOLLOWING:

501.23.1-General: The quantities, determined as provided above, will be paid for at the contract unit prices less adjustments referred to below, which shall constitute full compensation for furnishing and preparing of all materials, including reinforcing steel, transverse and longitudinal joints, expansion joint filler, elastomeric joint seals, silicone sealant, epoxy mortar for joint repair work, polyethylene tape, rope or rod joint back-up material, lubricant-adhesive for elastomeric seals, and dowels or load transfer devices as are required in the Plans; construction of any bond breaker/leveling course, milling existing surface; placing, finishing and curing concrete; and all labor, equipment, tools, field laboratory, supplies and incidentals necessary to complete the work.

501.24-PAY ITEMS:

ADD THE FOLLOWING PAY ITEMS:

ITEM	DESCRIPTION	UNIT
501009-*	"Thickness" UNBONDED PORTLAND CEMENT CONCRETE OVERLAY	Square Yard (Meter)
501011-*	UNBONDED PORTLAND CEMENT CONCRETE OVERLAY	Cubic Yard (Meter)

* Sequence number

SECTION 514 ROLLER COMPACTED CONCRETE

514.1-DESCRIPTION:

Roller Compacted Concrete (RCC) consists of aggregate, Portland cement and possibly other supplementary cementitious materials (fly ash, slag), and water. RCC is proportioned, mixed, placed, compacted, and cured in accordance with these specifications. Ensure that the RCC conforms to the lines, grades, thickness, and typical cross section shown in the plans or otherwise established by the WVDOH. When used as base course, it shall be constructed as shown in the plans.

514.2-MATERIALS:

Materials shall meet the requirements specified in the following Sections or Subsections of Division 700:

MATERIAL	SECTION OR SUBSECTION
Portland Cement	701.1, 701.3
*Fine Aggregate	702.1
Coarse Aggregate	703.1-4
Pozzolanic Additives	707.4
Water	715.7
Water Reducing and Retarding Admixtures	707.2
Curing Materials	707.6-707.10

* NOTE: The use of limestone as fine aggregate will not be permitted

Shipping and storage of Cement and Pozzolanic Additives: Cement and pozzolanic additives shall be shipped and stored as outlined in Section 501.2.

514.2.1-Material Requirements:

Aggregates: Use no aggregate where the plasticity index of the aggregate exceeds 5. Aggregates may be a blend of fine and coarse aggregates. Use well-graded aggregate without gradation gaps and conforming to the following gradation:

Sieve Size	% Passing by Weight
1 inch	100
$\frac{3}{4}$ inch	90-100
$\frac{1}{2}$ inch	70-100
$\frac{3}{8}$ inch	60-85
#4	40-60
#16	20-40
#100	6-18
#200	2-8

During production, the Contractor shall perform gradations on a daily basis, to verify that the aggregate gradation meets the above requirements. Those test results shall be submitted to the Engineer within 72 (seventy-two) hours.

514.3-PROPORTIONING:

514.3.1-RCC Mix Design Requirements: At least 45 days prior to the start of construction, the Contractor shall submit to the Engineer for approval the proportion of materials to be used which will result in a workable RCC mix. The Engineer will review these proportions within 14 (fourteen) Calendar Days and, if the mix design appears satisfactory to the Engineer, the Contractor shall prepare and test a trial batch mixture and representative test slab at least 100 ft in length to verify that the design criteria for strength are met. Perform batch mixture preparation and testing in the presence of representatives of the Engineer. Construction, using RCC, shall not begin until an approved mix design has been obtained.

514.3.2 - Design Compressive Strength: A mix design shall be used which demonstrates a minimum compressive strength of 4000 psi within 28 days. Compressive strength specimens shall be prepared in accordance with ASTM C 1435 and tested in accordance with AASHTO T 22. At least two sets of three cylinders shall be produced, with one set being tested at 4 days and the other at 28 days. The compressive strength at a particular age shall be determined as the average of the three specimens. If one individual result is much lower or much higher than the other two due to defects in the specimen as outlined in section 601.4.4, that value shall be discarded.

514.4-TESTING:

501.4.1-Compressive Strength Tests for Acceptance: For every 1500 cubic yards or fraction thereof, of mix produced, and at least once for each day of production, prepare at least three sets of test specimens in accordance with ASTM C 1435 under the direct observation of the Engineer. A set of specimens consists of three cylinders. Cure and transport the specimens to the Contractor's WVDOH approved laboratory in accordance with AASHTO T23. Test one set of these cylinders for compressive strength in accordance with AASHTO T22 at each of the following ages under the direct observation of the Engineer: 3 days, 7 days, and 28 days. The compressive strength of each set of cylinders shall be the average of the three specimens except that if one specimen shows evidence of improper sampling, molding, or testing, it shall be discarded and the remaining two strengths averaged. Should more than one specimen representing a given test show definite defects due to improper sampling, molding, or testing, the entire test shall be discarded.

If the compressive strength of the specimens, measured at 3 days, indicates that the 28-day compressive strength will be less than 3500 psi, investigate the potential causes of the low strengths and report to the Engineer within 24 hours. If the compressive strength of the specimens, measured at 3 days, indicates 28-day compressive strengths will be less than 3200 psi, immediately stop production and notify the Engineer. Do not resume production until the cause of the discrepancy has been determined to the satisfaction of the Engineer. The Engineer may adjust compressive strength targets at 3 days as production continues based on field experience.

514.5 EQUIPMENT AND TOOLS:

Construct roller compacted concrete with any combination of equipment that will produce a completed pavement meeting the requirements for mixing, transporting, placing, compacting, finishing, and curing as provided in this specification.

514.5.1-Field Laboratory: RCC shall be supplied by a plant which has been certified by the Division as meeting all requirements of the governing Specifications and as having the facilities necessary to ascertain and control the quality of the product in accordance therewith. A testing facility or laboratory, meeting the requirements of Section 501.5.1 shall be provided by the Contractor.

514.5.2 - Mixing Plant:

514.5.2.1-General: Unless approved measures are taken to delay the setting time of the RCC, the mixing plant shall be located within a thirty-minute haul time from the point of RCC placement. Use only plants capable of producing an RCC pavement mixture in the proportions defined by the final

approved mix design and within the specified tolerances. The capacity of the plant must be sufficient to produce a uniform mixture at a rate compatible with the placement equipment. The estimated production rate of the Plant shall be noted in the Contractor's Quality Control plan. If the plant is unable to produce material at a rate adequate to prevent unnecessary cold joints and frequent paver stoppages, the Engineer may halt production until such time that a plant of appropriate capacity is used. The plant shall be inspected and approved by WVDOH District Materials Personnel prior to production of material under these specifications.

514.5.2.2-Pugmill Plant: Use only pugmill plants of the central plant type with a twin-shaft pugmill mixer, capable of batch or continuous mixing, equipped with synchronized metering devices and feeders to maintain the correct proportions of aggregate, cement, pozzolan, and water. These plants shall meet the requirements of AASHTO M156. Other pugmill plant requirements are as follows:

514.5.2.2.1-Aggregate Storage: If previously blended aggregate is furnished, storage may be in a stockpile from which it is fed directly to a conveyor feeding the mixer. If aggregate is furnished in two size groups, follow proper stockpiling techniques in accordance with section 501 .7 to ensure aggregate separation.

514.5.2.2.2-Aggregate Feed Rate: Use aggregate bins with a feed rate controlled by a variable speed belt, or an operable gate calibrated to accurately deliver any specified quantity of material. If two aggregate size stockpile sources are used, the feed rate from each bin must be readily adjustable to change aggregate proportions, when required. Feed rate controls must maintain the established proportions of aggregate from each stockpile bin when the combined aggregate delivery is increased or decreased.

514.5.2.2.3-Plant Scales: Plant scales, if utilized, for any weigh box or hopper must comply with Section 601.5.2.3.

514.5.2.2.4-Cement and Pozzolan Material Storage: Supply separate and independent storage silos for Portland cement and pozzolan. At plants with two or more silos in which different types of cement or cementitious materials are stored, ensure that each silo has a sign at each fill inlet to reduce the potential for loading errors. Make the sign from a durable material, with minimum two-inch high by ¼-inch wide letters that are raised, indented, or cut. Ensure that the sign clearly identifies the material that is in the silo and may be easily read even when completely coated with dust.

514.5.2.2.5-Portland Cement and Pozzolan: If using Portland cement and pozzolan (such as fly ash or slag), employ blending equipment acceptable to the WVDOH and demonstrate, with a testing plan, the ability to successfully produce a uniform blended material meeting the mix design requirements. Perform testing on at least a daily basis to ensure both uniformity and proper quantities.

514.5.2.2.6-Cement and Pozzolan Feed Unit: Provide a satisfactory means of dispensing Portland cement and pozzolan, volumetrically or by weight, to ensure a uniform and accurate quantity of cementitious material enters the mixer.

514.5.2.2.7-Water Control Unit: Use a water control unit capable of measuring the required amount of water for the approved mix by weight or volume. Ensure that the unit is equipped with an accurate metering device. Vary the amount of water to be used only with the approval of the District Engineer.

514.5.2.2.8-Gob Hopper: For continuous operating pugmills, provide a gob hopper attached to the end of the final discharge belt to temporarily hold the RCC discharge in order to allow the plant to operate continuously.

514.5.2.3-Rotary Drum Mixer: Shall meet the requirements of Section 501.5.3 and shall provide a rotary drum batch mixer capable of producing a homogeneous mixture, uniform in color, and having all coarse aggregate coated with mortar. Equip the mixer with batching equipment to meet the following requirements:

514.5.2.3.1-Weighing Equipment: Measure the amounts of cement, pozzolan, and aggregate entering into each batch of RCC by direct weighing equipment. Use only weighing equipment that is readily adjustable in order to compensate for the moisture content of the aggregate or to change the proportionate batch weights. Include a visible dial or equally suitable device that will accurately register the scale load from zero to full capacity. The cement and pozzolan may be weighed separately or cumulatively in the same hopper on the same scale, provided the cement is weighed first.

514.5.2.3.2-Weigh Hoppers: Use only bulk cement and pozzolan weigh hoppers that are equipped with vibrators to operate automatically and continuously while weighing hoppers are being dumped. Ensure that the weigh hopper has sufficient capacity to hold not less than 10 percent in excess of the cementitious material required for one batch.

514.5.2.3.3-Water Metering: Measure the amount of water entering each batch of RCC by weight or volume. Use only equipment capable of measuring the water to within a tolerance of plus or minus one percent and equipped with an accurate gauge or dial measuring device. Vary the amount of water to be used only with the approval of the District Engineer. During batching, admit water to the mixer only through the water measuring device and then only at the time of charging.

514.5.2.3.4-Mixing Time: Use only drum mixers equipped with an accurate clock or timing device, capable of being locked, for visibly indicating the time of mixing after all the materials, including the water, are in the mixer.

514.5.2.3.5-Recharging: Discharge all material in the drum before recharging. Ensure that the volume of mixed material per batch does not exceed the manufacturer's rated capacity of the mixer.

514.5.3-Paver: Place RCC with a high-density asphalt-type paver subject to approval by the District Engineer. Use only pavers equipped with compacting devices capable of producing an RCC pavement with a minimum of 90 percent of the maximum density in accordance with AASHTO T 180, Method D prior to any additional compaction. Ensure that the paver is of suitable weight and stability to spread and finish the RCC material, without segregation, to the required thickness, smoothness, surface texture, cross-section, and grade.

514.5.4-Compactors: Use self-propelled steel drum vibratory rollers having a minimum static weight of 10 tons for primary compaction. For final compaction, use either a steel drum roller, operated in a static mode, or a rubber-tired roller of equal or greater weight. Only use walk-behind vibratory rollers or plate tampers for compacting areas inaccessible to large rollers.

514.5.5-Haul Trucks: Use trucks for hauling the RCC material from the plant to the paver with covers available to protect the material from inclement weather. To ensure adequate and continuous supply of RCC material to the paver, have a sufficient number of trucks. If the number of trucks is inadequate to prevent frequent starts and stops of the paver, cease production until additional trucks are obtained.

514.5.6-Water Trucks: Keep at least one water truck, or other similar equipment, on-site and available for use throughout the paving and curing process. Equip such equipment with a spreader pipe containing fog spray nozzles capable of evenly applying a fine spray of water to the surface of the RCC without damaging the final surface.

514.5.7-Inspection of Equipment: Before start-up, the Contractor's equipment will be carefully inspected. Should any of the equipment fail to operate properly, cease work until the deficiencies are corrected.

514.5.8-Access for Inspection and Calibration: Provide the District Engineer or WVDOH District Materials Inspector access at all times for any plant, equipment, or machinery to be used in order to check calibration, scales, controls, or operating adjustments.

**514.6-PREPARATION OF GRADE AND CONDITIONING OF
SUBGRADE OR BASE:**

Before the RCC processing begins, prepare the subgrade in accordance with Section 228 of the WVDOH Standard Specifications.

514.7-HANDLING, MEASURING, AND BATCHING MATERIALS:

Handling, measuring, and batching of materials shall be in accordance with Section 501.7, except that volumetric batching shall not be permitted.

514.8-MIXING RCC:

514.8.1-Mixing Process: Use the same mixture for the entire project unless otherwise stated in the project documents. If, during production, the source of Portland cement, pozzolan, or aggregates is changed, then suspend production and submit a new mix design to the Engineer for approval. Do not exceed the manufacturer's rated capacity for dry concrete mixtures in the mixing chamber. Keep the sides of the mixer and mixer blades free of hardened RCC or other buildups. Routinely check mixer blades for wear and replace if wear is sufficient to cause inadequate mixing.

514.8.2-Mixing Time: Use a mixing time adequate to ensure a thorough and complete mixing of all materials. Do not allow the mixing time, after all materials including water are in the mixer, to be less than 1½ minutes for one cubic yard and 20 seconds for each additional cubic yard.

514.8.3-Plant Calibration: Prior to commencement of RCC production, carry out a complete and comprehensive calibration of the plant in accordance with Section 501.5.2. Provide all scales, containers, and other items necessary to complete the calibration. After completion of the initial calibration, calibrate the plant periodically as directed by the Engineer. Plants listed on WVDOH approved list at the time of RCC production are exempt from this requirement, although the WVDOH reserves the right to require additional calibration if variation in mixture quantities are suspected.

514.8.4-Daily Reports: Supply daily plant records of production and quantities of materials used that day to the Engineer. These records may be used as a check on plant calibration.

514.8.5-Transportation: Transport the RCC pavement material from the plant to the areas to be paved in dump trucks equipped with retractable protective covers for protection from rain or excessive evaporation. Ensure that the trucks are dumped clean with no buildup or hanging of RCC material in the corners. Have the dump trucks deposit the RCC material directly into the hopper of the paver or into a secondary material distribution system that deposits the material into the paver hopper. Dump truck delivery must be timed and scheduled so that RCC material is spread and compacted within the specified time limits.

514.9-PLACING RCC:

514.9.1-Subbase Condition: Prior to RCC placement, ensure that the surface of the subbase is clean and free of foreign material, ponded water, and frost. Ensure that the subbase is uniformly moist at the time of RCC placement. If sprinkling of water is required to remoisten certain areas, ensure that the method of sprinkling will not form mud or pools of freestanding water. Correct soft or yielding subbase areas prior to placement of RCC as specified in Section 6.1 above.

514.9.2-Adverse Weather Conditions:

514.9.2.1-Cold Weather Precautions: Employ cold weather precautions as detailed in Section 601.9.1 of the Standard Specifications.

514.9.2.2-Hot Weather Precautions: Employ hot weather precautions as detailed in Section 601.9.2 of the Standard Specification. During periods of hot weather or windy conditions, take special precautions to minimize moisture loss due to evaporation. Cooling of aggregate stockpiles by shading or the use of a fine mist may be required. Protective covers may be required on dump trucks. Keep the surface of the newly placed RCC pavement continuously moist.

514.9.2.3-Rain Limitations: Conduct no placement of RCC pavement during rain conditions sufficient to be detrimental to the finished product. Placement may continue during light rain or mists provided the surface of the RCC pavement is not eroded or damaged in any way. Use dump truck covers during these periods. The WVDOH may terminate paving at any time when, in the WVDOH judgment, the rain is detrimental to the finished product.

514.9.3-Paver Requirements: Place all RCC with an approved paver as specified in Section 514.5.3, and also meeting the requirements of this Section.

514.9.3.1-Filling the Paver: Do not allow the quantity of RCC material in the paver to approach empty between loads. Maintain the material above the auger at all times during paving.

514.9.3.2-Stopping the Paver: Ensure that the paver proceeds in a steady, continuous operation with minimal starts and stops, except to begin a new lane. Maximum paver speed during laydown is 10 feet per minute. Higher paver speeds may be allowed at the discretion of the WVDOT if the higher speeds may be obtained without distress to the final product or cause additional starts and stops.

514.9.3.3-Surface Condition: Ensure that the surface of the RCC pavement is smooth, uniform, and continuous without excessive tears, ridges, or aggregate segregation once it leaves the paver.

514.9.4-Inaccessible Areas: Pave all areas inaccessible to either roller or paver with cast-in-place concrete meeting the requirements of Section 501.

514.9.5-Adjacent Lane Pavement: Place adjacent paving lanes within 60 minutes. If more than 60 minutes elapses between placement of adjacent lanes, the vertical joint must be considered a cold joint and prepared in accordance with Section 514.11. At the discretion of the Engineer, this time may be increased or decreased depending on ambient conditions of temperature, wind, and humidity. Multiple pavers may be used in tandem to reduce the occurrence of cold joints.

514.9.6-Hand Spreading: Broadcasting or fanning the RCC material across areas being compacted is not permissible. Such additions of materials may only be done immediately behind the paver and before any compaction has taken place. Any segregated coarse aggregate shall be removed from the surface before rolling.

514.9.7-Segregation: If segregation occurs in the RCC during paving operations, placement shall cease until the cause is determined and corrected to the satisfaction of the Engineer. If the segregation is judged by the Engineer to be severe, remove and replace the segregated area at no additional cost to the Department.

514.10-COMPACTION:

514.10.1-Time to Compaction Start: Ensure that compaction begins with the placement process and is completed within 60 minutes of the start of the mixing at the plant. The time may be increased or decreased at the discretion of the WVDOH depending on ambient conditions of temperature and humidity. Do not permit delays in rolling unless approved by the Engineer. Plan operations and supply sufficient equipment to ensure that these criteria are met.

514.10.2-Rolling: Determine the sequence and number of passes by vibratory and non-vibratory rollers to obtain the specified density and surface finish. Only operate rollers in the vibratory mode while in motion. Rubber-tire rollers may be used for final compaction. Use additional rollers if specific density requirements are not obtained or if placing operations get ahead of the rolling operations.

514.10.3-Rolling Longitudinal and Transverse Joints: Do not operate the roller within 2 feet of the edge of a freshly placed lane until the adjacent lane is placed. Then, roll both edges of the two lanes together within the allowable time. If a cold joint is planned, then roll the complete lane and follow cold joint procedures as specified in Section 514.11.

514.10.4-Inaccessible Areas: Compact areas inaccessible to large rollers using walk-behind rollers or hand tampers.

514.10.5-Density Requirements: Field density tests will be performed in accordance with Section 717.4 as soon as possible, but no later than 30 minutes after the completion of the rolling. Only wet density is used for evaluation. The required minimum density is 98 percent of the maximum laboratory density obtained according to AASHTO T 180 (Method D). The in-place density and moisture content may be determined with a nuclear moisture-density gauge. The gauge will be calibrated for moisture content at the beginning of the work and at any time during the work. RCC properly placed and compacted, but not meeting the density requirements, shall be cored and tested at the Contractor's expense. If the tested area achieves 28-day design strength, it will be paid at the full unit price. If the tested area indicates strength less than 3500 psi but greater than 3150 psi, payment will be made as follows:

Compressive Strength (psi)	Price Reduction (percent of unit bid price)
3300-3499	5
3150	15

If the cores indicate strengths less than 3150 psi at 28 days or longer, the Engineer will evaluate the results and may reject the affected area and require removal and replacement or elect to pay at a reduced rate.

514.11-JOINTS:

514.11.1-Fresh Vertical Joints: A joint is considered a fresh joint when an adjacent RCC lane is placed within 60 minutes of placing the previous lane or as specified by the Engineer based on ambient conditions. Fresh joints do not require special treatment.

514.11.2-Cold Vertical Joints: Any planned or unplanned construction joints that do not qualify as fresh joints are considered cold joints. Prior to placing fresh RCC mixture against a compacted cold vertical joint, thoroughly clean the cold joint of loose or foreign material. Wet the vertical joint face and maintain it in a moist condition immediately prior to placement of the adjacent lane.

514.11.2.1-Sawing Cold Vertical Joints: For uncompacted surfaces or slopes more than 15 degrees from the vertical, cut the joint vertically for the full depth. Within 2 hours of final compaction, the edge of a cold joint may be cut with approved mechanical equipment. For edges cut after 2 hours, sawcut to the full depth of the pavement. Demonstrate any modification or substitution of the sawcutting procedure to the WVDOH for approval prior to use. In no case allow cutting of the edge to cause raveling or tearing of the surface. Moisten the cut edge immediately prior to placement of the adjacent lane.

514.11.3-RCC Pavement Joints at Structures: Line structures such as manholes, valves, or concrete curb and gutter with joint filler as defined in Section 708 of the Standard Specifications.

514.11.4-Control Joints: Construct transverse contraction joints in the RCC pavement by sawing. At the option of the Contractor, soft-cut or green-cut saws may be utilized as soon as possible behind the rolling operation and set to manufacturer's recommendations. Conventional cut saws must be used as soon as the sawing operation will not result in raveling or other damage to the RCC pavement, but not more than 18 hours after RCC placement. Cut all joints to 1/4 the depth of the RCC pavement to a single saw blade width. Joints should be spaced at intervals equal to 24 times the nominal pavement thickness unless otherwise indicated on the Plans or directed by the WVDOH. (For example, for an 8-inch RCC pavement, cut joints at 16-foot intervals.)

514.12-FINISHING:

Ensure that the finished surface of the RCC pavement, when tested with a 10-foot straightedge or crown surface template, does not vary from the straightedge or template by more than 1/4 inch at any one point and shall be within 5/8 inch of the specified finished grade. When surface irregularities are outside these tolerances, or other smoothness requirements specified in the plans, diamond-grind the surface to meet the tolerance at no additional cost to the WVDOH.

514.13-CURING:

Immediately after final rolling and compaction testing, keep the surface of the RCC pavement continuously moist until an approved curing compound, a suitable prime coat, or a layer of asphalt concrete is applied or for 72 hours after placement, whichever comes first.

During the curing period, the surface temperature of the RCC shall not be allowed to fall below freezing. The Contractor shall be responsible for the quality of the RCC placed and cured during cold weather. Any RCC injured by frost action shall be removed and replaced at the Contractor's expense.

514.13.1-Water Cure: Apply water cure by water trucks equipped with fog spray nozzles, soaking hoses, sprinkling system, or other means such that a uniform moist condition on the surface of the RCC is ensured. Apply this moisture in a manner that will not erode or damage the surface of the finished RCC pavement.

514.13.2-Curing Compound: Do not use curing compounds when the RCC material is to be promptly covered with asphalt. Apply curing compound as indicated in Section 707.9 of the Standard Specifications, except that the minimum rate of curing compound application is 0.09 gallons per square yard (11 square yards per gallon) unless a higher rate is specified by the curing compound manufacturer.

514.14-OPENING TO TRAFFIC:

Protect the RCC from vehicular traffic during the curing period. Completed portions of the RCC pavement may be opened to automotive and light truck traffic as soon as the strength is sufficient to prevent visible damage to the RCC. The pavement may be opened to unrestricted traffic after 12 hours. However, if the temperature drops below 40° F, then the period of time the temperature is below 40° F will be added to the minimum time to opening. Temperature will be based on the temperatures recorded by the WVDOH Inspector.

514.15-MAINTENANCE:

Maintain the RCC pavement in good condition until all work is completed and accepted. Perform such maintenance at no additional cost to the Engineer.

514.16-THICKNESS:

Provide and operate equipment capable of extracting a small (approximately 1 inch diameter or greater) core to determine the pavement thickness. Extract samples in the presence of the Engineer. Repair the core holes using concrete meeting the requirements of Section 501. Rod and neatly strike off the repair material.

514.16.1-Tolerance in pavement thickness: The procedure for sampling and determining the thickness of the completed RCC shall be in accordance with Section 501.19.

514.17-METHOD OF MEASUREMENT:

The quantity of RCC placement to be paid for will be the number of square yards (meters) complete in place and accepted. The width for measurement will be the width of the pavement or overlay shown on the typical cross section of the Plans and additional widening where called for or as otherwise directed in writing by the Engineer. The length will be measured on the surface along the centerline of the roadway or roadway ramp. Construction of control joints will not be measured separately and no direct payment will be made for this work.

514.18-BASIS OF PAYMENT:

The quantities, determined as provided above, will be paid for at the contract unit prices less adjustments referred to below, which shall constitute full compensation for furnishing and preparing of all materials, equipment, tools, labor, and incidentals necessary to satisfactorily complete the work. Pavement that is deficient in thickness, but is permitted to be left in place, will be paid at the reduced unit price as provided in Section 501.23. No compensation will be allowed for the materials or labor involved in the removal of defective material.

501.19-PAY ITEM:

ITEM	DESCRIPTION	UNIT
514001-*	"Thickness" ROLLER COMPACTED CONCRETE	Square Yard (Meter)

* Sequence number

DIVISION 600 INCIDENTAL CONSTRUCTION

SECTION 601 STRUCTURAL CONCRETE

601.4-TESTING:

601.4.2-Contractor's Quality Control:

INSERT THE FOLLOWING PARAGRAPH AT THE END OF THE SECTION:

The Contractor shall provide a copy of the quality control test results to the Supplier of the concrete which was tested within 48 hours of the completion of the test.

SECTION 626 RETAINING WALL SYSTEMS

DELETE THE SECOND PARAGRAPH AND REPLACE WITH THE FOLLOWING:

626.5-MATERIALS:

626.5.1.1.2.3-Sealers shall be silane and/or siloxane based and specifically formulated for use on porous surfaces such as concrete block.

Sealers shall be tested in accordance with ASTM E514 on a block wall, and shall provide a minimum of 90% reduction in leakage.

Three dry-cast concrete block specimens shall be treated with the sealer and tested for absorption in accordance with ASTM C140. The sealer shall provide a minimum of 90% reduction in water absorption when tested in this manner.

SECTION 636 TEMPORARY BARRIER

ADD THE FOLLOWING SUBSECTION:

636.12-TEMPORARY IMPACT ATTENUATING DEVICE:

This device shall be a “stationary crash cushion” as described within Section F.82 of the manual *“Manual On Temporary Traffic Control For Streets And Highways, 2006 Edition”*.

The device utilized shall be a model listed on the WVDOH Approved Products Listing (APL) for Safety Devices specifically noted as being approved for temporary work zone use. Specific device selection in regards to manufacturer and model shall be at the Contractor’s discretion; however, unless the characteristics of the obstacle to be shielded dictate otherwise, the device utilized shall be a non-tapered, non-gating device. If it is not possible, based on the width of the obstacle to be shielded, to utilize a non-tapered, non-gating device, the Contractor shall utilize an approved Sand Barrel system.

Notes included on the APL characterize non-gating devices by their National Cooperative Highway Research Program Report 350 (NCHRP-350) crash testing approval level (Test Level 2 or Test Level 3). The Test Level certification required for each particular device to be qualified at shall be based on the normal (non work zone) posted speed limit in effect at the location of the device. A Test Level 2 or Test Level 3 device shall be utilized if the normal posted speed limit is 40 MPH or less. Otherwise, a Test Level 3 device shall be required. Sand Barrel arrays shall be designed for an impact speed 5 MPH greater than the normal posted speed limit.

All Temporary Impact Attenuating Devices shall be installed and maintained fully in accordance with the specifications and recommendations of the device manufacturer. This shall include, but shall not be limited to, characteristics of the roadway profile along the approach to the nose of the device and along the adjacent (traffic) side of the device, changes in the roadway grade within the length of the device, side slope and changes in the side slope at the location of the device, anchoring (base to be anchored to as well as the anchoring system), backup, attachment to the obstacle being shielded, transitioning to the obstacle being shielded, winterization, delineation, repair, and cleaning. If the installation requires deviations from the specifications and recommendations of the device manufacturer, the Contractor shall obtain written approval from the device manufacturer and shall produce this written approval for review upon request.

Impacted devices shall be maintained and returned to full impact capacity in a timely manner. Beginning 12 hours from the time and date upon which the Contractor is given documented notice of damage to a Impact Attenuating Device requiring repairs, the Contractor shall be subject to a penalty of \$1,000 per Calendar Day (24 hrs), or fraction thereof, until the necessary repairs are completed. This penalty shall not be temporarily suspended for any reason and shall apply regardless of the cause of the damage to the device.

All labor, equipment, and materials required for the repair of impact attenuating devices shall be incidental to Bid Item 636060.

636.14-TEMPORARY CONCRETE BARRIER:

DELETE THIS ENTIRE SECTION AND TITLE AND REPLACE WITH THE FOLLOWING:

636.14-TEMPORARY BARRIER:

Furnish, install, maintain, remove and dispose of temporary barrier in accordance with this specification and the contract plans.

636.14.1-Materials: Temporary Barrier shall meet the requirements of NCHRP Report 350 and/or MASH-08 for the different test levels as shown in Table 3.1 "Test Matrix for Longitudinal Barriers" in NCHRP Report 350. 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.

Based on past performance, existing temporary concrete barrier with pin and eye connections are considered acceptable up to and including test level TL-3, until January 1, 2016

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: 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 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.

636.15-REMOVING AND RESETTING TEMPORARY CONCRETE BARRIERS:

DELETE THIS ENTIRE SECTION AND REPLACE WITH THE FOLLOWING:

636.15-REMOVING AND RESETTING TEMPORARY BARRIERS:

Temporary barriers that are to be relocated within a project shall be salvaged and reinstalled as specified in 636.14 and set as indicated on the Plans.

636.23-METHOD OF MEASUREMENT:

636.23.17-TEMPORARY CONCRETE BARRIER:

DELETE THE HEADING CONTENTS. REPLACE WITH THE FOLLOWING:

636.23.17-Temporary Barrier: The quantity of "Temporary Barrier" shall be the linear feet (meters) of barrier actually placed. Payment shall include terminal connecting devices, delineators, anchoring, maintaining, dismantling, removal and disposal of the barrier and devices when no further use is required.

636.23.18-Removing and Resetting Temporary Concrete Barrier:

DELETE THE SECTION AND REPLACE WITH THE FOLLOWING:

636.23.18-Removing and Resetting Temporary Barrier: The quantity of “Removing and Resetting Temporary Barrier” shall be the linear feet (meters) of barrier reused in a different location. Payment shall include temporary storage if necessary, re-erecting, maintaining, dismantling, removal and disposal of the barrier.

ADD THE FOLLOWING SUBSECTION:

636.23.27-Temporary Impact Attenuating Device: One unit of “Temporary Impact Attenuating Device” shall be paid at the time of initial installation of a device, as described in Section 636.12, at each unique location within the project. However, over the life of the project the Contractor shall not be paid for a quantity of this item exceeding the maximum number of individual devices required to be in place on the project at a specific time. Each installation beyond this quantity shall be paid for using the “Remove And Reset Attenuator Device” item.

ADD THE FOLLOWING SUBSECTION:

636.23.28-Remove and Reset Attenuator Device: This item shall be measured and paid for in accordance with the provisions of Section 636.23.27.

636.25-PAY ITEMS:

ADD THE FOLLOWING ITEMS TO THE TABLE:

Item Number	Description	Unit
636017-*	Temporary Barrier, TL-1, **	Linear Foot (LF) Meter (M)
636017-*	Temporary Barrier, TL-2, **	Linear Foot (LF) Meter (M)
636017-*	Temporary Barrier, TL-3, **	Linear Foot (LF) Meter (M)
636017-*	Temporary Barrier, TL-4, **	Linear Foot (LF) Meter (M)
636017-*	Temporary Barrier, TL-5, **	Linear Foot (LF) Meter (M)
636018-*	Remove and Reset Temporary Barrier	Linear Foot (LF) Meter (M)
636060-*	Temporary Impact Attenuating Device	EA
636060-*	Remove and Reset Attenuator Device	EA

* Sequence number

** Deflection range (see below)

Example: “636017 Temporary Barrier TL-3, IV ”

DEFLECTION RANGES:

Supplemental Description	Deflection Criteria
I	Minimal Deflection < 6 in.
II	Low Deflection < 24 in.
III	Medium Deflection < 60 in.
IV	High Deflection < 96 in.

Deflection values are based on NCHRP testing for corresponding level and is permanent deflection measured at the bottom of the barrier.

SECTION 657 ROADSIDE SIGN SUPPORTS

657.2-MATERIALS:

ADD THE FOLLOWING SECTION.

657.2.5-U-channel Breakaway Mounting Device: When specified to be used in the project plans, this device shall be used in order to enable either 2# per foot or 3# per foot flanged “U-channel” to be installed into an anchor, which shall be imbedded in an existing asphalt or concrete surface. The device shall be designed as described in Materials Section 709.51.

657.4.2-Setting Posts:

REPLACE THE FORTH PARAGRAPH WITH THE FOLLOWING.

When posts are to be located in existing concrete such as dividers or islands, the concrete shall be carefully opened by drilling or other suitable methods. The post shall then be placed to the required depth of embedment and backfilled with base course material to a point approximately 2 inches (50 mm) from the top of a liquid, rubberized asphalt compound in accordance with 708.3. Alternatively, if specified to be used in the project plans on either existing concrete or asphalt surfaces, the supports shall be installed using U-channel Breakaway Mounting Device shall be installed as specified by the device manufacturer.

ADD THE FOLLOWING SECTION.

657.5.12-U-channel Breakaway Mounting Device: Any U-channel Breakaway Mounting Devices specified to be installed in the project plans shall be paid incidental to either bid item 657008-001-2.00 LB CHANNEL POST, or bid item 657010-001-3.00 LB CHANNEL POST, as applicable. This shall include all labor, materials, equipment, or other incidental expenses associated with the installation of the devices.

SECTION 660 TRAFFIC SIGNALS

ADD THE FOLLOWING.

660.9-LOOP TRAFFIC DETECTORS:

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

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

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

ADD THE FOLLOWING.

660.15-JUNCTION BOXES:

The Contractor shall be responsible for reconstruction and/or replacement of all damaged junction boxes. Damage junction boxes shall be defined as any junction box more than two (2) inches below grade, or is covered by the area roadway surface.

The adjustment of the junction box shall include the complete excavation and shall conform to WVDOH Standards Specifications, Section 660.8 and 660.15. All conduit, cable and attached appurtenances shall be incidental to this junction box.

The adjustment of the junction box shall be as per detail and shall conform to WVDOH Standards and Specifications Section 660.8 and 660.15.

660.21-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
660005-*	ADJUST JUNCTION BOX, BOX NUMBER "number"	Each
660007-*	MISCELLANEOUS SIGNAL LOOP NUMBER "number"	Lump Sum

Sequence Number

SECTION 662 ROADWAY LIGHTING

ADD THE FOLLOWING.

662.14-TESTING:

The Contractor shall inspect and certify to the replacement of all damaged traffic signal loop conductors and to the proper functioning of the traffic signal, and that the junction boxes within the project limits comply with section 660.15. The inspection shall be performed before project completion and after all the work has been completed in the area of the traffic signal system and related components.

The Electrical Inspection shall be paid as item 662015-*, Electrical Test, per Lump Sum.

DIVISION 700 MATERIALS DETAILS

SECTION 709 METALS

ADD THE FOLLOWING SECTION.

709.51-U-CHANNEL BREAKAWAY MOUNTING DEVICES:

709.51.1-General Description and Requirements: The device shall be NCHRP-350 approved up to Test Level III for use with 2# per foot and 3# per foot-u-channel supports on installations with up to three (3) supports in a seven (7) foot lateral width. The device shall be designed to withstand cyclic loading (allowing for bending beyond 12%), yet break away safely on impact. The device shall be designed to not fail due to wind loading prior to failure of the sign support.

709.51.2-General Design and Functionality: The objective of the device shall be to ensure a signpost with release from an anchor upon impact from a motor vehicle. The device shall include a driven subgrade anchor, a receiver for the channel support, and a breakaway coupling connecting the receiver to the anchor,

Vehicle damage shall be minimized, as shall the risk to pedestrians after the post has been impacted. As a minimum, the device shall incorporate the following features:

1. The breakaway coupler shall be designed to shear or yield at any angle of incidence (360) degrees), with a constant amount of force, irrespective of vehicle velocity.
2. The breakaway coupler shall function effectively and independent of the sequence in which the fasteners are tightened. The sole function of the fasteners shall be to secure the sign post to the receiver and the coupler to the subgrade anchor. The receiver for the sign support shall be integral to the upper end of the coupler, eliminating the need for connection hardware.
3. Upon impact, no shards of metal shall be left above the top of the subgrade anchor, which shall be designed to be driven to grade. The anchor shall be automatically plugged to prevent any foreign matter or debris from entering, and to ensure protection from a pedestrian trip or fall accident.

4. No special tools such as torque wrenches or the like shall be required for effective installation or replacement of the receiver and breakaway coupler.
5. The receiver and breakaway coupler design shall enable the sign installer to fully reattach a signpost to the anchor within a five-minute period after a knock down.
6. When damaged by a direct wheel impact or vehicle under carriage, the design of the breakaway coupler shall facilitate reuse of the anchor.

709.51.3-Individual Component Features:

709.51.3.1-Breakaway Coupler: The breakaway coupler shall incorporate a hollow biconical or other similarly shaped shear section facilitating reliable true 360 degree functionality and enabling the post and receiver to separate cleanly from the anchor. To prevent trip or fall hazards, the coupler shall break cleanly and reliably at grade without leaving any sharp pieces of metal above grade. The coupler material shall provide for a minimum bending (elongation) of 12% prior to fracture. Upon impact the anchor shall remain undamaged with the inside of the anchor plugged by the remaining portion of the coupler. The bottom end of the coupler shall attach to the anchor by slidably fitting inside with the breakaway portion of the coupler being slightly above the anchor. The coupler shall incorporate a locking feature which applies equal and opposite force directly to a minimum of two opposing side walls of the anchor through the tightening of one externally accessible fastener prior to or after installation of the sign support.

709.51.3.2-Anchor: The breakaway coupler shall attach to a square 2½ “ x 2½” (min.) heavy duty anchor. The length of the anchor shall be 8” min. for concrete applications and 12” min. for asphalt applications. The anchor shall incorporate a tab completely around the top end such that the tab will sit flush on the road surface when completely driven, and will aid to seal the pre-driven hole from moisture and debris.

The anchor may be designed to allow a square 2”x2” ¼ “ wall (min.), 80 KSI min. yield strength seamless extension to slide into the end in order to meet the 12” length requirement in asphalt. The anchor a minimum of 4”. The anchor shall use a taper lock feature which is designed to ensure the joining of the anchor and the extension.

The anchor shall incorporate a inside plug or barrier, below the designed elevation of the bottom of the coupler after being inserted, to prevent moisture or soil from the bottom of the anchor to come into contact with the coupler.

701.51.3.3-Receiver: The receiver for the sign support shall be cast, and shall facilitate a snug male (sign support) to female (receiver) connection. The support shall be securely fastened to the receiver through the use of a maximum of two fasteners.

709.51.4-Component Materials and Coatings: The coupler and receiver components of the device shall be manufactured using material meeting the requirements of ASTM A536 (65-45-12 min). These components shall be coating with an exterior grade (UV protected) powder coating.

The subgrade anchor shall be manufactured from steel meeting the requirements of ASTM C1018. The entire anchor shall be covered with a rust inhibiting exterior grade epoxy coating.