

City of Lynchburg
Procurement Division
900 Church Street
Lynchburg, Virginia 24504
Telephone No.: (434) 455-3970
Fax No.: (434) 845-0711

Addendum for Invitation for Bids
REBID- KEMPER STREET BRIDGE REPLACEMENT PROJECT

14-886

Date: 09/15/2014
From: Lisa Moss, Buyer VCA
RE: Addendum No. 2

This Addendum supplements and amends the original Plans and Specifications and shall be taken into account in preparing proposals and shall become a part of the Contract Documents. The Bidder shall indicate receipt of this Addendum and all previously issued Addenda on the Bid Form.

1. SPECIFICATIONS FOR THE PROJECT WERE INADVERTANTLY LEFT OFF OF THE PROJECT MANUAL. THEY ARE ATTACHED BELOW.

Company Name: _____ *Address:* _____ *Date:* _____

Authorized Signature: _____ *Title:* _____

Print Name: _____ *Telephone No.:* _____

Fax No.: _____

**SPECIAL PROVISIONS FOR
KEMPER STREET IMPROVEMENTS
STATE PROJECT: U000-118-204, C-501**

**LYNCHBURG, VIRGINIA
COMMISSION NO. 2387E**

JULY 2014



701 FIRST STREET, S.W.
ROANOKE, VA 24016
(540) 345-9342

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LYNCHBURG, VIRGINIA**

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VDOT SUPPLEMENTAL SPECIFICATIONS (SSs), SPECIAL PROVISIONS (SPs) AND SPECIAL PROVISION COPIED NOTES (SPCNs)

Where Virginia Department of Transportation (VDOT) Supplemental Specifications, Special Provisions and Special Provision Copied Notes are used in this contract, the references therein to “the Specifications” shall refer to the *Virginia Department of Transportation Road and Bridge Specifications*, dated 2007 for both imperial and metric unit projects. References to the “Road and Bridge Standard(s)” shall refer to the *Virginia Department of Transportation Road and Bridge Standards*, dated 2008 for both imperial and metric unit projects. References to the “Virginia Work Area Protection Manual” shall refer to the 2011 edition of the *Virginia Work Area Protection Manual* for imperial and metric unit projects. References to the “MUTCD” shall refer to the 2009 edition of the *MUTCD* and the current *Virginia Supplement to the MUTCD* for imperial and metric unit projects.

Where the terms “Department”, “Engineer” and “Contract Engineer” appear in VDOT Supplemental Specifications, Special Provisions and Special Provision Copied Notes used in this contract and the VDOT publication(s) that each references, the authority identified shall be in accordance with the definitions in Section 101.02 of the *Virginia Department of Transportation Road and Bridge Specifications*, dated 2007. Authority identified otherwise for this particular project will be stated elsewhere in this contract.

VDOT Supplemental Specifications, Special Provisions and Special Provision Copied Notes used in this contract and the VDOT publication(s) that each reference are intended to be complementary to the each other. In case of a discrepancy, the order of priority stated in Section 105.12 of the *Virginia Department of Transportation Road and Bridge Specifications*, dated 2007 shall apply.

VDOT Special Provision Copied Notes in this contract are designated with “(SPCN)” after the date of each document. VDOT Supplemental Specifications and Special Provision Copied Notes in this contract are designated as such above the title of each document.

The information enclosed in parenthesis “()” at the left of each VDOT Special Provision Copied Note in this contract is file reference information for VDOT use only. The information in the upper left corner above the title of each VDOT Supplemental Specification and VDOT Special Provision in this contract is file reference information for VDOT use only.

The system of measurement to be used in this project is stated elsewhere in this contract. VDOT Supplemental Specifications, Special Provisions and Special Provision Copied Notes containing imperial units of measure with accompanying expressions in metric units shall be referred to hereinafter as “dual unit measurement” documents. Such a “dual unit measurement” is typically expressed first in the imperial unit followed immediately to the right by the metric unit in parenthesis “()” or brackets “[]” where parenthesis is used in the sentence to convey other information. Where a “dual unit measurement” appears in VDOT documents, the unit that applies shall be in accordance with the system of measurement as stated elsewhere in this contract. The unit shown that is not of the declared unit of measurement is not to be considered interchangeable and mathematically convertible to the declared unit and shall not be used as an alternate or conflicting measurement. Where VDOT

Specifications are used for metric unit projects and only imperial units of measurement appear the document, the provision(s) in this contract for imperial unit to metric unit conversion shall apply.

12-1-11 (SPCN)

SECTION 101.02—TERMS of the Specifications is amended to replace the definition of "Board", "Commissioner", "Contract Engineer", "Department", "Deputy Commissioner", "Engineer", "Notice to Proceed", "Plans" and "State", with the following terms:

- Board - City of Lynchburg, Virginia
- Commissioner - Director of Public Works
- Contract Engineer - City Engineer
- Department - City of Lynchburg, Virginia
- Deputy Commission - Deputy Director of Public Works
- Engineer - City Engineer

Engineer. The Director of Public Works, as designated by the City of Lynchburg, Virginia, who acts directly or through his duly authorized representative(s) and who is responsible for street design, construction, and maintenance. The Director, or his/her representative(s), acts within the scope of the particular duties assigned to them or the authority given to them by the City of Lynchburg, Virginia, these Specifications, supplemental specifications, and the Contract documents.

Section 101.02—Terms of the Specifications is amended to replace the definition for **Notice to Proceed**, **Plans** and **State** with the following:

Notice to Proceed. A specified date, identified as such and set forth in the contract, on which the Contractor may begin the work.

Plans. The approved plans and standard drawings, profiles, cross sections, computer output listings, supplemental drawings or exact reproductions thereof, and all subsequent approved revisions thereto that show the location, character, dimensions, and details of the work specified in the Contract.

State. City of Lynchburg, Virginia.

And to add the following terms:

City. The City of Lynchburg, Virginia, a Virginia governmental entity.

Commonwealth. Commonwealth of Virginia.

Owner. The City of Lynchburg, Virginia.

And to add the following definition:

Affiliate. Any business entity which is closely associated to another business entity so that one has the power to control the other either directly or indirectly; or, where one business entity systematically shares resources, officers and/or other management with another business entity to the extent that a business relationship legally exists or is publicly perceived to exist; or, when a third party has the power to control both; or, where one business entity has been so closely allied with another through an established course of dealings, including but not limited to the lending of financial wherewithal or engaging in joint ventures, so as to cause a public perception that the two firms are one entity.

And to replace throughout the Specifications, "Treasurer of Virginia" with "City's Commissioner of the Revenue".

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
PROJECT COMMUNICATION AND DECISION MAKING

January 3, 2005c
Reissued July 2008

I. DESCRIPTION

The intent of this provision is to establish procedures, processes and guidelines for making decisions and managing communications regarding work under contract on construction and maintenance projects. The information contained herein is not meant to be all inclusive but to serve as a minimal general framework for promoting efficient and effective communication and decision making at both the project and, if needed, executive administrative level. It is also not meant to override the decision-making processes or timeframes of specific contract requirements.

II. DEFINITIONS

For the purposes of this provision the following terms will apply and be defined as follows:

Submittals – Documents required by the contract that the Contractor must submit for the Department's review, acceptance or approval. These may include shop drawings, working drawings, material test reports, material certifications, project progress schedules, and schedule updates. The Contractor shall produce submittals as early as practicable when required by the contract so as not to delay review and determination of action.

Confirmation of verbal instructions (COVI) - Contractor requested written confirmation of agreements and instructions developed in negotiations with the Department concerning the Work under contract. Agreements must be able to be quantified using existing contract procedures and will, in the vast majority of cases, not impact contract time and cost. When time and/or cost are impacted, they must be clearly spelled out in the COVI.

Requests for information (RFI) – Requests generated by either the Contractor or the Department that the other party supplies information to better understand or clarify a certain aspect of the Work.

Requests for owner action (ROA) – Requests when the Contractor asks that the Department take certain action(s) the Contractor feels is required for proper completion of a portion of the Work or project completion.

Contract change requests (CCR) - Request where the Contractor asks the Department to make an equitable adjustment to the contract because of excusable and/or compensable events, instructions that have or have not been given or other work requiring time and/or cost beyond that specified or envisioned within the original contract.

Requests for contractor action (RCA) – Request generated by the Department where the Department asks the Contractor to take certain action that is in the best interests of the project and/or is required for proper completion of a portion of the Work or for project completion.

Contract change directives (CCD) – Directive by the Department which instructs the Contractor to perform work beyond that specified or envisioned in the original contract and which may specify instructions, time, and cost(s) to make an equitable adjustment to the original contract.

Responsible Person – The individual in the normal or escalated resolution process, for either the Contractor or the Department, having the direct authority, responsibility and accountability to formulate and respond to each category of information request.

III. PROCESS FOR DECISION MAKING

Project teams composed on responsible individuals directly involved in the administration, prosecution, and inspection of the Work from the Contractor and the Department shall define and agree upon the field decision-making process during the pre-construction conference. This information relative to the process should be written down and distributed to all parties of the process once it is established. Where there are responsibility, authority or personnel changes associated with this process such changes shall be distributed to all affected parties as quickly as practicable after they are effective so as not to delay or impede this process.

The process for making field decisions with respect to the Work detailed in the contract basically requires the following steps:

1. The Contractor and the Engineer agree on the decision-making process, the identity, authority and accountability of the individuals involved and on the cycle times for response for each category of decision.
2. The party requiring the information generates the appropriate request documents, and calls for a decision from the individual who is accountable for the particular facet of the Work under consideration within the agreed period.
3. The responding party has an internal decision-making process that supports the individual who is accountable and provides the information required within the agreed period for each category of request.
4. The party receiving the decision has an internal process for accepting the decision or referring it for further action within an agreed period of time.

The process also requires that clear and well-understood mechanisms be in place to log and track requests, document the age and status of outstanding requests and actions to be taken on requests that have not been answered within the agreed period.

Both the Department and the Contractor shall agree on the following:

- The documentation and perhaps format to be developed for each category of information requested,
- The name (as opposed to organizational position) of all individuals with the responsibility, authority and accountability to formulate and respond to each category of information requested. The District Administrator (DA) or Chief Executive Officer (CEO) of the Contractor may delegate the responsibility and authority for formulating and responding to requests, however, the accountability for meeting the established response time(s) remains with the District Administrator and CEO.
- The cycle times for each stage in the decision-making process,
- The performance measures to be used to manage the process,
- The action to be taken if cycle times are not achieved and information is not provided in a timely manner.

The following general guideline and timeframe matrix will apply to the various requests for action. Again, please note these guidelines are general in scope and may not apply to specific contract timeframes for response identified within the requirements of the Contract documents. In such cases, specific contract requirements for information shall apply.

PROCESS GUIDELINES FOR REQUESTS GENERATED BY THE CONTRACTOR

Process	Situation	Normal resolution process		Escalated process		Final resolution
		By	Within (calendar days)	By	Within	
Submittal	Where the Contractor requests the Department's review, acceptance or approval of shop drawings, materials data, test reports, project progress schedules, or other submittals required by standard Specifications or other contract language.	Department's Designated Project Manager	<ul style="list-style-type: none"> • Acknowledge: 3 days¹ • Accept or Return: 14 days • Final Determination/Approve: 30 days or as outlined in contract documents. 	DA or their designee*	7 days	Submit ROA or CCR
Confirmation of Verbal Instruction (COVI)	Resolving routine field issues, within the framework of the Contract, in negotiation with Owner field personnel.	Department's Appropriate field personnel	<ul style="list-style-type: none"> • Confirmation: 1 day² 	Submit RFI, ROA or CCR	7 days	(See process for RFI, ROA, or CCR)
Request for Information (RFI)	Requests the Department to supply information to better understand or clarify a certain aspect of the work.	Department's Designated Project Manager	<ul style="list-style-type: none"> • Action: 14 days (or appropriate Action Plan) 	DA or their designee*	7 days	Submit ROA or CCR
Request for Owner Action (ROA)	Requests that the Department take certain action the Contractor feels is required for proper completion of a portion of the Work or project completion.	Department's Designated Project Manager	<ul style="list-style-type: none"> • Acknowledge: 3 days¹ • Action: 14 days (or appropriate Action Plan) 	DA or their designee*	7 days	Submit CCR
Contract Change Request (CCR)	Requests the Department to make an equitable adjustment to the contract because of excusable and/or compensable events, instructions that have or have not been given or other work requiring time and/or cost beyond that specified or envisioned within the original contract.	Department's Designated Project Manager	<ul style="list-style-type: none"> • Acknowledge: 3 days¹ • Action: 30 days (45 days if federal oversight project) 	DA or their designee*	7 days	Established dispute resolution and claims process

¹ Process initiated on the last business day of a week shall be acknowledged before 5 pm on the next VDOT business day.

² The absence of a written confirmation from the Owner to a Contractor's written request for confirmation of a verbal instruction shall constitute confirmation of the verbal instruction.

PROCESS GUIDELINES FOR REQUESTS GENERATED BY THE OWNER

Process	Situation	Normal resolution process		Escalated process		Final resolution
		By	Within (calendar days)	By	Within	
1. RFI	Requests the Contractor to supply information to better understand or clarify a certain aspect of the work. (RFI)	Contractor's Project Superintendent	<ul style="list-style-type: none"> Action: 14 days (or appropriate written Action Plan) 	Contractor's Project Manager	7 days	Submit RCA or CCD
2. RCA	Requesting the Contractor take certain action(s) that is in the best interests of the project and/or is required for proper completion of a portion of the work or for project completion. (RCA)	Contractor's Project Superintendent	<ul style="list-style-type: none"> Response or Action to safety and environmental issues: 1 day Otherwise acknowledge: 3 days¹ Action: 14 days (or appropriate Action Plan) 	Contractor's Project Manager	7 days	Submit CCD
3. CCD	Instructs the Contractor to perform work beyond that specified or envisioned in the original contract and undertakes action(s) to make an equitable adjustment to the contract. (CCD)	Contractor's Project Superintendent	<ul style="list-style-type: none"> Acknowledge: 3 days¹ Action: 30 days 	CEO or their designee**	7 days	Established dispute resolution and termination process

¹ Process initiated on the last business day of a week shall be acknowledged before 5 p m on next project business day.

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
CPM PROGRESS SCHEDULE FOR CATEGORY III PROJECTS

March 1, 2011

Section 103.06(e) Progress Schedule of the Specifications is deleted and replaced by this provision.

Section 108.03 Progress Schedule of the Specifications is deleted and replaced by this provision.

For definitions of scheduling terms not defined herein, and guidelines on preparing and maintaining the Progress Schedule, refer to the *VDOT Post-Award Scheduling Guide*.

I. GENERAL REQUIREMENTS

This work shall consist of generating and maintaining a project Progress Schedule to aid the Contractor and the Department in planning and executing the Work. The Progress Schedule shall be used by the Contractor, the Department, and all involved parties to plan and schedule all work required to complete the project. The Progress Schedule shall also be used by the Department to monitor progress of the individual activities required to complete the project; as well as to assess the overall progress of the Work and to evaluate the effects of time-related changes on the project. The Progress Schedule shall consist of a Critical Path Method (CPM) Progress Schedule, Progress Schedule Narrative, and Progress Earnings Schedule submitted in accordance with the requirements of this provision.

The Contractor shall prepare and submit, for the Engineer's review and acceptance, a Progress Schedule to communicate the Contractor's intentions and proposed plan to accomplish the Work in accordance with the requirements of the Contract. The Progress Schedule shall depict the sequence in which the Contractor proposes to perform the Work and the dates on which the Contractor contemplates starting and completing all schedule activities required to complete the project. The Contractor shall maintain the Progress Schedule, at a minimum, monthly to ensure that it continues to represent the current status of the project and the Contractor's current work plan to complete the project.

The Contractor shall attend a Scheduling Conference with the Engineer no later than seven (7) calendar days prior to beginning the Work, with the exception of project start-up activities such as submittals, mobilization, surveying, construction access and signage, erosion and sedimentation controls, etc., as approved by the Engineer. The Scheduling Conference will be held to discuss the Contractor's overall plan to complete the Work and the detail work plan for the first ninety (90) calendar days of Work. The Scheduling Conference may be held in conjunction with the Pre-Construction Conference or at a separate meeting as mutually agreed to by the Contractor and the Engineer. The Contractor shall discuss his/her overall plan of operations concerning the Maintenance of Traffic (MOT)/Sequence of Construction or any proposed deviations from the phasing, staging, or sequence of construction as indicated on the Contract plans or as approved by the Engineer. During the Scheduling Conference key issues and project specific requirements necessary for the development of the Baseline Progress Schedule shall also be discussed. Such key issues shall include as applicable, but are not limited to key submittals, permits, construction access, right of way, environmental, utility, traffic or local events identified in the Contract Documents that may impact traffic; as well as other limitations to the Work or any known constraints or foreseeable issues that may impact the schedule. Such project specific requirements shall include as applicable, but are not limited to scheduling, phasing, sequencing, milestone(s), work to be performed by the Department or other previously identified involved

parties; or any known or likely constructability issues relative to the Contract plans and specifications.

II. OVERVIEW OF THE VARIOUS REQUIRED PROGRESS SCHEDULE SUBMISSIONS

A. Preliminary Progress Schedule – At least two (2) business days prior to the Scheduling Conference, or as approved by the Engineer, the Contractor shall submit to the Engineer for review and acceptance a Preliminary Progress Schedule. At the Contractor's discretion, a complete detailed Baseline Progress Schedule for the entire project may be submitted in lieu of the Preliminary Progress Schedule. The Preliminary Progress Schedule submission shall consist of the following:

1. Preliminary Progress Schedule: The Preliminary Progress Schedule shall depict, at a detailed level, the Contractor's proposed sequence and start/finish dates for all activities scheduled for the first ninety (90) calendar days of work. It shall also include, as applicable, any milestones or work to be performed by sub-contractors, the Department, or third parties during the first ninety (90) calendar days of work. The Preliminary Progress Schedule shall also depict at a summary level the proposed overall sequence and timing of the remaining Work. The Preliminary Progress Schedule shall be prepared in accordance with Section IV (A), with the exception of cost-loading.
2. Preliminary Progress Schedule Narrative: The Preliminary Progress Schedule Narrative shall describe the Contractor's detailed work plan for the first ninety (90) calendar days of work. The Preliminary Progress Schedule Narrative shall be prepared in accordance with Section IV (B).

Until the Baseline Progress Schedule is accepted by the Engineer, the Contractor shall submit an update of the Preliminary Progress Schedule monthly, within five (5) working days after the current data date or as approved by the Engineer. The updated Preliminary Progress Schedule shall show the actual progress of work completed to date and the current detailed schedule for accomplishing the work planned for the following ninety (90) calendar days of Work, as of the data date. It shall also show the summary level activities required to complete the remainder of the Work.

B. Baseline Progress Schedule – Within thirty (30) calendar days after the Notice to Proceed (NTP) date or as approved by the Engineer, the Contractor shall submit in its entirety, his/her Baseline Progress Schedule, to the Engineer for review and acceptance. The Baseline Progress Schedule submittal shall consist of the following:

1. Baseline Progress Schedule: The Baseline Progress Schedule shall represent the Contractor's initial detailed plan to accomplish the entire scope of Work in accordance with the Contract. The Baseline Progress Schedule shall be prepared based on the Critical Path Method (CPM) and shall depict in a time-scaled bar-chart plot, the sequence in which the Contractor proposes to perform the Work, the project critical path, and the dates on which the Contractor contemplates starting and completing the individual schedule activities required to complete the project. The Baseline Progress Schedule shall also depict the current status of the project and the Contractor's current plan to complete the remaining work, as of the Baseline Progress Schedule submittal date.

The Baseline Progress Schedule shall reflect a practicable work plan and logical progress of the Work as indicated in the Contract Documents or as approved by the Engineer. When preparing the schedule, the Contractor shall consider as applicable, all known or specified constraints or restrictions such as: holidays,

seasonal, normal weather, traffic or previously identified local events that may impact traffic, utility, railroad, right-of-way, environmental, permits, or other limitations to the Work that will impact the schedule. The Baseline Progress Schedule shall be prepared in accordance with Section IV (A).

2. Baseline Progress Schedule Narrative: The Baseline Progress Schedule Narrative shall describe the Contractor's proposed overall work plan to complete the entire project as reflected on the Baseline Progress Schedule. The Baseline Progress Schedule Narrative shall be prepared in accordance with Section IV (B).
3. Baseline Progress Earnings Schedule: The Baseline Progress Earnings Schedule shall indicate the Contractor's anticipated cumulative progress each month as of the Contractor's progress estimate date as defined in Section 109.08(a) of the Specifications. The anticipated cumulative progress shall be expressed as "Percent Complete" based on the anticipated total earnings to date relative to the Total Contract Value. The Baseline Progress Earnings Schedule shall reflect the anticipated progress of the Work as shown on the Baseline Progress Schedule and shall be prepared on the VDOT Form C-13C in accordance with the VDOT Post-Award Scheduling Guide. At the Contractor's discretion, the Progress Schedule may be cost-loaded, in which case, the Progress Earnings Schedule shall then be prepared and submitted using the VDOT Form C-13CPM.

The Baseline Progress Schedule will be reviewed by the Engineer for acceptance in accordance with Section VII. Upon acceptance by the Engineer, the Baseline Progress Schedule shall replace the Preliminary Progress Schedule. The accepted Baseline Progress Schedule shall henceforth become the project Schedule of Record (SOR). The SOR shall be defined as the currently accepted Baseline Progress Schedule. Until a subsequent Revised Progress Schedule is submitted and accepted, the accepted Baseline Progress Schedule shall remain the SOR against which all subsequent Progress Schedule Updates and progress will be compared. The SOR shall be used by the Engineer to assess the Contractor's schedule-based performance on the project.

C. Progress Schedule Update – The Contractor shall on a monthly basis submit for the Engineer's review and acceptance the Contractor's Progress Schedule Update within five (5) business days after the Contractor's progress estimate date or as approved by the Engineer. The Progress Schedule Update shall consist of the following:

1. Progress Schedule Update: The Progress Schedule Update shall depict the current status of the Work and the Contractor's current plan to complete the remaining work as of the data date. The Progress Schedule Update shall be prepared in accordance with Section IV (A).
2. Progress Schedule Update Narrative: The Progress Schedule Update Narrative shall describe the work performed since the previous update and the Contractor's current plan for accomplishing the remaining work. It shall also describe any progress deficiencies, schedule slippages, or time-related issues encountered; as well as any actions taken or proposed to avoid or mitigate the effects of the progress deficiencies, schedule slippages, or time-related issues. The Progress Schedule Update Narrative shall be prepared in accordance with Section IV (B).
3. Progress Earnings Schedule Update: The Progress Earnings Schedule Update shall depict the current status of the project by percent complete based on the actual total earnings to date relative to the Total Contract Value. The Progress Earnings Schedule Update shall show the actual monthly and cumulative

earnings to date as reflected on the Contractor's payment estimate, any variance in percent complete relative to the SOR, and the projected earnings for the remaining payment periods. The Progress Earnings Schedule Update shall be prepared on the VDOT Form C-13C or as specified herein and in accordance with the VDOT Post-Award Scheduling Guide.

The Progress Schedule Update will be reviewed by the Engineer for acceptance in accordance with Section VII. Upon acceptance by the Engineer, the Progress Schedule Update shall replace any previous Progress Schedule Updates as the current update of the SOR; however, it shall not replace the SOR. The currently accepted Progress Schedule Update shall henceforth become the contemporaneous schedule with which to report the current status of the project, plan the remaining Work, and evaluate the effects of any time-related changes or delays on the remaining Work.

D. Revised Progress Schedule – When the current Progress Schedule or work plan deviates significantly from the SOR, the Contractor shall submit to the Engineer for review and acceptance a Revised Progress Schedule to represent the Contractor's revised plan to complete the remaining work. Deviate significantly will be construed to mean deviations from the SOR resulting from schedule impacts or major changes in the Progress Schedule that alter the project critical path, Contract interim milestone(s), or project completion; or causes a major shift in the Progress Earnings Schedule. A Revised Progress Schedule will be required when:

1. The Engineer approves a Schedule Impact Analysis (SIA) for authorized or unanticipated changes in the Work or conditions that significantly impacts the Progress Schedule, as determined by the Engineer.
2. The Contractor proposes a different approach to his/her work plan that significantly impacts the Progress Schedule or the Engineer determines that the current Progress Schedule Update or Contractor's current work plan deviates significantly from the SOR. Such deviations may include, but are not limited to major changes in the Contractor's proposed phasing, general sequence, resource plan, means and methods, or durations. The Contractor may revise his/her Progress Schedule at any time, at his/her discretion; however, the Engineer will only consider accepting a Revised Progress Schedule submission for major changes that deviate significantly from the SOR.
3. The Engineer determines that progress of the Work is trending towards unsatisfactory, in accordance with Section VIII (C), and in the opinion of the Engineer, it is apparent that the progress deficiency will not result in an extension of the completion date of the project beyond the Contract time limit and a Recovery Plan is not required to correct the progress deficiency. In such cases, the Engineer will request a meeting with the Contractor to discuss the progress deficiency to determine the appropriate corrective action required.

The Revised Progress Schedule submission shall be based on the currently accepted Progress Schedule Update and shall be prepared and submitted in the form of a Baseline Progress Schedule as described in Section II (B). However, it shall reflect the current status of the project as of the submittal date, approved changes in the Work, and the proposed plan for completing the remaining work. The Revised Progress Schedule shall be submitted in lieu of a subsequent Progress Schedule Update unless directed otherwise by the Engineer. The Revised Progress Schedule will be reviewed by the Engineer for acceptance in accordance with Section VII. Upon acceptance by the Engineer, the Revised Progress Schedule shall henceforth replace the accepted Baseline Progress Schedule or any previously accepted Revised Progress Schedule as the SOR for the remainder of the project.

- E. Final As-Built Progress Schedule** – Within thirty (30) calendar days after final acceptance, the Contractor shall submit to the Engineer his/her Final As-built Progress Schedule. The Final As-built Progress Schedule shall show the actual start and finish dates for each activity in the schedule. The Contractor shall certify in writing that the Final As-built Progress Schedule accurately reflects the actual start and finish dates for all activities contained in the Progress Schedule. The Final As-built Progress Schedule shall be submitted in the form of a monthly Progress Schedule Update and shall represent the last Progress Schedule Update submission.

III. SCHEDULE IMPACT ANALYSIS (SIA) FOR CHANGES AND DELAYS

- A. Changes, Delays, and Schedule Impacts** – When changes in the Work that will impact the schedule are proposed or authorized by the Engineer, the Contractor shall submit for the Engineer's review and approval, a Schedule Impact Analysis (SIA) to determine the impact of the change. Also, when the Contractor believes he is entitled to a time extension and/or additional compensation for a time-related impact that is attributable to a cause beyond the control of and without the fault, negligence, or responsibility of the Contractor or those for whom the Contractor is responsible, the Contractor shall submit for the Engineer's review and approval, a SIA and all available supporting data to substantiate the request for modification of the Contract. The Contractor's request and SIA shall be submitted in accordance with the following:

1. Impacts Due to Directed or Authorized Changes: When the Engineer issues a written order or authorizes a change in the Work in writing, the Contractor shall submit in writing within seven (7) calendar days of the Engineer's written direction or as required by the Engineer, a request for modification of the Contract, if the Contractor believes that additional time and/or compensation is required to perform the Work. Such changes in the Work may include, but are not limited to directed or authorized changes in accordance with the applicable portions of Sections 104.02, 108.05, and 109.05 of the Specifications. The Contractor shall submit along with his/her request a *prospective* Schedule Impact Analysis (SIA) to substantiate the request for modification of the Contract in accordance with this provision and the applicable portions of Sections 104.02, 108.05, and 109.05 of the Specifications.
2. Impacts Due to Unanticipated Changes or Delays: When the Contractor discovers or encounters previously unknown or unanticipated changes in the Work or conditions, or a delay event that he believes will impact progress of the Work or completion of the project, the Contractor shall notify the Engineer in writing within two (2) working days of such discovery or encounter. Such changes in the Work or conditions or delay events may include, but are not limited to unusually severe weather, extraordinary or catastrophic weather events, errors or omissions in the Contract Documents; or differing site conditions or utility delays in accordance with the applicable portions of Sections 104.03 and 105.08 of the Specifications.

The Contractor shall then gather all available pertinent information and data necessary to determine how such change in the Work or condition will impact progress of the Work or completion of the project. The Contractor and the Department shall promptly meet to evaluate the scope and potential impact of such change or condition to allow the Engineer to make a timely decision on how to proceed, as well as to determine how the impact of such change or condition can be avoided or mitigated.

The Engineer may direct the Contractor to submit a SIA prior to proceeding with the work affected by such change, condition, or delay, in which case the Contractor shall submit in writing within seven (7) calendar days after receipt of the Engineer's direction, a request for modification of the Contract and a *prospective* SIA to substantiate the request for modification of the Contract.

Otherwise, the Contractor shall submit in writing a request for modification of the Contract and a *contemporaneous* SIA to substantiate the request for modification of the Contract. The request for modification of the Contract and SIA shall be submitted within fourteen (14) calendar days of completion of the changed work or work directly impacted by such condition, or the cessation date of the delay event, or as approved by the Engineer.

3. Unresolved Impacts: When the Contractor believes he is entitled to a time extension and/or additional compensation for an unresolved impact to the Work that is attributable to a cause beyond the control of and without the fault, negligence, or responsibility of the Contractor or those for whom the Contractor is responsible, the Contractor shall submit for the Engineer's review and approval, a request for modification of the Contract and a *retrospective* SIA to substantiate the request for modification of the Contract. Such impacts may involve, but are not limited to changes authorized by either Force Account Work or Unilateral Work Order, or other changes for which the scope of the change or magnitude of the impact could not be determined or mutually agreed to at the time the change was authorized or the delay event or changed condition was encountered.

The Contractor's notice of a change, a subsequent meeting with the Engineer, or submittal of a request for modification of the Contract as defined herein, shall not constitute a notice of intent to file a claim as required by Section 105.19. *No part of this provision is intended to alter, replace, or supersede Section 105.19 of the Specifications. The Contractor must adhere to Section 105.19 as well as this provision to preserve their rights to file a claim.*

- B. Schedule Impact Analysis (SIA)** – The SIA submission shall include a SIA schedule and a written SIA statement as well as supporting data and such information necessary for the Department to make an adequate and timely evaluation of any time-related request received from the Contractor for modification of the Contract. The SIA submission shall consist of the following:

1. A SIA schedule, as specified herein, which shall depict the schedule impact of the change in the Work or condition or delay event based on the currently accepted Progress Schedule Update, submitted prior to the earlier of the date the change in the Work was authorized or the changed condition or delay event was encountered. If the most recently submitted Progress Schedule Update is unacceptable, then the Engineer will evaluate the request based on the previously accepted Progress Schedule Update. In which case, the Contractor shall update the previously accepted Progress Schedule Update to show the actual progress of the Work to date as of the earlier of the date the change in the Work was authorized or the changed condition or delay event was encountered. The SIA schedule shall:
 - a) Be based on the "Time Impact Analysis (TIA)" or "Contemporaneous Schedule Analysis" method as determined by the Engineer, to determine the status of the currently accepted Progress Schedule Update before and after the change in the Work or condition or delay event.

- b) Show a fragnet (fragmentary network of added or changed activities) representing the added work, changed work or condition, or delay event(s). The fragnet activities shall be logically linked to the affected activities to show the direct impact on the work.
- c) Show the current status of the completed and on-going activities as of the date the change in the Work was authorized or the changed condition was encountered or the delay event started.
- d) Depict the schedule impact by showing a comparison between the impacted Progress Schedule Update and the most recently accepted Progress Schedule Update with a data date closest to and prior to the earlier of the date the change in the Work was authorized or the changed condition or delay event was encountered.
- e) Depict the overall impact on the project critical path, Contract interim milestone(s), other significant dates, and the Contract fixed completion date, as applicable.

2. A written SIA statement to:

- a) Describe the type, cause, and scope of the added work, changed work or condition, or delay event.
- b) Provide sequence and timing of events and/or actions by all involved parties relating to the change or delay.
- c) Describe the particular operations affected as well as identify by Activity ID and Activity Name the activities that are directly impacted.
- d) Describe the impact on the critical path, total float, Contract interim milestone(s), other significant dates, or the Contract fixed completion date, as applicable.
- e) Include a comparative analysis report relative to the currently accepted Progress Schedule Update to identify all changes made to the impacted Progress Schedule.
- f) Identify any actions taken and/or needed to avoid or mitigate the delay or the effects of the delay.

Approval or rejection of the SIA by Engineer shall be made within ten (10) business days after receipt of the SIA, unless subsequent meetings and negotiations are necessary, as determined by the Engineer. Upon approval by the Engineer, the Contractor shall incorporate the SIA into the Progress Schedule and shall submit the impacted Progress Schedule as a Progress Schedule Update or Revised Progress Schedule as directed by the Engineer. If appropriate, the approved SIA shall be used to substantiate any request for a time extension or time-related damages or additional compensations, in accordance with the applicable portions of Sections 104.02, 104.03, 105.08, 108.04, and 109.05 of the Specifications.

IV. DETAILED REQUIREMENTS FOR PROGRESS SCHEDULE SUBMISSIONS

- A. **Progress Schedule** – The Progress Schedule shall conform to the following requirements:

1. Software Compatibility Requirements: The Contractor shall submit his/her Progress Schedule in the Primavera proprietary exchange format (XER) to ensure compatibility with the Department's scheduling software system. The Department's scheduling software system is the latest version of Primavera's Project Management software (currently P6 version 6.2). Compatible shall mean that the Contractor-provided electronic file versions of the schedule can be imported into the Department's scheduling software system with no modifications, preparation or adjustments. For projects that are included in a multi-contract mega-project, the Contractor shall prepare and maintain his/her Progress Schedule in the Department's scheduling software system. At the Contractor's request, secured access via the internet may be granted to allow the Contractor to develop and maintain his/her Progress Schedule in the Department's scheduling software system. The Progress Schedule shall be submitted in accordance with Section V.
2. Software Settings: If Primavera (P6) or equivalent scheduling software with similar features is used to prepare the Progress Schedule, the Contractor shall define the project attributes and schedule calculation options in accordance with the software settings detail requirements defined in the VDOT Post-award Scheduling Guide.
3. Work Breakdown Structure (WBS): The Baseline Progress Schedule shall be organized using a multi-level hierarchical Work Breakdown Structure (WBS). The Contractor shall define a project WBS to allow for a hierarchical organization and breakdown of the Work based on the Contractor's approach and in accordance with the phasing/sequence of construction and traffic control plans as specified in the Contract or as approved by the Engineer.
4. Activity Codes: The Contractor shall define and assign as appropriate, activity codes to allow for filtering, grouping, and sorting of activities by Responsibility, Phase, Stage, Feature of Work, Area, Location, Work Type, Crew, and Contract Modification activity codes to facilitate review and use of the Progress Schedule. If Primavera (P6) or equivalent scheduling software with similar features is used to prepare the Progress Schedule, the Contractor shall define activity codes using the project-specific activity codes option. Use of global activity codes shall not be allowed and shall be grounds for rejecting the Progress Schedule submission. Project-specific activity codes shall be defined and assigned in accordance with the detail requirements defined in the VDOT Post-award Scheduling Guide.
5. Calendars: The Contractor shall define and assign as appropriate, project-specific calendar to each activity to indicate when the activity can be performed. If Primavera (P6) or equivalent scheduling software with similar features is used to prepare the Progress Schedule, the Contractor shall define the project calendars using the project-specific option. The project calendars shall indicate, as applicable, the standard working hours per day, standard working days per week, and non-work days such as week-ends, holidays, weather days, local events, environmental, time-of-year restrictions, etc. Use of global calendars shall not be allowed and shall be grounds for rejecting the Progress Schedule submission. The project-specific calendars shall be defined in accordance with the detail requirements defined in the VDOT Post-award Scheduling Guide.
6. Level of Detail: The Contractor shall develop the Progress Schedule to an appropriate level of detail that allows for the formation of a reasonable critical path. The Progress Schedule shall show as applicable, Contract milestones and

other key milestones for significant project events. The Progress Schedule shall also show, as applicable, administrative, procurement, MOT, work to be performed by other involved parties, discrete work activities to indicate the type of operation and location of the work, and other necessary time-based tasks required for completion of the project. The Work shall be sub-divided as practical, to such a level that the activity durations for on-site work excluding, activities whose durations are specified elsewhere in the Contract, are twenty (20) workdays or less. Longer durations may be allowed, as approved by the Engineer, for activities that typically span long periods of time such as fabrication and delivery of materials, administrative, MOT, or other such level of effort activities.

7. Network Logic: The Progress Schedule network logic shall be based on the Precedence Diagram Method (PDM) and shall show the order and interdependence of the activities and the sequence in which the Contractor proposes to accomplish the Work. The Contractor shall apply the Critical Path Method (CPM) of network calculation to generate the Progress Schedule. The project critical path shall be based on the "Longest Path". The Progress Schedule network logic shall be developed in accordance with the detail requirements defined in the VDOT Post-award Scheduling Guide.
8. Schedule Constraints: All Contract milestone activities shall be constrained, as applicable, with a "Start On or After" (Early Start) date or "Finish On or Before" (Late Finish) date equal to the "Start No Earlier Than" or "Must Finish By" date specified in the Contract, except as specified below. The Contractor's use of schedule constraints with the exception of the specific requirements defined below is not allowed, unless approved by the Engineer. The use of schedule constraints such as "Start On" or "Finish On" for the purpose of manipulating float or the use of schedule constraints that violate network logic such "Mandatory Start" or "Mandatory Finish" will not be allowed. When a schedule constraint is used, other than the schedule constraints specified herein, the Contractor shall provide explanation for the use of such constraint in the Progress Schedule or Progress Schedule Narrative.
9. Data Date: The data date is defined as the current status date of the Progress Schedule, which defines the start date for the scheduled remaining Work. All Progress Schedule submissions shall be calculated using an appropriate data date to indicate the status of the project at the time the Progress Schedule is submitted.
 - a) For the Preliminary, Baseline, or subsequent Revised Progress Schedule submission, the data date shall be no more than five (5) business days prior to the submittal date.
 - b) For the monthly Progress Schedule Update submissions the data date shall be the Contractor's monthly progress estimate date as defined in Section 109.08(a) of the Specifications.
10. Total Float: This section is intended to apply only to considerations of Contract time extension requests relative to available total float. Considerations for other time-related impacts, if any, are covered in other Sections of the Specifications. Any request for a Contract time extension will be evaluated, in accordance with Section 108.04, based on the critical path and available total float. Total float is defined as the amount of time, typically expressed in days (number of workdays or calendar days depending on the assigned calendar), that an activity can be delayed without extending the completion date of a related Contract interim

milestone or the project, as applicable. Except as specified herein, total float shall be calculated, as applicable, relative to a constrained Contract interim milestone date or the Contract fixed completion date specified in the Contract or a subsequent Work Order.

With the exception of A+B based Contracts, any float available in the Progress Schedule, at any time, shall be considered project float and is not for the exclusive use or benefit of either the Department or the Contractor. It shall be understood by the Contractor and the Department that float is a shared commodity and either party has the right to full use of any available float. Until such time that all available float is depleted, the project float shall be used responsibly in the best interest of the project and in a manner that best serves the timely completion of the Work by either a specified Contract interim milestone or the Contract fixed completion date, as applicable.

For A+B based Contracts for which the Contractor bids the Contract time and/or Contract interim milestone(s), any float on a critical activity or activities on the critical path shall belong to the Contractor and any float on non-critical activities or activities not on the critical path shall belong to the project and shall be considered available project float for use by either the Department or the Contractor for the benefit of the project.

The Contractor shall not modify the Progress Schedule at any time for the purpose of manipulating float. Negative float conditions will not be allowed in the Preliminary, Baseline, or Revised Progress Schedule.

11. Progress Schedule Update: The Progress Schedule Update shall reflect the actual status of the Work and the current plan to complete the remaining work as of the current data date. It shall show the actual start/finish dates for each completed activity and the actual start date, remaining duration, and progress (percent complete) of each on-going activity. The Progress Schedule Update shall allow for an accurate determination of progress of completed and on-going work based on total actual cost (earnings) to date; as well as an accurate projection of the anticipated monthly earnings for the remaining work based on remaining cost. The Progress Schedule Update shall be based on the most recently accepted Progress Schedule and shall be prepared in accordance with the detail requirements defined in the VDOT Post-award Scheduling Guide.

B. Progress Schedule Narrative – As specified in Section II of this provision, a Baseline Progress Schedule Narrative shall be submitted with the Baseline Progress Schedule submission and a Progress Schedule Update Narrative shall be submitted with the Progress Schedule Update submission. The Progress Schedule Narrative shall be prepared in accordance with the following:

1. Baseline Progress Schedule Narrative: The Baseline Progress Schedule Narrative shall include the following written information:
 - a) The Contractor's overall plan describing:
 - i) The proposed overall sequence of construction, including where the work will begin and how the work will progress;
 - ii) The methodology, scheduling assumptions, and general procedures for completing each major feature of Work;
 - iii) A list of the major resources (number and type of crews and equipment) required to complete the project as scheduled. For early completion schedules (projects with an early completion

interim milestone provision or projects with scheduled completion dates earlier than the Contract specified date by thirty (30) calendar days or more), the Contractor shall also provide a written resource plan for the major operations to demonstrate the Contractor's ability and commitment to provide resources at the level required to complete the work within the timeframes shown in the Progress Schedule;

iv) Anticipated daily production rates for each major operation.

- b) A description of the project critical path.
- c) A listing of the major milestone dates, including as applicable, Contract interim milestone(s), major traffic switches, start/finish milestones for each phase or stage of work, or related work to be performed by the Department or other involved parties.
- d) A log identifying the schedule constraints used in the Progress Schedule and reason for using each constraint.
- e) A description of the calendar(s) used in the Progress Schedule to indicate the Calendar ID, number of work days per week, number of shifts per day, and number of hours per day as well as the anticipated number of non-working days per month for each calendar with considerations, as applicable, for holidays, normal weather conditions; as well as for seasonal or other known or specified constraints and restrictions (i.e. traffic, local events, environmental, permits, utility, etc.).
- f) A description of any known problems or anticipated issues that may impact the schedule; and any actions taken, proposed, or needed to correct the problems.

2. Progress Schedule Update Narrative: The Progress Schedule Update Narrative shall include the following written information:

- a) A description of the current status of the project in terms of the current actual percent complete by total earnings relative to the SOR planned percent complete; as well as the scheduled completion dates of the interim milestone(s) and project completion.
- b) A description of any deviations from scheduled performance in terms of the scheduled completion dates of the interim milestone(s) and project completion since the previous schedule submission, including a statement explaining why any of the schedule milestone date(s) is forecast to occur after the specified date(s).
- c) A description of the work performed since the previous Progress Schedule submission and any deviations from the work scheduled.
- d) A description of major changes in the Contractor's work plan in terms of sequence of construction, shifts, manpower, equipment, or materials.
- e) A description of any deviations in project critical path since the previous Progress Schedule submission.
- f) A listing of adverse weather dates and number of days lost this period due to adverse weather or conditions resulting from adverse weather. List the activities affected and any impacts to the critical path.

- g) A description of problems encountered or anticipated since the previous Progress Schedule submission, including an explanation of any corrective actions taken or required to be taken.
- h) A description of work planned for the next update period and actions to be taken by the Department or other involved parties.

V. REPORTING AND SUBMITTAL REQUIREMENTS FOR PROGRESS SCHEDULE SUBMISSIONS

Unless directed otherwise by the Engineer, the Contractor shall submit for each Progress Schedule submission the following submittal items. Each electronic file submittal shall have a unique file name prefixed by the Contract ID to identify the Contract, submission type and order of submission, and date of submittal (e.g. C00012345B01_B-1_12-30-10.xer, C00012345B01_U-1_1-10-11.xer, etc.). The Progress Schedule submittals shall include:

- 1. A transmittal letter to the Engineer, identifying the date of submittal and which Progress Schedule is being submitted for review.
- 2. Two (2) sets of data compact disks (CD) containing the electronic working export file copy of the Progress Schedule in an "XER" file format in version 6.2 or lower. Each CD shall be labeled to indicate the Contract ID, type of submission, filename, and submittal date.
- 3. Two (2) sets of paper copies of the following schedule reports:
 - a) Schedule calculation log.
 - b) A legible time-scaled bar-chart plot of the Progress Schedule organized by WBS and sorted by early start to show for each activity: the Activity ID, Activity Name, Original Duration, Remaining Duration, Start and Finish dates, Activity Percent Complete, and Total Float. The bar-chart plot shall identify the project critical path (longest path).
- 4. Electronic file copies by email of the following:
 - a) A working export file of the Progress Schedule in an "XER" file format in version 6.2 or lower.
 - b) Electronic "PDF" copy of the tabular Predecessor/Successor report sorted in ascending order by Activity ID to show the following:
 - i) Activity ID;
 - ii) Activity Name;
 - iii) Original Duration;
 - iv) Remaining Duration;
 - v) Early Start;
 - vi) Early Finish;
 - vii) Late Start;
 - viii) Late Finish;
 - ix) Total Float;
 - x) Critical (Yes or No);

- xi) Predecessors: Activity ID, Activity Name, Early Start, Early Finish, Relationship Type, Lag, Driving (Yes or No), Constraint, and Constraint Date;
 - xii) Successors: Activity ID, Activity Name, Early Start, Early Finish, Relationship Type, Lag, Driving (Yes or No), Constraint, and Constraint Date.
- c) Electronic "PDF" copy of the Progress Schedule Narrative.
 - d) Electronic "PDF" copy of the Progress Earnings Schedule S-Curve.
 - e) A working file of the Progress Earnings Schedule (VDOT Form C-13C).

VI. FAILURE TO SUBMIT PROGRESS SCHEDULES

The Engineer will take necessary actions in accordance with the following for failure on the part of the Contractor to submit the required Progress Schedules:

1. If the Contractor fails to submit his/her complete Preliminary Progress Schedule at least two (2) business days prior to the Scheduling Conference, the Contractor shall not commence Work, with the exception of project start-up activities such as submittals, mobilization, surveying, construction access and signage, erosion and sedimentation controls, etc., until after seven (7) calendar days from the date the Contractor submits his/her complete Preliminary Progress Schedule, unless otherwise approved in writing by the Engineer.
2. If the Contractor fails to submit his/her complete Baseline Progress Schedule within thirty (30) calendar days after the NTP date or as approved by the Engineer, the Engineer will delay approval of the Contractor's next monthly progress estimate following the due date of the Baseline Progress Schedule until such time as the Contractor has satisfied the submittal requirements.
3. If the Progress Schedule submission is deemed unacceptable by the Engineer; and the Contractor fails to submit an acceptable Progress Schedule within fourteen (14) calendar days after the Engineer's request, the Engineer will delay approval of the Contractor's next monthly progress estimate following the due date of the Progress Schedule until such time as the Contractor has satisfied the submittal requirements.
4. If the Contractor fails to provide a Progress Schedule Update or if a Revised Progress Schedule is required as specified herein and the Contractor fails to provide such a Progress Schedule, the Engineer will delay approval of the Contractor's next monthly progress estimate following the due date of the Progress Schedule until such time as the Contractor has satisfied the submittal requirements.
5. If the Contractor fails to provide an acceptable Final As-built Progress Schedule as specified, the Engineer will delay approval for payment of the Contractor's final progress estimate until such time as the Contractor has satisfied the submittal requirements.

Please note: Delays resulting from the Contractor's failure to provide the Progress Schedule in accordance with the requirements set forth herein will not be considered just cause for extension of the Contract time limit or for additional compensation.

VII. REVIEW AND ACCEPTANCE

The Engineer will review all Progress Schedule submissions within fourteen (14) calendar days of receipt of the Contractor's complete submittal, unless subsequent review meetings are necessary, as determined by the Engineer. The Engineer's review for acceptance will not commence until all required submittal items and schedule information as defined herein are provided. Acceptance by the Engineer will be based only on completeness and conformance with the requirements of the Contract.

If the Contractor's Progress Schedule submission is deemed to be acceptable, the Engineer will respond with a written notice of acceptance, which may include comments or minor concerns on the submission and/or a request for clarification or justification. When the Engineer's response include any comments, concerns, or request for clarification or justification, the Contractor shall respond accordingly within seven (7) calendar days of receipt of the Engineer's response. The Contractor's response may include a resubmission of the Progress Schedule to address the Engineer's comments or concerns or provide clarification or justification accordingly.

If the Contractor's Progress Schedule submission is deemed to be unacceptable, the Engineer will issue a written notification of non-conformance, which will include a request for resubmission and comments describing the deficiencies prompting the Engineer's decision. At the Engineer's discretion, the Contractor may be required to attend a schedule review meeting to discuss the issues prompting the Engineer's decision or to facilitate review and acceptance of the Progress Schedule submission.

When the Progress Schedule submission is deemed by the Engineer to be unacceptable, the Contractor shall revise and re-submit the Progress Schedule submission accordingly, within seven (7) calendar days of receipt of the Engineer's response.

Review and acceptance by the Engineer will not constitute a waiver of any Contract requirements and will in no way assign responsibilities of the work plan, scheduling assumptions, and validity of the schedule to the Department. Failure of the Contractor to include in the Progress Schedule any element of work required by the Contract for timely completion of the project will not excuse the Contractor from completing the Work within the Contract specified interim milestone(s) or the Contract time limit, as applicable.

VIII. MONITORING THE WORK AND ASSESSING PROGRESS

A. Monitoring The Work – The Engineer will monitor the Work regularly to identify deviations from the Contractor's scheduled performance relative to the SOR. The Contractor shall notify the Engineer at least two (2) working days in advance of any changes in the Contractor's planned operations or critical stage work requiring Department oversight or inspection. The Contractor shall attend a monthly progress schedule meeting with the Engineer on a day agreed to by the Contractor and the Engineer. The Contractor shall furnish his/her detailed 30-day look-ahead schedule at the progress meeting and shall be prepared to discuss the current status of the Work and planned operations for the following thirty (30) calendar days. The 30-day look-ahead schedule shall be based on the Contractor's current monthly Progress Schedule Update.

B. Progress Evaluation – Progress will be evaluated by the Engineer at the time of the monthly progress estimate relative to the SOR. The Contractor's actual progress will be considered unsatisfactory if any one of the following conditions occurs:

1. The actual total earnings to date percentage for work completed, based on the Contractor's progress payment estimate, falls behind the SOR planned

cumulative earnings percentage by more than ten (10) percentage points. If the Progress Earnings Schedule is based on a cost-loaded Progress Schedule, then the unsatisfactory progress threshold will be based on falling behind the SOR planned cumulative late dates earnings percentage. Payments for Stored Materials, Materials on Hand, or Adjustments (asphalt, fuel, etc.) shall not be included in the actual progress earnings.

2. The calculated completion date of a Contract interim milestone is later than the specified completion date by more than fourteen (14) calendar days.
3. The calculated project completion date is later than the Contract fixed completion date by more than thirty (30) calendar days.

C. Progress Deficiency and Schedule Slippage – When the Contractor’s actual progress is trending toward unsatisfactory status, the Engineer will request a meeting with the Contractor to discuss any actions taken or required by the Contractor to reverse this trend and to correct the progress deficiency or schedule slippage.

When the Contractor’s actual progress is deemed unsatisfactory as defined by any one of the conditions listed under **Progress Evaluation** of this provision, the Engineer will issue a written notice of unsatisfactory performance to advise the Contractor that five (5) percent retainage of the monthly progress estimate is being withheld and will continue to be withheld as described in Section 109.08(c), for each month the Contractor’s actual progress is determined to be unsatisfactory, unless there is a pending decision by the Engineer on a request for modification of the Contract for which the Contractor has previously provided documentation as required.

When the Contractor fails to respond with good faith efforts as described herein to restore satisfactory progress, the Engineer will issue a notice to indicate that he may recommend the Contractor be temporarily disqualified from bidding on Contracts with the Department as described in Section 102.08 of the Specifications, if progress remains unsatisfactory at the time of preparation of the next monthly progress estimate following the Engineer’s notice. Prior to recommendation for removal from the list of pre-qualified bidders, the Engineer will allow the Contractor fourteen (14) calendar days from the date of the unsatisfactory performance notice to respond. Such “good faith” efforts shall be provided in sufficient detail to allow the Engineer to fully evaluate the Contractor’s plans for recovery. As an example of good faith efforts, the Contractor may submit to the Engineer, a proposed recovery plan in the form of a Progress Schedule Update and a written statement to describe the Contractor’s proposed actions and timeframe to correct the progress deficiency or schedule slippage. The Contractor may also submit to the Engineer a written explanation and supporting documentation to establish that such delinquency was attributable to conditions beyond his/her control. Any schedule adjustments resulting from a recovery plan will be reviewed in accordance with Section VII, but the modified Progress Schedule Update shall not replace the current SOR.

When the Engineer determines the Contractor’s progress is again satisfactory the five (5) percent retainage previously withheld will be released to the Contractor in accordance with the provisions of Section 109.08 (c) of the Specifications.

If the Contractor is temporarily disqualified from bidding on Contracts with the Department, the Contractor will not be reinstated until either the Engineer deems that his/her progress has improved to the extent that the Work can be completed within the Contract time limit or the project has received final acceptance in accordance with the provisions of Section 108.09.

IX. MEASUREMENT AND PAYMENT

Required Progress Schedule submissions will be measured and paid for in accordance with the following:

A. Basis of Payment – Progress payments will be made in accordance with the following:

1. Progress payments for the Baseline Progress Schedule pay item will be made as follows:
 - a) A twenty-five (25) percent of the Contract bid item lump sum amount will be made upon acceptance of the Preliminary Progress Schedule submission.
 - b) A seventy-five (75) percent of the Contract bid item lump sum amount will be made upon acceptance of the Baseline Progress Schedule submission. When a Baseline Progress Schedule is provided in lieu of a Preliminary Progress Schedule, a payment of one hundred (100) percent of the Contract bid item lump sum amount will be made upon acceptance of the Baseline Progress Schedule submission.
2. Progress payments for the Progress Schedule Update pay item will be made as follows:
 - a) Progress payments of one each (1 EA) at the Contract bid item unit price will be made upon acceptance of the Progress Schedule Update submission.
 - b) A Revised Progress Schedule may be required in lieu of and paid for upon acceptance as a Progress Schedule Update, as determined by the Engineer. When a Revised Progress Schedule is required by the Engineer, in addition to a regular Progress Schedule Update submission, progress payments of one each (1 EA) at the Contract bid item unit price will be made under the pay item for Progress Schedule Updates upon acceptance of the Revised Progress Schedule submission.
 - c) Upon approval, the SIA shall be incorporated into the Progress Schedule Update or Revised Progress Schedule, as directed by the Engineer, and paid for as a Progress Schedule Update. When a SIA is required in addition to a regular Progress Schedule Update submission, progress payment of one each (1 EA) at the Contract bid item unit price will be made upon approval under the pay item for Progress Schedule Update.
 - d) Progress payments of one each (1 EA) at the Contract unit price will be made upon acceptance of the Final As-built Schedule submission.
3. No separate measurement and payment will be made for attendance of the Scheduling Conference, progress meetings or other schedule related meetings. All costs associated with attendance of the scheduling meetings will be considered incidental.

B. Payment Items – Payments for all associated costs to attend schedule meetings, prepare, update, revise, and/or furnish the Progress Schedule will made under the following pay items:

Pay Item	Pay Unit
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Baseline Progress Schedule
Progress Schedule Update

Lump Sum
Each

(c211hg0-1209)

POLISHING AGGREGATE IN ASPHALT CONCRETE - Section 211—Asphalt Concrete of the Specifications is amended as follows:

Section 211.02—Materials is amended by replacing (e) with the following:

Fine or coarse aggregate that tend to polish under traffic will not be permitted in any final surface exposed to traffic except as permitted within the limits of Section 211.04(a) and (b) of the Specifications and as designated by the Engineer or as permitted elsewhere in these Specifications.

Section 211.04—Asphalt Concrete Mixtures is amended by replacing (a) and (b) with the following:

Asphalt concrete mixtures shall conform to the requirements of Table II-14 and the following:

- (a) **Types SM-9.0A, SM-9.0D, SM-9.0E, SM-9.5A, SM-9.5D and SM-9.5E asphalt concrete** shall consist of crushed stone, crushed slag, or crushed gravel and fine aggregate, slag or stone screenings or a combination thereof combined with asphalt cement.

NOTE: For all surface mixes, except where otherwise noted, no more than 5 percent of all aggregate retained on the No. 4 sieve and no more than 20 percent of the total aggregate may be polish susceptible. At the discretion of the Engineer, a SM-9.5AL may be specified and polish susceptible aggregates may be used (without percentage limits).

- (b) **Types SM-12.5A, SM-12.5D, SM-12.5E, IM-19.0A, IM-19.0D, and IM-19.0E asphalt concrete** shall consist of crushed stone, crushed slag, or crushed gravel and fine aggregate, slag or stone screenings or a combination thereof combined with asphalt cement.

NOTE: At the discretion of the Engineer, an intermediate mix may be designated as either a SM-19.0A or SM-19.0D. For SM-12.5 and SM-19.0 surface mixes, no more than 5 percent of the aggregate retained on the No. 4 sieve may be polish susceptible. All material passing the No. 4 sieve may be polish susceptible. No more than 35 percent of the total aggregate composition (polish and non-polish susceptible) shall be passing the No. 8 sieve. At the discretion of the Engineer, a SM-12.5AL may be specified and polish susceptible aggregates may be used (without percentage limits).

10-7-09 (SPCN)

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
CORROSION RESISTANT REINFORCING STEEL

January 24, 2012

SECTION 223—STEEL REINFORCEMENT of the Specifications is revised as follows:

223.02—Detail Requirements is amended to add the following

- (e) **Corrosion Resistant Reinforcing Steel, Class I:** Steel shall conform to the requirements of ASTM A1035/A1035M – Standard Specification for Deformed and Plain, Low-carbon, Chromium, Steel Bars for Concrete Reinforcement; or shall conform to the requirements of ASTM A955/A955M – Standard Specification for Deformed and Plain, Solid Stainless Steel Bars for Concrete Reinforcement, UNS* Designation(s): S32101.
- (f) **Corrosion Resistant Reinforcing Steel, Class II:** Steel shall conform to the requirements of AASHTO Designation: MP 13M/MP 13-04, Standard Specification for Stainless Steel Clad Deformed and Plain Round Steel Bars for Concrete Reinforcement; or shall conform to the requirements of ASTM A955/A955M - Standard and Specification for Deformed and Plain Solid Stainless Steel Bars for Concrete Reinforcement. UNS* Designations: S24100. Stainless steel clad bars may only be provided if they are domestically produced except for projects designated as experimental in the plans.
- (g) **Corrosion Resistant Reinforcing Steel, Class III:** Steel shall conform to the requirements of ASTM A955/A955M - Standard Specification for Deformed and Plain Solid Stainless Steel Bars for Concrete Reinforcement. UNS* Designations: S24000, S30400, S31603, S31653, S31803, S32304.

* Unified Numbering System for Metals and Alloys

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS**SUPPLEMENTAL SECTION 200—GENERAL**

SECTION 200—GENERAL of the Specifications is amended as follows:

200.06-Technician and Batchers Certification is replaced with the following:

Certification for technicians and batchers will be awarded by the Department upon a candidate's satisfactory completion of an examination.

- (a) **Central Mix Aggregate Technician:** A Central Mix Aggregate Technician designs and makes necessary adjustments in job mixtures at the plant based on an analysis of the specified material. The technician also samples materials and conducts any tests necessary to put the plant into operation and produce a mixture in accordance with the applicable Specifications.
- (b) **Asphalt Plant Level I Technician:** An Asphalt Plant Level I Technician samples materials.
- (c) **Asphalt Plant Level II Technician:** An Asphalt Plant Level II Technician samples material and is capable of conducting any tests necessary to put the plant into operation.
- (d) **Concrete Plant Technician:** A Concrete Plant Technician performs necessary adjustments in the proportioning of material used to produce the specified concrete mixtures
- (e) **Concrete Batchers:** A Concrete Batchers performs the batching operation. The batchers implements adjustments only at the direction of a certified Concrete Plant Technician unless the batchers's certification authorizes otherwise.
- (f) **Asphalt Field Level I Technician:** An Asphalt Field Level I Technician provides quality control of the placement operations of Asphalt Concrete.
- (g) **Asphalt Field Level II Technician:** An Asphalt Field Level II Technician inspects asphalt concrete placement in accordance with applicable requirements.
- (h) **Concrete Field Technician:** A Concrete Field Technician provides quality control of placement operations for hydraulic cement concrete in accordance with applicable requirements.
- (i) **Asphalt Mix Design Technician:** An Asphalt Mix Design Technician is responsible for designing and adjusting mixes as needed, reviewing and approving all test results, having direct communication with the plant for making recommended adjustments and is capable of conducting any tests necessary to put the plant into operation.
- (j) **Aggregate Properties Technician:** An Aggregate Properties Technician conducts all aggregate tests on aggregate used in asphalt concrete in accordance with applicable requirements

- (k) **Slurry Surfacing Technician:** A Slurry Surfacing Technician inspects the placement of emulsified asphalt slurry seal and latex modified emulsion treatment (Micro-surfacing) in accordance with applicable requirements.
- (l) **Surface Treatment Technician:** A Surface Treatment Technician inspects the placement of single seal and modified (blotted) seal coats in accordance with applicable requirements.

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SUPPLEMENTAL SECTION 207—SELECT MATERIAL

SECTION 207—SELECT MATERIAL of the Specifications is amended as follows:

Section 207.03—Job Mix Formula for Select Material, Type I is amended to replace the first paragraph with the following:

The Contractor shall submit or shall have the source of supply submit a job-mix formula for each mixture for the Engineer's approval through the "Producer Lab Analysis and Information Details" (PLAID) website <https://plaid.vdot.virginia.gov> prior to starting work. The formula shall establish a single percentage of aggregate passing each required sieve size denoted in Table II-6 and shall be in effect until a modification is approved by the Engineer. If unsatisfactory results or other changed conditions make it necessary, the Contractor shall prepare and submit a new formula for the Engineer's approval.

Section 207.05—Acceptance of Select Material, Type I is amended to replace the first and second paragraphs with the following:

Sampling and testing for determination of grading, moisture, and Atterberg limits shall be performed by the Contractor. The Contractor shall provide such test results within 48 hours of sampling to the Department through the "Producer Lab Analysis and Information Details" (PLAID) website <https://plaid.vdot.virginia.gov>. The Contractor shall maintain appropriate, current quality control charts. The Department will perform independent monitor tests. If there is a statistically significant difference between the two sets of results, an investigation will be made to determine the reason for the difference. If it is determined that the material does not conform to the requirements of the Contract, the material will be rejected or a payment adjustment will be made in accordance with the requirements of Section 207.07.

Determination of gradation and Atterberg limits will be based on a mean of the results of tests performed on four samples taken in a stratified random manner from each lot. Lots of 2000 tons or 4000 tons may be used at the discretion of the Engineer when warranted by annual plant shipping quantity and past performance. If visual examination reveals that the material is obviously contaminated or segregated, the material will be rejected without additional sampling or testing. If it is necessary to determine the gradation and Atterberg limits of the material in an individual location, one sample taken from the material in question will be tested and the results will be compared to the job-mix formula with the tolerances specified in Table II-7 and Table II-8 for one test. The results obtained will apply only to the material in question.

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SUPPLEMENTAL SECTION 208—SUBBASE AND AGGREGATE BASE MATERIAL

SECTION 208—SUBBASE AND AGGREGATE BASE MATERIAL of the Specifications is amended as follows:

Section 208.04—Job Mix Formula is amended to replace the first paragraph with the following:

The Contractor shall submit, or shall have the source of supply submit a job-mix formula for each mixture for the Engineer's approval through the "Producer Lab Analysis and Information Detail" (PLAID) website <https://plaid.vdot.virginia.gov> prior to starting work. The formula shall be within the design range specified in Table II-9. If unsatisfactory results or other conditions make it necessary, the Contractor shall prepare and submit a new job-mix formula for approval.

Section 208.06—Acceptance is amended to replace the second and third paragraphs with the following:

Sampling and testing for determination of grading, moisture, and Atterberg limits shall be performed by the Contractor. The Contractor shall provide such test results within 48 hours of sampling to the Department through "the Producer Lab Analysis and Information Details" (PLAID) website <https://plaid.vdot.virginia.gov>. The Contractor shall maintain appropriate current quality control charts. The Department will perform independent monitor tests at a laboratory of its choice. If there is a statistically significant difference between the two sets of results, an investigation will be made to determine the reason for the difference. If it is determined that the material does not conform to the requirements of the Contract, the material will be rejected or a payment adjustment will be made in accordance with the requirements of Section 208.08.

Determination of gradation and Atterberg limits will be based on a mean of the results of tests performed on four samples taken in a stratified random manner from each lot. Lots of 2000 tons or 4000 tons may be used at the discretion of the Engineer when warranted by annual plant shipping quantity and past performance. Samples shall be obtained by methods approved by the Engineer. Any statistically acceptable method of randomization may be used to determine the time and location of the stratified random sample to be taken. The Department shall be advised of the method to be used prior to the beginning of production.

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SUPPLEMENTAL SECTION 211—ASPHALT CONCRETE

SECTION 211—ASPHALT CONCRETE of the Specifications is amended as follows:

Section 211.01—Description is replaced with the following:

Asphalt concrete shall consist of a combination of mineral aggregate and asphalt material mixed mechanically in a plant specifically designed for such purpose.

An equivalent single-axle load (ESAL) will be established by the Engineer, and SUPERPAVE mix types may be specified as one of the types listed as follows:

Mix Type	Equivalent Single-Axle Load (ESAL) Range (millions)	Minimum Asphalt Performance Grade (PG) ²	Aggregate Nominal Maximum Size ¹
SM-9.0A	0 to 3	64-16	3/8 in
SM-9.0D	3 to 10	70-16	3/8 in
SM-9.0E	Above 10	76-22	3/8 in
SM-9.5A	0 to 3	64-16	3/8 in
SM-9.5D	3 to 10	70-16	3/8 in
SM-9.5E	Above 10	76-22	3/8 in
SM-12.5A	0 to 3	64-16	1/2 in
SM-12.5D	3 to 10	70-16	1/2 in
SM-12.5E	Above 10	76-22	1/2 in
IM-19.0A	Less than 10	64-16	3/4 in
IM-19.0D	10 to 20	70-16	3/4 in
IM-19.0E	20 and above	76-22	3/4 in
BM-25.0A	All ranges	64-16	1 in
BM-25.0D	Above 10	70-16	1 in

¹**Nominal Maximum Size** is defined as one sieve size larger than the first sieve to retain more than 10 percent aggregate.

²**Minimum Asphalt Performance Grade (PG)** is defined as the minimum binder performance grade for the job mixes as determined by AASHTO T170 or AASHTO M320.

Asphalt concrete shall conform to the requirements for the mix type designated.

At the Contractor's option, an approved Warm Mix Asphalt (WMA) additive or process may be used to produce the asphalt concrete (AC) mix type designated.

Section 211.02(h) antistripping additive is replaced with the following:

An antistripping additive shall be used in all asphalt mixes. It may be hydrated lime or an approved chemical additive from the Department's approved list found in the Materials Division's Manual of Instructions, or a combination of both. The approved chemical additive shall be added at a rate of not less than 0.30 percent by weight of the total asphalt content of the mixture.

The mixture shall produce a tensile strength ratio (TSR) not less than 0.80 for the design and production tests. The TSR shall be determined in accordance with AASHTO T283, including a freeze-thaw cycle (4-inch specimens compacted with a Marshall Hammer or 3.5 by 6-inch specimens when compacted with a gyratory compactor); except that the 16-hour curing time requirement and the 72 to 96-hour storage period will be waived. Design tests shall use the same materials that are to be used in the production mix and shall be conducted in a laboratory approved by the Department.

When a chemical additive is used, it shall be added to the asphalt cement prior to introduction into the mix. Any chemical additive or particular concentration of chemical additive found to be harmful to the asphalt material or that changes the original asphalt binder performance grade (PG), shall not be used.

Section 211.02(j)1 is replaced with the following:

1. Asphalt surface, intermediate and base mixtures containing RAP should use the performance grade (PG) of asphalt cement as indicated in Table II-I4A, however, the choice of PG to use in the mix shall be the responsibility of the Contractor in order to meet the requirements of Section 211.01 of the Specifications.

Section 211.02—Materials is amended by adding the following:

- (k) **Warm Mix Asphalt (WMA)** additives or processes shall be approved by the Department prior to use. Approved materials and processes shall be obtained from the Department's approved list which is included in the Materials Division's Manual of Instructions.

TABLE II-12A AGGREGATE PROPERTIES is amended to add **Mix Type IM-19.0E** as follows:

**TABLE II-12A
Aggregate Properties**

Mix Type	Coarse Aggregate Properties			Fine Aggregate Properties	
	CAA		ASTM D4791 F & E "(5:1) % by weight	SE	FAA
	1 fractured face	2 fractured faces			
IM-19.0 E	95% min.	90% min.	10% max. ¹	45% min.	45% min.

TABLE II-13 ASPHALT CONCRETE MIXTURES: DESIGN RANGE is amended to add **Mix Type IM-19.0E** to IM-19.0 A,D as follows:

**TABLE II-13
Asphalt Concrete Mixtures: Design Range¹**

Mix Type	Percentage by Weight Passing Square Mesh Sieves										
	2 in	1 1/2 in	1 in	3/4 in	1/2 in	3/8 in	No. 4	No. 8	No. 30	No. 50	No. 200
IM-19.0 A,D,E			100	90-100	90 max.	--	--	28-49			2-8

TABLE II-14 MIX DESIGN CRITERIA is replaced with the following:

**TABLE II-14
Mix Design Criteria**

Mix Type	VTM (%) Production (Note 1)	VFA (%) Design	VFA (%) Production (Note 2)	Min. VMA (%)	Fines/Asphalt Ratio (Note 3)	No. of Gyrations N Design
SM-9.0A ^{Notes 1,2,3}	2.0-5.0	75-80	70-85	16	0.6-1.3	65
SM-9.0D ^{Notes 1,2,3}	2.0-5.0	75-80	70-85	16	0.6-1.3	65
SM-9.0E ^{Notes 1,2,3}	2.0-5.0	75-80	70-85	16	0.6-1.3	65
SM-9.5A ^{Notes 1,2,3}	2.0-5.0	73-79	68-84	15	0.6-1.2	65
SM-9.5D ^{Notes 1,2,3}	2.0-5.0	73-79	68-84	15	0.6-1.2	65
SM-9.5E ^{Notes 1,2,3}	2.0-5.0	73-79	68-84	15	0.6-1.2	65
SM-12.5A ^{Notes 1,2,3}	2.0-5.0	70-78	65-83	14	0.6-1.2	65
SM-12.5D ^{Notes 1,2,3}	2.0-5.0	70-78	65-83	14	0.6-1.2	65
SM-12.5E ^{Notes 1,2,3}	2.0-5.0	70-78	65-83	14	0.6-1.2	65
IM-19.0A ^{Notes 1,2,3}	2.0-5.0	69-76	64-81	13	0.6-1.2	65
IM-19.0D ^{Notes 1,2,3}	2.0-5.0	69-76	64-81	13	0.6-1.2	65
IM-19.0E ^{Notes 1,2,3}	2.0-5.0	69-76	64-81	13	0.6-1.2	65
BM-25.0A ^{Notes 2,3,4}	1.0-4.0	67-87	67-92	12	0.6-1.3	65
BM-25.0D ^{Notes 2,3,4}	1.0-4.0	67-87	67-92	12	0.6-1.3	65

¹SM = Surface Mixture; IM = Intermediate Mixture; BM = Base Mixture.

Note 1: Asphalt content should be selected at 4.0 % Air Voids,

Note 2: During production of an approved job mix, the VFA shall be controlled within these limits.

Note 3: Fines-asphalt ratio is based on effective asphalt content.

Note 4: Base mix shall be designed at 2.5% air voids. BM-25.0 A shall have a minimum asphalt content of 4.4% unless otherwise approved by the Engineer. BM-25.0D shall have a minimum asphalt content of 4.6% unless otherwise approved by the Engineer.

Section 211.03—Job-Mix Formula is amended to replace the first paragraph with the following:

The Contractor shall submit a job-mix formula for each mixture for the Engineer's approval through the "Producer Lab Analysis and Information Details" (PLAID) website. Paper copies of the job mix formula along with supporting documentation shall also be submitted to the Department. The job-mix formula shall be within the design range specified. The job-mix formula shall establish a single percentage of aggregate passing each required sieve, a single percentage of asphalt material to be added to the aggregate, a temperature at which the mixture is to be produced, and a temperature at which the mixture is to be compacted for SUPERPAVE testing in accordance with the requirements of AASHTO R35. Each approved job-mix formula shall remain in effect, provided the results of tests performed on material currently being produced consistently comply with the requirements of the job-mix formula for grading, asphalt content, temperature, and SUPERPAVE compaction results and the requirements of Section 315 of the Specifications.

Section 211.03—Job-Mix Formula is amended by deleting the second paragraph of (a).

Section 211.03—Job-Mix Formula is amended to replace (c) with the following:

- (c) Three trial blends for gradation shall be run at one asphalt content.

Section 211.03—Job-Mix Formula is amended to replace (d)8 with the following:

- 8. For surface mixes, permeability test data shall be submitted in accordance with VTM 120 using either single point verification or the regression method for each surface mix having a different gradation. If the average of the permeability results from the single point verification method exceeds 150×10^{-5} cm/sec, or if the regression method predicts a permeability exceeding 150×10^{-5} cm/sec at 7.5% voids, the Contractor shall redesign the mixture to produce a permeability number less than 150×10^{-5} cm/sec.

Section 211.03—Job-Mix Formula is amended to replace (f) with the following:

- (f) A determination will be made that any asphalt concrete mixture being produced conforms to the job-mix formula approved by the Department. The Department and Contractor will test the mixture using samples removed from production. The following tests will be conducted to determine the properties listed:

Property	Test
Asphalt content	VTM-102, (VTM-36 when approved)
Gradation	AASHTO T-30
SUPERPAVE properties	AASHTO R35
Asphalt cement material	AASHTO T316 or T-201

For Warm Mix Asphalt (WMA), SUPERPAVE properties will be determined by the Department and Contractor based on the mix designation in Section 211.03(d)6 of the Specifications.

The Department will perform rut testing in accordance with the procedures detailed in VTM-110. If the results of the rut testing do not conform to the following requirements, the Engineer reserves the right to require adjustments to the job-mix formula:

Mix Designation	Maximum Rut Depth, mm
A	7.0
D	5.5
E, (S)	3.5

After calibration of the gyratory compactor is completed, adjustments to the job-mix formula may be required by the Engineer.

In the event the Department determines that the mixture being produced does not conform to the approved job-mix formula and volumetric properties specified in Table II-14 based on the Department's or Contractor's test results, the Contractor shall immediately make corrections to bring the mixture into conformance with the approved job-mix formula or cease paving with that mixture.

Subsequent paving operations using either a revised or other job-mix formula that has not been verified as described herein shall be limited to a test run of 100 to 300 tons of mixture if such material is to be placed in Department project work. No further paving for the Department using that specific mixture shall occur until the acceptability of the mixture being produced has been verified using the 100 to 300 ton constraint.

**TABLE II-14A
Recommended Performance Grade of Asphalt Cement**

Mix Type	Percentage of Reclaimed Asphalt Pavement (RAP) in Mix		
	%RAP ≤ 25.0%	25.0% < %RAP ≤ 30%	25.0% < %RAP ≤ 35%
SM-4.75A, SM-9.0A, SM-9.5A, SM-12.5A	PG 64-22	PG 64-22	
SM-4.75D, SM-9.0D, SM-9.5D, SM-12.5D	PG 70-22	PG 64-22	
IM-19.0A	PG 64-22	PG 64-22	
IM-19.0D	PG 70-22	PG 64-22	
BM-25.0A	PG 64-22		PG 64-22
BM-25.0D	PG 70-22		PG 64-22

Based on rut testing performed by the Department and/or field performance of the job mix, the Engineer reserves the right to require adjustments to the job-mix formula.

Section 211.04—Asphalt Concrete Mixtures is amended by replacing (b) with the following:

- (b) **Types IM-19.0A, IM-19.0D, and IM-19.0E asphalt concrete** shall consist of crushed stone, crushed slag, or crushed gravel and fine aggregate, slag or stone screenings, or a combination thereof combined with asphalt cement.

NOTE: At the discretion of the Engineer, an intermediate mix may be designated as either SM-19.0A, SM-19.0D or SM-19.0E. When designated as such, no more than 5 percent of the aggregate retained on the No. 4 sieve may be polish susceptible. All material passing the No. 4 sieve may be polish susceptible.

Section 211.04—Asphalt Concrete Mixtures is amended to replace (e) with the following:

- (e) **Type SM-9.5, SM-12.5, IM-19.0 and BM-25.0 asphalt concrete** may be designated E (polymer modified), or stabilized (S). Asphalt concrete mixtures with the E designation may not be stabilized.
- Type E asphalt mixtures** shall consist of mixes incorporating a neat asphalt material with polymer modification complying with the requirements of PG 76-22 and have a rolling thin film oven test residue elastic recovery at 77 degrees F of a minimum of 70 percent when tested in accordance with ASTM D 6084 procedure A. E designated mixtures shall not contain more than 15 percent reclaimed asphalt pavement (RAP) material.
 - Type (S) asphalt mixtures** shall consist of mixes incorporating a stabilizing additive from the Department's approved list found in the Materials Division's Manual of Instructions. These mixes shall be designated with an (S) following the standard mix designation. The minimum required additive shall be as specified on the Department's approved list found in the Materials Division's Manual of Instructions.
 - Type L asphalt mixtures** will be allowed to contain a 100 percent polishing coarse and fine aggregate. These mixes shall be designated with a L following the standard mix designation.

Section 211.05—Testing is amended to replace the second paragraph with the following:

The Contractor shall have a Department-certified Asphalt Mix Design Technician for designing and adjusting mixes as necessary. The Asphalt Mix Design Technician or Asphalt Plant Level II Technician may perform testing of asphalt mixes. The Asphalt Mix Design Technician shall be responsible for reviewing and approving the results of all testing. The Asphalt Mix Design Technician shall be available and have direct communication with the plant for making necessary adjustments in the asphalt concrete mixes at the mixing plant. The Asphalt Mix Design Technician and Asphalt Plant Level II Technician shall each be capable of conducting any tests necessary to put the plant into operation; however, the Asphalt Mix Design Technician shall be responsible for producing a mixture that complies with the requirements of these Specifications. The Department will award certification.

Section 211.05—Testing is amended to delete the last sentence of the last paragraph.

Section 211.06—Tests is replaced with the following:

The Department may sample materials entering into the composition of the asphalt concrete, the mixture, or the completed pavement. The Contractor shall cooperate with the Engineer in obtaining these samples. When samples are obtained from the pavement, the resulting voids shall be filled and refinished by the Contractor without additional compensation.

Abson recovery samples shall be PG graded according to the requirements of AASHTO M 320-05. Samples meeting the required grades specified in Section 211.01 of the Specifications shall be acceptable.

When the Department performs PG grading on the asphalt in a Contractor's liquid asphalt storage tank, the Engineer will notify the asphalt concrete producer and binder supplier if tests indicate that the binder properties of the asphalt material differ from those of the approved job-mix. The asphalt concrete producer and binder supplier shall determine corrective action with the approval of the Engineer.

Section 211.08—Acceptance is amended to replace the first paragraph with the following:

Acceptance will be made under the Department's quality assurance program, which includes the testing of production samples by the Contractor and of monitor samples by the Department. Sampling and testing for the determination of grading, asphalt cement content, and temperature shall be performed by the Contractor, and the Department will perform independent monitor checks at a laboratory of its choosing. The Contractor shall input such test results within 24 hours of sampling to the Department through the "Producer Lab Analysis and Information Details" (PLAID) website <https://plaid.vdot.virginia.gov>, unless otherwise approved by the Materials Engineer. Where the Contractor's test results indicate that the mixture conforms to the gradation, asphalt cement content, and mix temperature requirements of the Specifications, the mixture will be acceptable for these properties; however, nothing herein shall be construed as waiving the requirements of Section 106.06, Section 200.02, Section 200.03, and Section 315 of the Specifications or relieving the Contractor of the obligation to furnish and install a finished functional product that conforms to the requirements of the Contract. In the event a statistical comparative analysis of the Contractor's test results and the Department's monitor tests indicate a statistically significant difference in the results and either of the results indicates that the material does not conform to the grading and asphalt cement content requirements of the Specifications, an investigation will be made to determine the reason for the difference. In the event it is determined from the investigation that the material does not conform to the requirements of the Contract, price adjustments will be made in accordance with the requirements of Section 211.09 of the Specifications.

Section 211.08—Acceptance is amended to replace the second paragraph with the following:

Acceptance for gradation and asphalt cement content will be based on the mean of results of eight tests performed on samples taken in a stratified random manner from each 4,000-ton lot (8,000-ton lots may be used when the normal daily production of the source from which the material is being obtained is in excess of 4,000 tons). Unless otherwise approved by the Engineer, samples shall be obtained from the approximate center of the truckload of material. Any statistically acceptable method of randomization may be used to determine when to take the stratified random sample; however, the Department shall be advised of the method to be used prior to the beginning of production.

Section 211.08—Acceptance is amended to replace the third sentence of the fourth paragraph with the following:

The maximum temperature as recommended by the supplier shall not be exceeded for a mix designated E or (S).

Table II-15 PROCESS TOLERANCE is replaced with the following:

**TABLE II-15
Process Tolerance**

Tolerance on Each Laboratory Sieve and Asphalt Content: Percent Plus and Minus												
No. Tests	Top Size ¹	1 1/2"	1"	3/4"	1/2"	3/8"	No. 4	No. 8	No. 30	No. 50	No. 200	A.C.
1	0.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	6.0	5.0	2.0	.60
2	0.0	5.7	5.7	5.7	5.7	5.7	5.7	5.7	4.3	3.6	1.4	0.43
3	0.0	4.4	4.4	4.4	4.4	4.4	4.4	4.4	3.3	2.8	1.1	0.33
4	0.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	2.5	1.0	0.30
5	0.0	3.6	3.6	3.6	3.6	3.6	3.6	3.6	2.7	2.2	0.9	0.27
6	0.0	3.3	3.3	3.3	3.3	3.3	3.3	3.3	2.4	2.0	0.8	0.24
7	0.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.3	1.9	0.8	0.23
8	0.0	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.1	1.8	0.7	0.21
12	0.0	2.3	2.3	2.3	2.3	2.3	2.3	2.3	1.7	1.4	0.6	0.17

¹Defined as the sieve that has 100% passing as defined in Table II-13.

Section 211.09 is amended to replace the last three paragraphs with the following:

The unit bid price will be reduced by 0.5 percent for each adjustment point applied for standard deviation.

Section 211.10—Referee System is amended to replace (a) and (b) with the following:

- (a) In the event the test results obtained from one of the eight samples taken to evaluate a particular lot appear to be questionable, the Contractor may request in writing that the results of the questionable sample be disregarded, whereupon the Contractor shall have either an AASHTO-accredited lab or Department lab perform tests on five additional samples taken from randomly selected locations in the roadway where the lot was placed.

In the event the Engineer determines that one of the 8 test results appears to be questionable, the Department will perform tests on five additional samples taken from the

randomly selected locations in the roadway where the lot was placed. The test results of the seven original, i.e. unquestioned, samples will be averaged with the test results of the five road samples, and the mean of the test values obtained for the twelve samples will be compared to the requirements for the mean of twelve tests as specified in Table II-15.

- (b) In the event the Contractor questions the mean of the eight original test results obtained for a particular lot, the Contractor may request in writing approval to have either an AASHTO-accredited lab or Department lab perform additional testing of that lot.

In the event the Engineer determines that the mean of the eight original test results are questionable, the Department will perform additional testing of that lot. The test results of the eight samples will be averaged with the test results of the four additional samples taken from randomly selected locations in the roadway where the lot was placed, and the mean of the test values obtained from the twelve samples will be compare to the requirements for the mean of twelve tests as specified in Table II-15.

If the Contractor requests additional tests, as described in (a) or (b) herein, the Contractor shall sample the material and have either an AASHTO-accredited lab or Department lab test the material in accordance with Department-approved procedures. The Engineer reserves the right to observe the sampling and testing.

In the event the mean of the test values obtained for the twelve samples conforms to the requirements for the mean of twelve tests, the material will be considered acceptable. In the event that the mean of the test values obtained for the twelve samples does not conform to the requirements for the mean result of twelve tests, the lot will be adjusted in accordance with the adjustment rate specified in Section 211.09 of the Specifications.

Samples of the size shown herein shall be saw cut by the Contractor for testing without the use of liquids:

Application Rate	Minimum Sample Size
125 lb/yd ²	8 by 8 in
150 lb/yd ²	7 by 7 in
200 lb/yd ²	6 by 6 in
300 lb/yd ²	5 by 5 in

Section 211.12 (a) – Certification for Plant Operation and Sampling is replaced with the following:

- (a) **Certification for Plant Operation and Sampling:** A Certified Asphalt Plant Level I Technician or a Certified Asphalt Plant Level II Technician shall sample material at the plant.

Section 211.15—Initial Production is replaced with the following:

- (a) **Warm Mix Asphalt (WMA):** At the start of production, the Contractor shall place no more than 500 tons or up to one day’s production as directed by the Engineer at an approved site, which may be the project site, so the Engineer can examine the process control of the mixing plant, the Contractor’s placement procedures, surface appearance of the mix, compaction patterns of the Contractor’s roller(s), and correlation of the nuclear density device.
- (b) **Hot Mix Asphalt (HMA):** At the start of production of a mix not previously used on a state roadway, the Contractor shall place 100 to 300 tons or up to one day’s production

as directed by the Engineer at an approved site, which may be the project site, so the Engineer can examine the process control of the mixing plant, the Contractor's placement procedures, surface appearance of the mix, compaction patterns of the Contractor's roller(s), and correlation of the nuclear density device.

The material shall be placed at the specified application rate and will be paid for at the contract unit price for the specified mix type. The Engineer will determine the disposition of material that was not successfully produced and/or placed due to negligence in planning, production, or placement by the Contractor.

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SUPPLEMENTAL SECTION 212—JOINT MATERIALS

SECTION 212—JOINT MATERIALS of the Specifications is amended as follows:

Section 212.02(h)—Gaskets for pipe is replaced with the following:

- (h) **Gaskets for pipe** shall conform to the following: Rubber gaskets for ductile iron pipe and fittings shall conform to the requirements of AWWA C111; rubber gaskets for all other pipe shall conform to the requirements of ASTM C443 and the ozone cracking resistance described in Section 237.02.

Preformed plastic gaskets shall conform to the requirements of ASTM C990.

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SUPPLEMENTAL SECTION 214—HYDRAULIC CEMENT

SECTION 214—HYDRAULIC CEMENT of the Specifications is amended as follows:

Section 214.02(b) Portland cements is amended by replacing 1. with the following:

1. The SO₃ content as specified in AASHTO M85 will be permitted, provided supporting data specified in AASHTO M85 are submitted to the Department for review and acceptance prior to use of the material.

Section 214.02(b) Portland cements is amended by deleting 3., 4., and 5.

Section 214.02—Detail Requirements is amended by adding the following:

- (c) **Expansive hydraulic cement** shall conform to the requirements of ASTM C 845 Type K.

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SUPPLEMENTAL SECTION 215—HYDRAULIC CEMENT CONCRETE ADMIXTURES

SECTION 215—HYDRAULIC CEMENT CONCRETE ADMIXTURES of the Specifications is amended as follows:

Section 215.02(g) Fly ash is replaced with the following:

- (g) **Pozzolan** shall conform to Section 241 of the Specifications.

Section 215.02—Materials is amended by adding the following:

- (k) **Metakaolin** shall conform to the requirements of AASHTO M321

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SUPPLEMENTAL SECTION 217—HYDRAULIC CEMENT CONCRETE

SECTION 217—HYDRAULIC CEMENT CONCRETE of the Specifications is amended as follows:

Section 217.02(a) Cementitious Materials is replaced with the following:

Cementitious materials shall be a blend of mineral admixtures and Portland cement or a blended cement. In overlay concretes, expansive hydraulic cement is permitted in lieu of Portland cement. Portland cement (Types I, II, III) blended cements (Type IP, Type IS) or expansive cement (Type K) shall comply with Section 214 of the Specifications. Flyash, ground granulated iron blast-furnace slag (GGBFS), silica fume or metakaolin shall conform to Section 215 of the Specifications. As a portion of the cementitious material, Table 1 lists the minimum percents of specific pozzolans required by mass of the cementitious material depending on the alkali content of the cement. Any other mineral admixture or any other amount or combination of mineral admixtures may be used if approved by the Engineer. As a portion of the cementitious material, the fly ash content shall not exceed 30 percent for Class F, the ground granulated blast-furnace slag content shall not exceed 50 percent and the silica fume content shall not exceed 10 percent unless approved by the Engineer. Class C Flyash or other pozzolans may be used provided the contractor demonstrates that the percent usage of Class C Flyash or other pozzolans have a maximum expansion of 0.15% according to ASTM C227 at 56 days using borosilicate glass as aggregate. Blended cements require no further pozzolan additions to meet minimum pozzolan content to compensate for the alkali-silica reaction.

Up to 7 percent silica fume may be added to all combinations of cementitious materials to reduce early permeability without approval by the Engineer. Other silica fume additions must be approved by the Engineer.

Table 1 – Minimum percent pozzolan required by mass of cementitious material as a portion of the total cementitious materials and are based upon the alkali content of the cement.

	Total Alkalies of Cement is less than or equal to 0.75%	Total Alkalies of Cement is greater than 0.75% and less than or equal to 1.0%
Class F Flyash	20%	25%
GGBF Slag	40%	50%
Silica Fume	7%	10%
Metakaolin	7%	10%

TABLE II–17 Requirements for Hydraulic Cement Concrete is replaced with the following:

**TABLE II-17
Requirements for Hydraulic Cement Concrete**

Class of Concrete	Design Min. Laboratory Compressive Strength at 28 Days (f'c) (psi)	Aggregate Size No. ⁶	Design Max. Laboratory Permeability at 28 Days (Coulombs) ⁵	Design Max. Laboratory Permeability at 28 days - Over tidal water (Coulombs) ⁵	Nominal Max. Aggregate Size (in)	Min. Grade Aggregate	Min. Cementitious Content (lb./cu yd)	Max. Water /Cementitious Mat. (lb. Water/lb. Cement)	Consistency (in of slump)	Air Content (percent) ¹
A5 Prestressed and other special designs ²	5,000 or as specified on the plans	57 or 68	1,500	1,500	1	A	635	0.40	0-4	4 1/2 ± 1 1/2
A4 General	4,000	56 or 57	2,500	2,500	1	A	635	0.45	2-4	6 1/2 ± 1 1/2
A4 Post & rails	4,000	7, 8 or 78	2,500	2,500	0.5	A	635	0.45	2-5	7 ± 2
A3 General	3,000	56 or 57	3,500	3,500	1	A	588	0.49	1-5	6 ± 2
A3a Paving	3,000	56 or 57	3,500	3,500	1	A	564	0.49	0-3	6 ± 2
A3b Paving	3,000	357	3,500	3,500	2	A	N.A	0.49	0-3	6 ± 2
B2 Massive or lightly Reinforced	2,200	57	N.A.	N.A.	1	B	494	0.58	0-4	4 ± 2
C1 Massive Unreinforced	1,500	57	N.A.	N.A.	1	B	423	0.71	0-3	4 ± 2
T3 Tremie seal	3,000	56 or 57	N.A.	N.A.	1	A	635	0.49	3-6	4 ± 2
Latex hydraulic cement concrete overlay ³	3,500	7, 8 or 78	1,500	1,500	0.5	A	658	0.40	4-6	5 ± 2
Silica fume, silica fume /Class F Fly Ash or silica fume/slag concrete overlay ⁴	5000	7, 8 or 78	1,500	1,500	0.5	A	658	0.40	4-7	6 ± 2
Class F Fly Ash or slag overlay	4000	7, 8 or 78	1,500	1,500	0.5	A	658	0.40	4-7	6 ± 2

(See next page for notes on TABLE II-17).

(See next page for notes on TABLE II-17).

----- (TABLE II-17 Notes) -----

- ¹ When a high-range water reducer is used, the upper limit for entrained air may be increased by 1% and the slump shall not exceed 7 inches.
- ² When Class A5 concrete is used as the finishing bridge deck riding surface, or when it is to be covered with asphalt concrete with or without waterproofing, the air content shall be $5 \frac{1}{2} \pm 1 \frac{1}{2}$ percent.
- ³ The latex modifier content shall be 3.5 gallons per bag of cement. Slump shall be measured approximately 4.5 minutes after discharge from the mixer.
- ⁴ Silica fume with a minimum of 7% by weight of cementitious material; silica fume with a range of 2.5-5 % shall be combined with Class F Fly Ash in range of 15-20% and minimum cement of 77.5% by weight of cementitious material; silica fume with a range of 2.5-5% shall be combined with Ground Granulated Blast Furnace Slag in the range of 30-35% and a minimum cement of 67.5% by weight of cementitious material.
- ⁵ The permeability testing does not apply to small bridges identified on the bridge plans and to concrete structures and incidental concrete as described in Sections 219, 232, 302, 415, 502, 504, 506 and 519. Curing and testing of test cylinders for permeability will be in accordance with VTM 112.
- ⁶ The contractor may use different aggregate sizes or a combination of sizes to increase the coarse aggregate content of the concrete as approved by the Engineer. The maximum size of the coarse aggregate shall not exceed 2.5 inches.

Note: With the approval of the Engineer, the Contractor may substitute a higher class of concrete for that specified at the Contractor's expense.

Section 217.02(b) Formulated latex modifier is amended by adding the following:

For latex-modified concrete, Type I, Type II, Type III or Type K, cement shall be used without mineral admixtures.

Section 217.04(a)4. Admixtures is replaced with the following:

4. **Admixtures** shall be dispensed and used according to the manufacturer's recommendations. They shall be added within a limit of accuracy of 3 percent, by means of an approved, graduated, transparent, measuring device before they are introduced into the mixer. If more than one admixture is to be used, they shall be released in sequence rather than in the same instant. Once established, the sequence of dispensing admixtures shall not be altered. However, when the amount of admixture required to give the specified results deviates appreciably from the manufacturer's recommended dosage, use of the material shall be discontinued.

Section 217.05—Equipment is amended to replace the first paragraph with the following:

Equipment and tools necessary for handling materials and performing all parts of the work will be approved by the Engineer and must be in accordance with one of the following procedures:

1. having a current National Ready Mix Concrete Association Plant and Truck Certification, or
2. having a Department approved self-certification program in-place prior to the production of concrete for the Department.

Failure to comply with one or the other of these procedures will result in the concrete production being unapproved and work will not be allowed to proceed.

Section 217.05(a) Batching Equipment is amended to replace the second paragraph with the following:

Scales used for weighing aggregates and cement shall be approved and sealed in accordance with the requirements of Section 109 of the Specifications.

Section 217.05—Equipment is amended to add the following:

(d) **High Performance Volumetric Mixers (HPVMs):** The Contractor may produce the specified class of hydraulic cement concrete in Table II-17 in accordance with Section 217.02(a) of the Specifications provided that the manufacturer's equipment meets the tolerance requirements of Section 217.04(a) of the Specifications and has a stamped plate from the Volumetric Mixers Manufacturers Bureau stating that the equipment conforms to the requirements in ASTM C685.

The hydraulic cement concrete shall be mixed at the point of delivery by a combination of materials transport and mixer unit conforming to the following:

1. The unit shall be equipped with calibrated proportioning devices for each ingredient added to the concrete mix. The unit shall be equipped with a working recording meter that is visible at all times and furnishes a ticket printout with the calibrated measurement of the mix being produced. If at anytime the mixer fails to discharge a uniform mix, production of concrete shall halt until any problems are corrected.
2. Each unit shall have a metal plate(s) attached in a prominent place by the manufacturer on which the following are plainly marked: the gross volume of the transportation unit in terms of mixed concrete, the discharge speed and the mass calibrated constant of the machine in terms of volume.
3. HPVMs shall be calibrated by a Department approved testing agency in accordance with the manufacturer's recommendations at an interval of every 6 months or a maximum production of 2500 cubic yards, whichever occurs first prior to use on the project. The yield shall be maintained within a tolerance of ± 1 percent and verified using a minimum 2 cubic feet container every 500 cubic yards or a minimum once per week.
4. The three cubic feet initially discharged from the truck shall be discarded and not used for concrete placement. Acceptance of the specified class of concrete shall comply with Section 217.08 of the Specifications except that the sample secured for acceptance testing will be taken after four cubic feet is discharged from the delivery vehicle. During discharge, the consistency as determined by ASTM C143 on representative samples taken from the mixer discharge at random intervals shall not vary more than 1 inch. Acceptance tests shall be performed on each load. If test data demonstrates that consistency of concrete properties are being achieved, the Engineer may reduce testing requirements.
5. The HPVM shall be operated by a person who is a certified operator by the HPVM manufacturer. Any equipment adjustments made during the on-site production of concrete shall be done under the direct on-site supervision of the producer's VDOT Concrete Plant and Field Certified Technician.

Each load of HPVM produced concrete shall be accompanied by a Form TL-28 signed by the producer's VDOT Certified Concrete Plant Technician or a designated company

representative working under the direct on-site supervision of the producer's VDOT Concrete Plant and Field Certified Technician. The form shall be delivered to the Inspector at the site of the work. Loads that do not carry such information or do not arrive in satisfactory condition shall not be used.

Section 217.07—Proportioning Concrete Mixtures is amended to replace the first paragraph with the following:

The Contractor is responsible for having a Certified Concrete Plant Technician available during batching operations, and a Certified Concrete Field Technician shall be present during placing operations.

Section 217.07—Proportioning Concrete Mixtures is amended to delete the third paragraph beginning with “**A Certified Concrete Batchers**”.

Section 217.07—Proportioning Concrete Mixtures of the Specifications is amended to replace the eleventh paragraph with the following:

Except for latex hydraulic cement concrete, concrete mixtures shall be developed and/or verified by any one of the following three options listed below.

The mix design(s) as determined by the respective option shall be valid provided there is no change in sources of aggregate, chemical admixtures, mineral admixtures or hydraulic cement. All concrete mixtures shall contain the minimum amount of mineral admixtures or combination thereof expressed as a percent of the total cementitious materials in accordance with Section 217.02(a). All quantities of materials shall be weighed in accordance with tolerances specified in Section 217.04. Neither the quantities of coarse or fine aggregates used in concrete production shall deviate by more than $\pm 5\%$ by weight from the batch weights of the approved mix design.

When low permeability concrete is specified, two 4 X 8 inch specimens shall be molded from concrete representing the proposed mix design and tested in accordance with VTM 112 to validate conformance. For trial batches, the tested permeability value shall be considered satisfactory provided it is 500 coulombs less than the specified maximum value for the class of concrete specified.

Option 1 - Prescriptive Method:

Mix proportions for normal, heavy weight, and lightweight concrete shall be established by the methods described in ACI 211, on an absolute volume basis, for the respective aggregate size and meeting all the requirements of Table II-17 for the class of concrete indicated. Aggregate properties obtained from the aggregate producer shall be used for design purposes.

Once the proposed mix design has been established, the contractor or their concrete supplier shall produce one 3-cubic yard production verification batch using the same type of equipment intended for use in supplying concrete to the Department. The proposed mix design will be considered acceptable provided that the plastic properties of the concrete are within the Department's specification limits for the given class of concrete. Strength tests of the verification batch must equal or exceed $f'c$ for the intended class of concrete.

Option 2 - Trial Batch Mix Design Method:

The minimum cementitious content requirement in Table II-17 shall be waived provided that the maximum water-cementitious ratio requirement of Table II-17 is met for the respective

class of concrete. The required grading for fine and coarse aggregate shall be waived provided the coarse aggregate meets the nominal maximum size as required in Table II-17 for the respective class of concrete.

The Contractor or their concrete supplier shall prepare a minimum of 3 trial concrete batches with differing cementitious materials contents over a range anticipated to encompass the design strength, f_c , plus overdesign, and water-cementitious ratios encompassing the range permitted for the classes of concrete being evaluated. Trial batches may be produced in either;

Option 2A: Small scale laboratory batches, or

Option 2B: Truck batches with a minimum batch volume of 3 cubic yards each.

The plastic properties of the trial concrete batches shall meet the requirements for consistency and air content in Table II-17 and meet the additional requirements listed below:

- The concrete temperature of the trial batches, as batched and sampled, shall be a minimum of 68 degrees F.
- Air content of the trial batches shall within a range of -1.0 to + 1.5 percentage points of the median design air content for the classes of concrete being evaluated.
- Slump of the trial batches shall be within ± 1 inch of the maximum slump permitted for the class of concrete.

Three 4 X 8 inch test specimens shall be molded from each batch, cured in accordance with ASTM C 31 for acceptance specimens, and then compression tested at an age of 28 days. The strength results of these tests shall be plotted on a graph to establish the relationship between the water-cementitious ratio and the compressive strength. Alternately, the relationship can be established between the cementitious content and the compressive strength. The design water-cementitious ratio, or design cementitious content, can then be derived from the graph to satisfy the required design strength plus an appropriate overdesign to be designated as f'_{cr} . The required cementitious materials content determined from these tests can be interpolated from the established graph. If desired, the design water-cementitious ratio or cementitious content can be determined from a polynomial regression analysis of the plotted strength data.

Test results from prior trial concrete batches are acceptable for use provided that they represent the same material sources proposed for the Department work, meet the requirements for trial concrete batches as stated above and are less than 18 months old.

The required cementitious content to satisfy the strength requirement for the respective class of concrete shall be determined in accordance with either of the two following procedures:

1. When the concrete production facility has sufficient data to establish a production standard deviation (s), as described in **Documentation of Previous Field Experience or Production Standard Deviation (s)**. The cementitious content required to meet the design strength requirement, f'_{cr} , then the f'_{cr} shall be based upon the following equation:

$$f'_{cr} = f_c + 3s$$

2. When the concrete production facility does not have a production standard deviation established the cementitious content required to meet the design strength requirement, f'_{cr} , then the f'_{cr} shall be based upon the following equation :

$$f'_{cr} = f'_c + 1700 \text{ psi.}$$

Once the proposed mix design has been established, the contractor or their concrete supplier shall produce one 3-cubic yard production verification batch using the same type of equipment intended for use in supplying concrete to the Department. The proposed mix design will be considered acceptable provided that the plastic properties of the concrete are within the Department's specification limits for the given class of concrete. Strength tests of the verification batch must equal or exceed f'_c for the intended class of concrete. The requirement for a production verification batch shall be waived when the trial batching is performed by Option 2B -Truck batches.

Option 3 - Documented Field Experience Method:

The minimum cementitious content requirement in Table II-17 shall be waived provided that the maximum water-cementitious ratio requirement of Table II-17 is met for the respective class of concrete. The required grading for fine and coarse aggregate shall be waived provided the coarse aggregate meets the nominal maximum size as required in Table II-17 for the respective class of concrete.

An existing concrete mixture shall be considered acceptable for use provided that the contractor or their concrete supplier has a satisfactory test record of pervious field experience as described in:

Documentation of Previous Field Experience or Production Standard Deviation (s), and that the proposed concrete mixture meets the following requirements:

1. The water cementitious ratio of the proposed concrete mixture is less than or equal to the maximum water cementitious ratio specified for the respective class of concrete.
2. The documented average strength, f'_{cr} , equals or exceeds the design compressive strength f'_c for the respective class of concrete in accordance with the following equation: $f'_{cr} = f'_c + 3s$
3. The proposed concrete mixture contains the same aggregate sources, supplementary cementitious materials type, and admixture type as those used to establish the previous field experience test record.
4. The consistency (slump) and air content are within the specification limits for the respective class of concrete.

Documentation of Previous Field Experience or Production Standard Deviation (s)

An acceptable test record to document previous field experience and/or to establish a production facility standard deviation shall represent a minimum of 30 consecutive compressive strength tests results, encompass a production period of at least 45 days and test data not more than 18 months old. A test record of less than 30 tests, but not less than 15 tests, shall be permitted provided a modification factor is applied to the production facility sample standard deviation as shown below:

Multiply Standard Deviation by Modification Factor	
Number of Test	Modification Factor

15	1.16
20	1.08
25	1.03
30	1.00

The test record does not necessarily have to be based on Department projects provided that documentation of the source(s) of concrete strength test results accompanies the submittal.

Section 217.08—Acceptance is replaced with the following:

- (a) **Air Consistency Tests:** Air and consistency tests will be performed by the Department prior to discharge of concrete into the forms to ensure that specification requirements are consistently being complied with for each class of concrete. The sample secured for the tests shall be taken after at least two cubic feet of concrete has been discharged from the delivery vehicle. The two cubic feet discharged is not to be used as part of the test sample. Any deviation from sampling and testing procedures must be approved by the Engineer. The Contractor shall provide a receptacle conforming to the requirements of ASTM C31, Section 5.9, for the Department’s use in obtaining the sample. If either determination yields a result that is outside of the allowable range for air content or consistence, the following procedure will be used:
1. The Engineer will immediately perform a recheck determination. If the results confirm the original test results, the load will be rejected.
 2. The Contractor’s representative will be immediately informed of the test results.
 3. The Contractor’s representative shall notify the producer of the test results through a pre-established means of communication.

The Engineer may perform any additional tests deemed necessary and reject all remaining material that fails the tests.

Entrained air content will be determined in accordance with the requirements of ASTM C231 or ASTM C173. Acceptance or rejection will be based on the results obtained from these tests.

In general, a mixture that contains the minimum amount of water consistent with the required workability shall be used. Consistency will be determined in accordance with the requirements of ASTM C143. Adding cement to loads previously rejected for excessive water content or consistency will not be permitted.

- (b) **Strength Tests:** The 28-day compressive strengths (f'_c) specified in Table II-17 are the strengths used in the design calculations. The Engineer will verify design strengths by tests made during the progress of the work in accordance with the requirements of ASTM C31 (Standard Practice for Making and Curing Concrete Test Specimens in the Field) and ASTM C39 (Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens) with the exception that the fresh concrete sample used for testing is to be secured after at least two cubic feet has been discharged from the delivery vehicle. The two cubic feet discharged is not to be used as part of the test sample. Any deviation from sampling and testing procedures must be pre-approved by the Engineer. The use of ASTM C42 (Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete) will be at the Engineer’s discretion. If the 28-day design compressive strength (f'_c) test results do not conform to the strength requirements

specified in Table II-17, immediate steps shall be taken to adjust the mixture design. In addition, the Engineer may require removal of or corrective measures be applied to any concrete that does not meet the requirements of Table II-17. If the concrete cylinder strength, f_{cyl} , is less than the specified compressive strength found in Table II-17, the criteria in Table II-17A shall apply:

Table II – 17A Price Reduction or Action Taken due to f_{cyl} not meeting the specification value f_c listed in Table II-17

Condition	Concrete is a Pay Item	Concrete is <u>Not</u> a Pay Item
f_{cyl} is greater than or equal to 98% f_c	A	A
f_{cyl} is greater than or equal to 90% f_c and less than 98% f_c	B	C
f_{cyl} is less than 90% f_c	D	D
f_{cyl} is not available due to the Contractor's inappropriate handling and storage of specimens in accordance with ASTM C31	D	D

f_c is the 28-day design compressive strength found in Table II-17.

f_{cyl} is the actual average tested strength of the standard-cured concrete cylinder made and tested in accordance with ASTM C31 and ASTM C39.

A = full payment

B = pay reduction = $[(f_c - f_{cyl})/f_c] \times$ contract unit price for concrete per yd^3 x number of yds^3 the concrete represents] or \$500, whichever is greater.

C = pay reduction = $[(f_c - f_{cyl})/f_c] \times 5 \times$ Contractor's invoice price for concrete per yd^3 x number of yds^3 the concrete represents] or \$500, whichever is greater.

D = The Contractor shall submit an investigative plan stamped by a Virginia-licensed Professional Engineer outlining how the Contractor shall demonstrate that the in-place concrete meets the structural strength requirements of the design. For barriers, parapets, railings, etc., no reduction in concrete strength below $0.9f_c$ shall be allowed. For all other applications, the investigative plan must be approved by the Department's Engineer prior to the execution of the investigation. All costs associated with this investigation shall be borne by the Contractor. After the investigation is completed, a report shall be submitted to the Engineer showing the results of the analysis, testing and conclusions of the Virginia-licensed Professional Engineer and recommendations for action proposed by the Contractor to be taken with the concrete that did not meet the strength requirements. The Department retains all rights to determine if the action proposed with regard to the concrete in question is acceptable. If the Department concurs with the

proposed action and the concrete meets the structural strength requirements of the design and remains in place, any price reduction will be taken by Method B if the concrete is a pay item or Method C if the concrete is not a pay item. If the concrete does not meet the structural requirements of the design, the concrete shall be removed and replaced at no cost to the Department. The maximum penalty assessed for low strength concrete left in place will be 10% as specified in Table II-17A not including the cost of the investigation and any corrective measures taken by the Contractor.

No calculated penalty less than \$500 will be assessed. The Contractor shall have the right to remove and replace concrete failing to meet specifications at the Contractor's cost.

Before concrete is placed, the Contractor shall provide a storage chamber at his expense for temporary storage of the Department's concrete cylinders. The contractor shall be responsible for maintaining the chamber such that the concrete test cylinders are kept in a continuously moist condition and within a temperature range of 60 degrees F to 80 degrees F. The chamber shall be equipped with a continuously recording thermometer accurate to ± 2 degrees F for the duration of concrete cylinder curing. The chamber shall be located in an area where the test cylinders will not be subject to vibration and shall be of sufficient size or number to store, without crowding or wedging, the required number of test cylinders as determined by the Contractor based on his plan of operations. Location of the chamber is subject to approval by the Engineer.

When use of high-early-strength hydraulic cement concrete is required, it shall conform to the requirements specified in Table II-17 except that the 28-day strength shall be obtained in 7 days. Up to 800 pounds per cubic yard of Type I, Type II or Type III cement may be used to produce high-early-strength concrete.

(c) **Concrete Temperature** shall be measured in accordance with the requirements of ASTM C1064.

(d) **Quality Assurance** for Low Permeability Concrete:

General:

At least two trial batches, using job materials, with permissible combination of cementitious materials shall be prepared, and test specimens shall be cast by the Contractor and tested by the Department for permeability and strength at least a month before the field application. The permeability samples shall be cylindrical specimens with a 4-inch diameter and at least 4-inches in length. Cylinders will be tested at 28 days in accordance with VTM 112. The test value shall be the result of the average values of tests on two specimens from each batch. Permeability values obtained from trial batches shall be 500 coulombs below the maximum values specified in Table II-17 of the Specifications to be acceptable.

Acceptance Tests:

For each set of cylinders made for compressive strength tests, two additional cylinders shall be made for the permeability test. The Department will be responsible for making and testing all permeability test specimens.

If the average permeability test result is equal to or less than the value for the specified class of concrete in Table II-17, then full payment will be made for the lot the average

permeability test result represents. However, if the average permeability test result exceeds the coulomb value in Table II-17, payment for that lot of concrete shall be reduced by 0.005 percent for each coulomb above the coulomb value in Table II-17 multiplied by the bid item cost of the concrete times the number of cubic yards or cubic meters of concrete in the lot. The reduction in price will not exceed 5 percent of the bid price of the concrete. Any concrete with a coulomb value that exceeds the maximum required in Table II-17 by 1000 coulomb will be rejected. However, bridge deck concrete with any coulomb value exceeding the maximum required by over 1000 coulomb may be accepted by the Engineer at 95 percent of the bid price if the concrete in question has the required strength and meets other specification requirements, and the Contractor applies, at his own expense, an approved epoxy concrete overlay to the top of the entire deck. In such case deck grooving will not be required. Epoxy overlays over latex overlays will not be permitted. The adjustment to the roadway grade shall be made as required by the Engineer at the Contractor's expense.

Similarly, concrete in abutments and pier caps with coulomb value exceeding the maximum required in Table II-17, by more than 1000 coulomb may be accepted at 95 percent of the bid price if it has the required strength and meets other specification requirements, and the Contractor applies at his own expense, one coat of Type EP-3B and one coat of EP-3T in conformance with the requirements of Section 243.02 of the Specifications, on top of the pier cap or abutment seat.

Section 217.09(b) Ready Mixed Concrete is amended to replace the second paragraph with the following:

Each load of transit or shrink-mixed concrete shall be accompanied by Form TL-28 signed by the VDOT Certified Concrete Field Technician or a designated company representative working under the direction of the VDOT Certified Concrete Field Technician. The form shall be delivered to the Inspector at the site of the work. Loads that do not carry such information or that do not arrive in satisfactory condition shall not be used.

Section 217.09(b) Ready-Mixed Concrete is amended to replace the fourth paragraph and the table with the following:

Each batch of concrete shall be delivered to the site of work and discharged within 90 minutes of the time the cement is introduced into the mixture unless approved otherwise by the Engineer.

Section 217.09(b)1. Transit mixing is amended to replace the first paragraph with the following:

1. **Transit mixing:** Concrete shall be mixed in a truck mixer. Mixing shall begin immediately after all ingredients are in the mixer and shall continue for at least 70 revolutions of the drum or blades at the rate of at least 14 but no more than 20 revolutions per minute.

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 221—GUARDRAIL

SECTION 221—GUARDRAIL of the Specifications is amended as follows:

Section 221.02(e)2 is replaced with the following:

2. **Sheet steel for fabricated shapes** shall conform to the requirements of ASTM A1011, Grade 36.

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS**SUPPLEMENTAL SECTION 224—CASTINGS**

SECTION 224—CASTINGS of the Specifications is amended as follows:

Section 224.02—Materials is amended as follows:

The following is added as the first paragraph:

All casting suppliers/manufacturers shall have an approved QA/QC plan on file with the Department. Junction boxes that are to be installed within that portion of the roadway not protected by a guardrail or barrier shall be designed in accordance with the requirements of AASHTO M306 and M105, Class 35B.

Section 224.02(b) is replaced with the following:

- (b) **Gray iron castings** used in that portion of the roadway not protected by a guardrail or barrier shall conform to the requirements of AASHTO M306 and M105, Class 35B. All other castings shall conform to AASHTO M105, Class 35B.

Section 224.02(c) is replaced with the following:

- (c) **Ductile iron castings** used in that portion of the roadway not protected by a guardrail or barrier shall conform to AASHTO M306. All other ductile iron castings shall conform to ASTM A536, Grade 60-40-18.

Section 224.03—Detail Requirements is replaced with the following:

If castings are supplied from materials conforming to Sections 224.02 (a), (d) and (e) of the Specifications, all tolerances and workmanship requirements for castings shall conform to AASHTO M306. If used in that portion of the roadway not protected by a guardrail or barrier, the load testing shall conform to the requirements of AASHTO M306. When the alternate load test is used, test bars shall be present and fully identifiable with regard to the casting lot. Each casting in a lot must have the same markings as all of the other castings in the lot; if not, each group of castings with the same markings within the original lot, becomes a new lot.

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS**SUPPLEMENTAL SECTION 232—PIPE AND PIPE ARCHES**

SECTION 232—PIPE AND PIPE ARCHES of the Specifications is amended as follows:

Section 232.02 Detail Requirements of the specifications is amended to replace the first paragraph with the following:

Concrete, corrugated steel and polyethylene pipe shall only be supplied from manufacturers currently having an approved Quality Control Plan on file with the Department.

Section 232.02(a)1.b.(6) is replaced with the following:

- (6) **Strength tests** shall be performed by the three-edge bearing method in accordance with the requirements of AASHTO T280 or by control cylinders tested in accordance with ASTM C31 and C39 or by the testing of cores in accordance with ASTM C42. Control cylinders for acceptance testing shall be cured under the same conditions as the concrete the cylinders represent. Hand cast pipe and end sections may be tested in accordance with the requirements of ASTM C31 and C39. Concrete pipe may be shipped after reaching 85 percent of design strength as determined by control cylinders or cores.

Section 232.02(a)1.b.(7) is replaced with the following:

- (7) **Absorption tests** shall be performed in accordance with the requirements of AASHTO T280 on specimens of broken pipe or cores.

Section 232.02(c)2. Asphalt-coated corrugated steel culvert pipe and pipe arches is deleted entirely.

Section 232.02-Detail Requirements is amended to add the following:

(m) **Polypropylene (PP) Pipe:**

1. **PP corrugated culvert and storm drain pipe** shall conform to the requirements of AASHTO MP 21-11, and shall be double wall pipe (Type S) for nominal diameters of 12 inches through 30 inches, inclusive, and shall be triple wall pipe (Type D) for nominal diameters of 36 inches through 48 inches, inclusive. Polypropylene Pipe less than 12 inches and greater than 48 inches in diameter will not be allowed. Fittings and joining systems shall also meet the requirements of the AASHTO MP 21-11.

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 238—ELECTRICAL AND SIGNAL COMPONENTS

SECTION 238 ELECTRICAL AND SIGNAL COMPONENTS of the Specifications is amended as follows:

Section 238.02(f) Electrical and Signal Junction Boxes is replaced with following:

(f) **Electrical and Signal Junction Boxes:**

Boxes, frames and covers shall be water resistant. Covers shall be secured with stainless steel bolts and fasteners. Covers shall be flush with surface of the junction box and not protrude above the top of the junction box flange.

Junction box bolt attachment holes shall be drilled through to prevent debris from collecting in the threaded bolt holes.

Junction boxes shall be tested and certified by an independent testing laboratory as meeting the requirements indicated herein for approval for use. Independent testing laboratory shall be approved by VDOT Materials Division prior to testing. The Contractor shall furnish the Engineer documentation of such test results.

Testing reports shall provide complete test results for the type of design testing indicated for the respective type of junction box.

Junction Boxes for deliberate traffic in the roadway applications:

- Concrete shall conform to the requirements of Section 217 of the Specifications and shall be designed to meet the provisions of AASHTO's *Standard Specifications for Highway Bridges* for HS20 loading. Concrete shall have a design minimum compressive strength of 4000 psi.
- Gray Iron frame and covers shall conform to the requirements of Section 224 of the Specifications.

Junction Boxes for off roadway applications:

- Shall conform to the requirements of ANSI/SCTE 77 2007 and tier 15 loading. Boxes shall be open bottom.
- Shall be Polymer concrete with straight sides or Polymer concrete with flared or straight fiberglass sides.
- Other materials may be submitted for the sidewalls provided they conform to the requirements of ANSI/SCTE 77 2007 and tier 15 loading.

Junction Boxes frames and covers for bridge structures encasements shall be one of the following types:

1. Steel castings conforming to the requirements of Section 224 of the Specifications, galvanized inside and out.

2. Welded sheet steel having a thickness of at least 3/16 inch or 7 gage, galvanized inside and out.
3. Polymer concrete with fiberglass sides or all polymer concrete.

Section 238.02(h)6.f. Light Emitting Diode (LED) traffic signal head sections is amended to replace the third paragraph with the following:

LED arrow traffic signal modules shall conform to the requirements of the *ITE Vehicle Traffic Control Signal Heads – Light Emitting Diode Vehicle Arrow Traffic* issued April 3, 2006 (inclusive of any ITE documents that amend, revise and/or supersede it).

And to replace the seventh paragraph with the following:

The LED's shall be mounted and soldered to a printed circuit board. Modules shall be provided with an external in-line fuse or internal fusing of the 120 VAC (+) input. The fuse shall be rated in accordance with the LED module manufacturer. The LED signal module shall utilize the same mounting hardware used to secure the incandescent lens and gasket assembly and shall only require a screwdriver or standard installation tool to complete the mounting.

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS**SUPPLEMENTAL SECTION 245—GEOSYNTHETICS**

SECTION 245—GEOSYNTHETICS of the Specifications is amended as follows:

Section 245.03—Testing and Documentation is amended by replacing the first four paragraphs and subparagraph (a) with the following:

Each geosynthetic material provided to the project shall be tested to determine conformance with the material properties specified herein within 24 months of submission. Test results reported from AASHTO's National Transportation Product Evaluation Program—Laboratory Results of Evaluations on Geotextile and Geosynthetics may be used. The Contractor shall provide certification of the material in accordance with the requirements of AASHTO M288, Section 5, Certification, and copies of the test results. This testing, however, will not be the sole basis for acceptance.

The Contractor shall be responsible for ensuring that each roll of geosynthetic delivered to the project includes a certificate from the manufacturer showing manufacturer name, product name, style number or identifier, roll number, chemical composition of the filaments or yarns, any other pertinent information to fully describe the product, and a signature or attest of a person having legal authority to bind the manufacturer.

VDOT will sample and test the geosynthetics for acceptance to verify conformance with this specification. Sampling shall be performed in accordance with the requirements of ASTM D4354, Procedure C. For tests not conducted by VDOT, acceptance may be based on the manufacturer's certifications as a result of testing by the manufacturer of quality assurance samples obtained using the procedure for ASTM D4354 Procedure B Sampling for Manufacturer's Quality Assurance (MQA) Testing. A lot size shall be considered to be the shipment quantity of the given product or a truckload of the given product, whichever is smaller, but in no case shall lot size exceed 250,000 square feet.

Property values, with the exception of apparent opening size (AOS) and panel vertical strain, in these specifications represent minimum average roll values (MARV) in the weakest principal direction (i.e., average test results of any roll in a lot sampled for conformance or quality assurance testing shall meet or exceed the minimum values provided herein). Values for AOS and panel vertical strain represent maximum average roll values.

Tests shall be performed in accordance with the methods referenced in this specification for the indicated application. The number of specimens to test per sample is specified by each test method. Geotextile product acceptance shall be based on conformance to the requirements of ASTM D4759. Product acceptance is determined by comparing the average test results of specimens in a given sample to the specification MARV.

- (a) **Geotextile Fabric for Use in Silt Fences, Silt Barriers, or Filter Barriers:** Geotextile shall function as a vertical, permeable interceptor designed to remove suspended soil from overland water flow. Fabric shall filter and retain soil particles from sediment-laden water to prevent eroding soil from being transported off the construction site by water runoff. Fabric shall contain ultraviolet inhibitors and stabilizers to provide at least 6 months of expected, usable construction life at a temperature of 0 degrees F to 125

degrees F. The tensile strength of the material after 6 months of installation shall be at least 50 percent of the initial strength.

Physical Property	Test Method	Requirements
Filtering efficiency	VTM-51 or ASTM D5141-11	Min. 75%
Flow rate	VTM-51 or ASTM D5141-11	Min. 0.2 gal/ft ² /min

In addition to these requirements, the geotextile shall comply with the requirements of AASHTO M288 for temporary silt fence property requirements, Table 7, Temporary Silt Fence Property Requirements, for grab strength and ultraviolet stability.

The Contractor shall be responsible for supplying test results on each lot of silt fence geotextile for filtering efficiency, flow rate, and grab strength. These results shall be from a GAI-accredited laboratory, which also is specifically accredited by GAI in tests ASTM D5141 and ASTM D4632. Passing test results submitted by the Contractor are not sufficient for acceptance, as VDOT shall also conduct verification testing.

Section 245.03(f) Geocomposite Wall Drain is amended to delete the first paragraph

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 247—REFLECTIVE SHEETING

SECTION 247—REFLECTIVE SHEETING of the Specifications is completely replaced with the following:

247.01—Description

This specification covers reflective sheeting used on traffic control devices to provide a retroreflective surface or message. The color of the reflective sheeting shall be as specified in the Contract Documents. Reflective sheeting shall be certified in accordance with the requirements of Section 106.06 of the Specifications.

247.02—Detail Requirements

Reflective sheeting shall be selected from the Department's Approved Products list. Reflective sheeting products are included on the Approved Products List only after the Department determines conformance to the Specifications and the manufacturer has supplied written information indicating conformance to the warranty requirements of Section 247.03 of the Specifications where required. Determination of conformance will include, but not be limited to, the evaluation of test data from AASHTO's National Transportation Product Evaluation Program (NTPEP) or other Department-approved facilities except as noted. When color test data (Chromaticity and Luminance Factor - Y%) provided by NTPEP or other Department-approved facilities are evaluated, color must have been maintained within the color specification limits for the full duration of the outdoor weathering test. The sheeting and any applied coatings such as inks, overlay films, other coatings, shall be weather resistant in accordance with ASTM D4956 after being tested by AASHTO, NTPEP or other Department approved facilities except as noted.

- (a) **Reflective sheeting used on permanent signs (except those addressed in Section b), on object markers, nose of guardrails, permanent impact attenuators (except sand barrels), standard road edge delineators, special road edge delineators, barrier delineators, guardrail delineators, interstate road edge delineators, chevron panels, bridge end panel signs (VW-13), and railroad advance warning signs (including any supplemental plaques) vertical panels (Group 2 channelizing devices), traffic gates, Automatic Flagger Assistance Device (AFAD) gate arms, and the "STOP" side of sign paddles (hand signaling device)** shall conform to the requirements of ASTM D4956 for a Type IX material and, except for the "STOP" side of sign paddles, shall be warranted in accordance with Section 247.03 Sheeting Warranty Class I of the Specifications.

Color shall conform to the requirements of 23 CFR, Part 655, Subpart F, Appendix Tables 1 and 1A (non-fluorescent colors) and Tables 3 and 3A (fluorescent colors). In Table 1A, the values for daytime luminance factor (Y%) shall be based on the colors for a Type IV, VII, and VIII sheeting.

The minimum maintained coefficient of retroreflection of the sheeting after 3 years on the test deck shall conform to the requirements of ASTM D4956.

1. **Reflective sheeting used on the following signs** shall be Fluorescent Yellow-Green conforming to the requirements of ASTM D4956 for a Type IX material

and shall be warranted in accordance with Section 247.03, Sheeting Warranty Class I of the Specifications.

- **Bicycle Crossing sign (W11-1) including supplemental plaques**
- **Pedestrian Crossing sign (W11-2) including supplemental plaques**
- **Playground sign (W15-1) including supplemental plaques**
- **DEAF CHILD AREA sign including supplemental plaques**
- **WATCH FOR CHILDREN sign including supplemental plaques**
- **School Signing consisting of the following:**
 - School Crossing sign (S1-1)**
 - School Bus Stop Ahead sign (S3-1)**
 - SCHOOL plaque (S4-3)**
 - School Portion of the School Speed Limit sign (S5-1)**
 - Supplemental plaques used with these signs**

Color shall conform to the requirements of 23 CFR, Part 655, Subpart F, Appendix Tables 3 and 3A.

The minimum maintained coefficient of retroreflection of the sheeting after 3 years on the test deck shall conform to the requirements of ASTM D4956.

- (b) **Reflective sheeting used on permanent recreational and cultural interest area guidance signs, and for the hand symbol/DON'T WALK and numerals on permanent educational pedestrian signal signs (R10-3b thru R10-3e)** shall conform to the requirements of ASTM D4956 for a Type III material and shall be warranted in accordance with Section 247.03, Sheeting Warranty Class I of the Specifications.

Color shall conform to the requirements of 23 CFR, Part 655, Subpart F, Appendix Tables 1 and 1A.

The minimum maintained coefficient of retroreflection of the sheeting after 3 years on the test deck shall conform to the requirements of ASTM D4956.

- (c) **Reflective sheeting used to delineate the trailer's back frame of Portable Changeable Message Signs (PCMS), Automatic Flagger Assistance Device (AFAD) gate arm, arrow boards and portable lights** shall conform to the requirements of 49 CFR 571.108 for a Grade DOT-C2 truck conspicuity marking. References to ASTM specifications therein shall be interpreted to mean the latest version of the specification at the time of advertisement regardless of the date indicated in the reference.

Color shall conform to the requirements of 23 CFR, Part 655, Subpart F, Appendix Tables 1 and 1A.

This reflective sheeting is not required to be tested by NTPEP.

- (d) **Reflective sheeting used on Type III barricades** shall conform to the following:

Minimum Coefficient of Retroreflection R_A (R_A =Candelas per foot-candle per square foot)			
Observation Angle ($^\circ$)	Entrance Angle ($^\circ$)	White	Orange
0.2	-4	400	200
0.2	+30	200	80
0.5	-4	300	100
0.5	+30	100	40
1.0	-4	50	25
1.0	+30	15	10

Color and Luminance Factor (Y%) shall conform to the requirements of 23 CFR, Part 655, Subpart F, Appendix Tables 1 and 1A, for a Type IV Sheeting.

Impact Resistance shall conform to the requirements of ASTM D4956.

The minimum maintained coefficient of retroreflection of the sheeting after one year on the test deck shall be at least 50 percent of the minimum coefficient of retroreflection values specified.

- (e) **Reflective sheeting used on orange construction and maintenance activity signs, barrier vertical panels installed on concrete traffic barrier service, rear panel of truck-mounted attenuators, temporary impact attenuators (except temporary sand barrels), and the "SLOW" side of sign paddles** shall conform to the requirements of ASTM D4956 for a Type IX, Fluorescent Orange material (with the following retroreflection exception):

Minimum Coefficient of Retroreflection R_A (R_A =Candelas per foot-candle per square foot)		
Observation Angle ($^\circ$)	Entrance Angle ($^\circ$)	Fluorescent Orange
0.2	-4	140
0.2	+30	90
0.2	+40	24
0.5	-4	90
0.5	+30	50
0.5	+40	15
1.0	-4	10
1.0	+30	5
1.0	+40	3

Color shall conform to the requirements of 23 CFR, Part 655, Subpart F, Appendix Tables 3 and 3A.

The minimum maintained coefficient of retroreflection of the sheeting after one year on the test deck shall be at least 50 percent of the minimum coefficient of retroreflection values specified.

- (f) **Reflective sheeting used on tubular delineators, drums and temporary sand barrels** shall conform to the following:

1. **Reflective sheeting used on tubular delineators and drums** shall conform requirements of ASTM D4956 including supplementary requirement S2 for a Type III reboundable material. Color shall conform to the requirements of Tables 1 and 1A of the USDOT specification as contained in the Appendix to 23 CFR, Part 655, Subpart F except the minimum daytime luminance factor (Y%) for white shall be 25 when used on tubular delineators and drums. The following supplementary table shall apply for tubular delineators and drums:

Minimum Coefficient of Retroreflection R_A
(Candelas per foot-candle per square foot)
(High Intensity)

Observation Angle (°)	Entrance Angle (°)	White	Orange
0.2	+50	75	25
0.5	+50	35	10

Reflective sheeting used on tubular delineators is not required to be tested by NTPEP.

2. **Reflective sheeting used on temporary sand barrels** shall be a fluorescent orange prismatic lens reboundable sheeting conforming to the following:

Color shall conform to the requirements of Tables 3 and 3A of the USDOT specification as contained in the Appendix to 23 CFR, Part 655, Subpart F.

Minimum Coefficient of Retroreflection R_A
(Candelas per foot-candle per square foot)
(High Intensity)

Observation Angle (°)	Entrance Angle (°)	Fluorescent Orange
0.2	-4	200
0.2	+30	120
0.2	+50	40
0.5	-4	80
0.5	+30	50
0.5	+50	30

Minimum maintained coefficient of retroreflection of the sheeting after one year on the test deck shall be at least 50 percent of the minimum coefficient of retroreflection values indicated above.

Reflective sheeting shall conform to the supplementary requirement S2 of ASTM D4956.

Please note: Beginning July 1, 2012 reflective sheeting used on Drums, Temporary Sand Barrels and Tubular delineators for all projects shall conform to the requirements of ASTM D4956 including supplementary requirement S2 for a Type III reboundable material with the following retroreflection exception as shown in the chart below:

Minimum Coefficient of Retroreflection R_A
(R_A =Candelas per foot-candle per square foot)
(Prismatic Lens)

Observation Angle (°)	Entrance Angle (°)	White	Fluorescent Orange
0.2	-4	400	175
0.2	+30	200	100
0.2	+40	135	60
0.2	+45	120	40
0.5	-4	150	70
0.5	+30	50	30
0.5	+40	45	25
0.5	+45	40	20

Color shall conform to the requirements of 23 CFR, Part 655, Subpart F, Appendix Tables 1 and 1A (non-fluorescent colors) and Table 3 and 3A (fluorescent colors).

The minimum maintained coefficient of retroreflection of the sheeting after one year on the test deck shall be at least 50 percent of the minimum coefficient of retroreflection specified.

- (g) **Reflective sheeting used on Permanent Sand Barrels and on Cones** shall conform to the requirements of ASTM D4956 including supplementary requirement S2 for a Type III reboundable material. The following supplementary table shall also apply for cones:

Minimum Coefficient of Retroreflection R_A
(R_A =Candelas per foot-candle per square foot)
(High Intensity)

Observation Angle (°)	Entrance Angle (°)	White
0.2	+50	60
0.5	+50	35

Color shall conform to the requirements of 23 CFR, Part 655, Subpart F, Appendix Tables 1 and 1A.

The maintained coefficient of retroreflection of the sheeting after one year on the test deck shall be at least 50 percent of the minimum coefficient of retroreflection specified for permanent sand barrel sheeting.

Reflective sheeting for cones is not required to be tested by NTPEP.

- (h) **Reflective sheeting used on Retroreflective Rollup Signs** shall conform to the following:

Minimum Coefficient of Retroreflection R_A
(R_A =Candelas per foot-candle per square foot)
(Prismatic Lens)

Observation Angle (°)	Entrance Angle (°)	White	Fluorescent Orange	Fluorescent Pink
0.2	-4	500	200	200
0.2	+30	200	80	100
0.5	-4	225	90	100
0.5	+30	85	35	35
1.0	-4	20	10	10
1.0	+30	15	8	10
1.5	-4	5	3	2
1.5	+30	4	1.5	2

Color shall conform to the requirements of 23 CFR, Part 655, Subpart F, Appendix Tables 1 and 1A for white, and Appendix Tables 3 and 3A for fluorescent colors.

Reflective sheeting for retroreflective rollup signs is not required to be tested by NTPEP.

247.03—Warranty Requirements

The reflective or retroreflective sheeting manufacturer shall provide the following warranty to the Department for the respective types of sheeting furnished as specified herein:

Class I Warranty: 10-year warranty with 7 years being 100 percent full replacement covering all material and labor costs associated with fabrication and installation of the sign or device and the final 3 years being 100 percent sheeting replacement cost.

The minimum values of retroreflectivity maintained during the warranty period shall be the same as those required for the maintained coefficient of retroreflection values as indicated herein, or where not indicated, shall be in accordance with those specified in ASTM D4956.

Loss of colorfastness is considered to have occurred if the color of the sheeting is not within the color specification limits in 23 CFR, Part 655, Subpart F, Appendix during the full duration of the warranty period.

Warranty period shall begin on the date of fabrication and shall be documented as follows:

For warranty requirements, each permanent sign shall be labeled on the reverse in a location not to be obscured by sign supports or backing hardware, showing 1.) Month and year the sign was fabricated, marked via punch-out numerals, 2.) Sheeting Manufacturer's name or logo and product designation or number, and 3.) Sign fabricator's name or logo. Labels shall be made of a self adhesive, permanent weather resistant material and shall be a minimum 4" by 4" in size. Label may be made from permanent sign material provided the finished label meets all other aspects required for warranty documentation.

Where the information required for the label is not furnished by punched-out numerals, it shall be supplied by permanent means, such as sign ink, capable of resisting weathering so as to be legible for the full duration of the warranty period.

Prior to applying the label, the area shall be thoroughly cleaned to ensure proper adhesion.

(c302h00-0708) **SECTION 302.03(b) PRECAST DRAINAGE STRUCTURES** of the Specifications is amended to include the following:

Precast units, excluding concrete pipe, prestressed concrete items and soundwalls, conforming to the requirements herein will only be accepted under a Quality Control/Quality Acceptance Program (QC/QA). The Contractor shall have the producer perform quality control functions in accordance with a Department approved QC/QA plan. Each piece, manufactured under the QC/QA program, in addition to the date and other required markings, shall be stamped with the letters (QC), as evidence that the required QC/QA procedures have been performed. Each shipping document shall be affixed with the following:

We certify that these materials have been tested and conform to VDOT Precast Concrete Products Quality Assurance Program

Signature and Title

1-14-08 (SPCN)

(c303kg0-0708) **AGGREGATE MATERIAL** shall be the size specified conforming to Section 203 of the Specifications. The aggregate shall be placed at locations shown on the plans or as directed by the Engineer. Aggregate material will be measured in units of tons for the size specified in accordance with Section 109 of the Specifications. Payment will be made at the contract unit price per ton, which bid price shall be full compensation for furnishing, placing, and shaping and compaction, if required.

Payment will be made under:

Pay Item	Pay Unit
Aggregate Material (Size)	Ton

5-23-95c, Reissued 7-2008c (SPCN)

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
RESTORING EXISTING PAVEMENT

January 14, 2008cc

I. DESCRIPTION

This work shall consist of restoring existing pavement, removed for installation or repair of utilities such as, but not limited to pipe culverts, conduits, water and sanitary sewer items.

II. MATERIALS

Asphalt Concrete shall conform to the requirements of Section 211 of the Specifications.

Aggregate Subbase material shall conform to the requirements of Section 208 of the Specifications.

Asphalt Material shall conform to the requirements of Section 210 of the Specifications.

Fine Aggregate shall conform to the requirements of Section 202 of the Specifications.

Coarse Aggregate for surface treatment shall conform to the requirements of Section 203 of the Specifications.

Hydraulic Cement Concrete Class A3 shall conform to the requirements of Section 217 of the Specifications.

Steel Reinforcement shall conform to the requirements of Section 223 of the Specifications.

III. PROCEDURES

Pavement restoration shall be in accordance with this Provision and plan notes.

Backfill shall be in accordance with Section 302.03(a)2.g. of the Specifications.

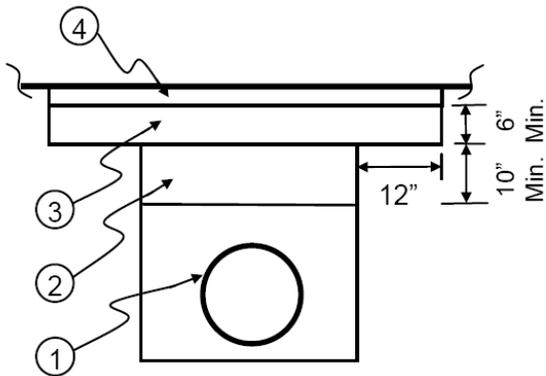
Asphalt Concrete shall be placed and compacted in accordance with Section 315 of the Specifications.

Surface Treatment shall be placed in accordance with the Asphalt Surface Treatment special provision and the attached drawing.

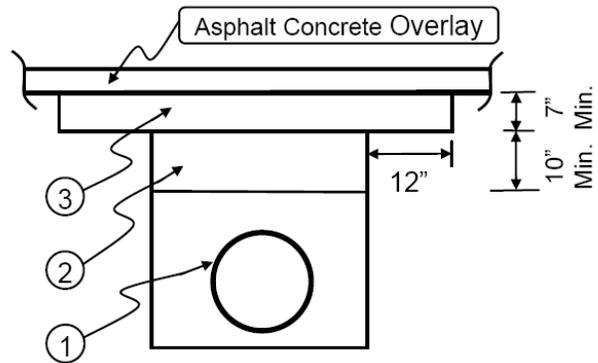
Concrete Pavement shall be placed in accordance with Section 509 of the Specifications and this special provision. Open trench in Hydraulic Cement Concrete Pavement should be located at existing transverse joints if at all possible. If concrete pavement is removed within two feet of an existing transverse joint, pavement removal shall be extended two feet beyond the joint. Reinforcing steel and dowels shall be installed in accordance with Road and Bridge Standard PR-2. Joint replacement shall be in accordance with Road and Bridge Standard PR-2.

IV. MEASUREMENT AND PAYMENT

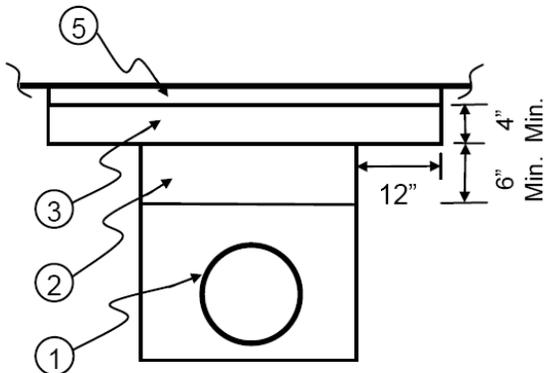
Restoring Existing Pavement unless otherwise specified will not be measured for separate payment, the cost thereof shall be included in the price bid for the utility to which it pertains in accordance with Section 302.04, Section 520.06 or Section 700.05 of the Specifications, as appropriate. However, widths and depths in excess of the attached drawing that are authorized or directed by the Engineer will be paid for in accordance with Section 109.05 of the Specifications.



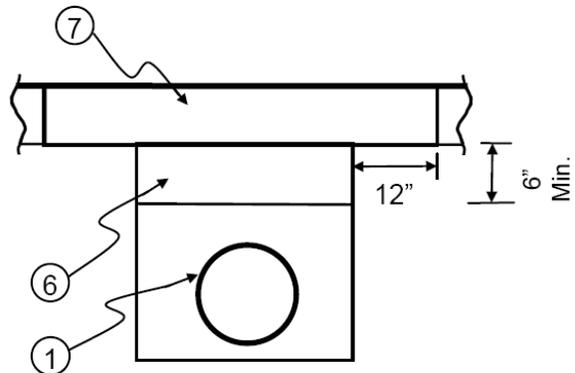
PAVEMENT STRUCTURE
Asphalt Conc. Base and Surface



PAVEMENT STRUCTURE
Scheduled for Asphalt Conc. Overlay



PAVEMENT STRUCTURE
Aggregate Base and Surface Treatment



PAVEMENT STRUCTURE
Hydraulic Cement Concrete

NOTES:

The following methods for restoring existing pavement shall be adhered to unless otherwise specified on the plans.

1. Pipe culverts, conduits and utility items shall be installed in accordance with the applicable Road and Bridge Standards and Specifications.
2. Subbase - Aggregate material Type 1, Size 21A or 21B.
3. Asphalt Concrete Type BM-25.0
4. Surface - Asphalt Concrete Type SM-9.5D @ 165 lbs. per sq. yd.
5. Surface - Blotted Seal Coat Type C: The initial seal and final seal shall be CRS-2, CMA-2 or CMS-2h liquid asphalt material @ 0.17 gal./sq. yd. with 15 lbs. of No. 8P stone/sq. yd. each. The blot seal shall be CRS-2, CMS-2 or CMS-2h liquid asphalt material @ 0.15 gal./sq. yd. with 10 lbs. of fine aggregate grade B sand per sq. yd.
6. Subbase - Aggregate material Type 1 Size 21B
7. Surface - Hydraulic Cement Concrete, high early strength, matching existing structure for depth and surface texture.

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
FLOWABLE BACKFILL

March 11, 2010

I. DESCRIPTION

This work shall consist of furnishing and placing flowable backfill for use as backfill material in pipe installations or in other uses at locations as designated on the plans, and as backfill material for plugging designated abandoned pipes and culverts.

II. MATERIALS

Hydraulic Cement shall conform to the requirements of Section 214 of the Specifications.

Fly Ash shall conform to the requirements of Section 241.02(a) of the Specifications.

Water shall conform to the requirements of Section 216 of the Specifications with the exception that wash water as described in Section 216.02 may comprise the total mix water.

Aggregates shall conform to the requirements of Sections 202 and 203 of the Specifications with a combined gradation as determined by the Contractor.

Admixtures shall conform to the requirements of Section 215 of the Specifications.

Granulated Iron Blast Furnace Slag shall conform to the requirements of Section 215 of the Specifications.

III. MIX DESIGN

Mix design for flowable backfill shall be provided by the Contractor. When used as backfill material in pipe installations or in other uses at locations as designated on the plans flowable backfill shall have a design compressive strength of 30 to 200 pounds per square inch. When used as backfill material for plugging designated abandoned pipes and culverts flowable backfill shall have a design compressive strength of 30 to 1200 pounds per square inch. The design compressive strength requirement shall be at 28 days when tested in accordance with ASTM D 4832. Mix design shall result in a fluid product having no less than an 8-inch slump at time of placement. The Contractor shall submit a mix design for approval supported by laboratory test data verifying compliance with 28 day compressive strength requirements. Mix design shall be approved by the Engineer prior to placement.

IV. PROCEDURES

Mixing and transporting shall be in accordance with Section 217 of the Specifications or by other methods approved by the Engineer.

Temperature of flowable backfill shall be at least 50 degrees F at time of placement. Material shall be protected from freezing for 24 hours after placement.

When used as backfill for pipe installation and floatation or misalignment occurs, correct alignment of the pipe shall be assured by means of straps, soil anchors or other approved means of restraint.

When used to fill the voids in abandoned pipes and culverts, they shall be plugged and backfilled in accordance with the plan details or as directed by the Engineer. The plugs shall be in accordance with the plan details. The backfill material shall be flowable backfill placed into the abandoned pipe or culvert without voids. When deemed necessary by the Engineer, the Contractor shall submit a plan of operations for acceptance showing how the flowable backfill will be placed without voids. The opening for culvert backfill installation shall be sealed with masonry or Class A-3 concrete at completion of backfilling.

V. MEASUREMENT AND PAYMENT

Flowable Backfill will be measured and paid for in cubic yards complete-in-place. When used as backfill material in pipe installations or in other uses at locations as designated on the plans this price shall be full compensation for furnishing and placing flowable backfill, securing the pipe alignment, and for all materials, labor, tools, equipment and incidentals necessary to complete the work. When used as backfill material for plugging designated abandoned pipes and culverts the price bid shall include furnishing and placing of backfill material and furnishing and installing plugs.

Payment will be made under:

Pay Item	Pay Unit
Flowable Backfill	Cubic yard

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
NONTRACKING TACK COAT

October 5, 2010c

I. DESCRIPTION

This work shall consist of preparing and treating an existing asphalt or concrete surface with asphalt in accordance with the requirements of these specifications and in conformity with the lines shown on the plans or as established by the Engineer.

II. MATERIALS

Liquefied asphalt materials for non-tracking tack coat must be on the Department's list of approved non-tracking tack coat materials. Non-tracking tack coat materials shall not be diluted with water.

III. PROCEDURES

Nontracking Tack will be required only between May 1 and October 1. Tack coat, in accordance with Section 310 of the Specifications, may be used at other times.

Equipment for heating and applying asphalt shall conform to the requirements of Section 314.04(b) of the Specifications or the non-tracking tack coat material's manufacturer's recommendations. The maximum application temperature of liquefied asphalt shall conform to the manufacturer's requirements.

The existing surface shall be patched when necessary, cleaned, and rendered free from irregularities to the extent necessary to provide a reasonably smooth and uniform surface. Unstable corrugated or deteriorated areas of existing pavement shall be removed and replaced with suitable patching materials. The edges of existing pavements that will be adjacent to new pavement shall be thoroughly cleaned to permit adhesion of asphalt.

Tack material shall be uniformly applied with a pressure distributor conforming to the requirements of Section 314.04(b) of the Specifications. Hand spray equipment shall not be used except in areas inaccessible by a pressure distributor. The tack material shall be applied at a rate recommended by the manufacturer. This rate is typically between 0.05 to 0.10 gallons per square yard. The asphalt tack shall be applied to the pavement surface in such a manner that it will bond the overlay and the underlying surfaces together.

Application of tack at joints, adjacent to curbs, gutters, or other appurtenances shall be uniformly applied with a hand wand or with a spray bar at the rate of 0.2 gallon per square yard.

The tack coat shall be applied in a manner to offer the least inconvenience. All traffic, including construction traffic, shall be excluded from sections treated with non-tracking tack until the tack has cured and will no longer track onto adjacent non-treated areas.

The tack coat shall be applied in accordance with the same weather limitations that apply to the course being placed as well as the manufacturer's recommendations. The quantity, rate of application, temperature, and areas to be treated shall be approved by the Engineer prior to application of the tack coat.

Adjacent concrete or asphalt concrete surfaces shall show minimal visible evidence and white or yellow pavement markings shall show no visible evidence of tracking of the asphalt tack material at the end of the production shift. Tracking of the tack material on pavement markings will require the Contractor to immediately restore the marking to their original pre-tack condition. Build-up of the tacking material on existing pavement surfaces shall be removed by the Contractor.

During the application of non-tracking asphalt tack coat, care shall be taken to prevent spattering adjacent items or vehicular traffic. The distributor shall not be cleaned or discharged into ditches or borrow pits, onto shoulders, or along the right of way. When not in use, application equipment shall be parked so that the spray bar or mechanism will not drip asphalt on the surface of the traveled way.

IV. REFEREE SYSTEM

When the new asphalt course is placed on a milled or non-milled surface, the Contractor shall take steps to ensure an adequate bond between the new material and existing surface. If the Engineer suspects the Contractor is failing to apply good bond promoting procedures or adequately tacking the existing surface per the manufacturer's recommendations, the Department may core a minimum of 6 locations to determine the shear and tensile strength at the interface. These locations will be determined through a stratified random selection process. Cores will be tested in the Department's laboratory in accordance with the procedures described in report VTRC 09-R21. For the surface to be acceptable, the average results for shear and tensile strength must be met. A minimum of 3 cores will be tested for shear and 3 cores for tensile strength. The average shear strength must meet or exceed 100 psi with no single core having a shear strength less than 50 psi on a milled surface. The average shear strength must meet or exceed 50 psi with no single core having a shear strength less than 30 psi on a non-milled surface. The average tensile strength of the remaining cores must meet or exceed 40 psi with no single core having a tensile strength less than 20 psi on a milled surface. The average tensile strength of the remaining cores must meet or exceed 30 psi with no single core having a tensile strength less than 20 psi on a non-milled surface. In the event the minimum shear or tensile strength requirements are not met, then payment for the asphalt concrete tonnage placed in the area in dispute shall be reduced by 10 percent.

V. MEASUREMENT AND PAYMENT

Nontracking tack coat, the cost thereof, shall be included in the price for other appropriate pay items.

Patching will be paid for at the contract unit price for the various items used unless a reconditioning item is included in the Contract.

VI. REFERENCES

McGhee, K.K , and Clark, T.M. *Bond Expectations for Milled Surfaces and Typical Tack Coat Materials Used in Virginia*. VTRC 09-R21. Virginia Transportation Research Council, Charlottesville, 2009.

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 302—DRAINAGE STRUCTURES

SECTION 302—DRAINAGE STRUCTURES of the Specifications is amended as follows:

Section 302.03(b) Precast Drainage Structures is amended to replace the second paragraph with the following:

Requests for approval of a precast design shall include detailed plans and supporting computations that have been reviewed by a registered Professional Engineer having at least 5 years experience in structural design of precast structures or components proposed and licensed in the Commonwealth. Unless otherwise specified, concrete exposed to freeze/thaw environments shall conform to Section 217.02 of the Specifications and shall have a design strength at 28 days of at least 4,000 pounds per square inch and an air content of 6 ± 2 percent. Concrete not exposed to freeze/thaw environments shall be exempt from the requirements of Section 217.02(a) of the Specifications. The design of the concrete mixture and the method of casting, curing handling and erecting of precast units shall be subject to review by the Engineer. Precast units may be shipped after reaching 85 percent of the design strength as determined by control cylinders. Sampling and testing concrete strength shall be performed using control cylinders in accordance with ASTM C31 and C39 at a rate of one set of cylinders per lot. A lot is defined as a maximum 250 cubic yards or a single weeks production (whichever quantity is less) of precast concrete from each batching operation, being of like material, strength and manufactured by the same process. Variations of lot definition will be governed by applicable specifications and approved by the Engineer. Control cylinders used for acceptance testing shall be cured under the same conditions as the concrete the cylinders represent. Units shall retain their structural integrity during shipment and shall be subject to inspection at the job site. Approval to use precast units shall not be construed as waiving the size and weight limitations specified in Section 107.21 of the Specifications.

Section 302.03(b)2. Precast arches is replaced with the following:

2. **Precast arches** shall conform to the applicable requirements of the current AASHTO's *LRFD Bridge Design Specifications* and VDOT modifications (current VDOT I&IM-S&B-80) and the following modifications:

a. **Protection against corrosion:** The concrete cover of reinforcement shall be at least 1 1/2 inches.

Reinforcing steel for arches in 0 to 2 foot fills, in corrosive or marine environments, or in other severe exposure conditions shall be corrosion resistant reinforcing steel, Class I. When corrosion resistant reinforcing steel is required, the minimum cover specified shall not be reduced.

Exposed reinforcing bars, inserts, and plates intended for bonding with future extensions shall be protected from corrosion as directed by the Engineer.

Reinforcement shall be designed and detailed in consideration of fabrication and construction tolerances so that the minimum required cover and proper positioning of reinforcement shall be maintained.

- b.—**Anchorage:** Sufficient anchorage shall be provided at the terminus of lines of precast units. Anchorage may consist of a cast-in-place end section at least 3 feet in length with a headwall or collar around the precast unit(s) provided adequate connection can be made between the collar and units.
- c.—**Joints:** Joints between units shall be sealed by preformed plastic or mastic gaskets or grout. When preformed gaskets are used, they shall be of a type listed on the Department's approved products list.
- d. **Pipe openings:** Pipe openings will not be allowed in the precast arch but may be provided through the wingwalls. When required, openings shall conform to the requirements of (b)1.b. herein.

Section 302.03(b)3. Precast box culverts is replaced with the following:

- 3. **Precast box culverts** shall conform to the applicable requirements of the current *AASHTO's LRFD Bridge Design Specifications* and VDOT modifications (current VDOT I&IM-S&B-80) and the following modifications:

- a. Precast Box Culverts shall conform to the applicable material requirements of ASTM C1577. The design shall be a Special Design which need not conform to the reinforcing steel and geometry shown in the design tables and the appendix in ASTM C1577.
- b. For protection against corrosion, the following minimum concrete cover shall be provided for reinforcement: For boxes with more than 2 feet of fill over the top slab: 1 1/2 inches. For boxes with less than 2 feet of fill over the top slab: top reinforcement of top slab: 2 1/2 inches; bottom reinforcement of top slab: 2 inches; all other reinforcement: 1 1/2 inches.

Reinforcing steel for arches in 0 to 2 foot fills, in corrosive or marine environments, or in other severe exposure conditions shall be corrosion resistant reinforcing steel, Class I. When corrosion resistant reinforcing steel is required, the minimum cover specified shall not be reduced.

- c. The type of sealant used in joints between units shall be from the Department's Approved List of Preformed Plastic or Mastic Gaskets.

Where double or greater lines of precast units are used, a buffer zone of 3 to 6 inches between lines shall be provided. This buffer zone shall be backfilled with porous backfill conforming to the requirements of Section 204. The porous backfill shall be drained by a 3-inch-diameter weep hole, formed by non-rigid tubing, located at the top of the bottom haunch, centered in the outlet end section and at approximately 50-foot intervals along the length of the box. Weep holes shall be covered with a 3-foot-square section of filter barrier cloth firmly attached to the outside of the box. A 3-foot width of filter barrier cloth shall also be centered over the buffer zone for the entire length of the structure after placement of the porous backfill material. Filter barrier cloth shall conform to the requirements of Section 245.

Forming weep holes and furnishing and placing of the filter barrier cloth shall be included in the price bid per linear foot for the precast box culvert.

- d. At the terminus of precast units, sufficient anchorage shall be provided. This anchorage may consist of a cast-in-place end section at least 3 feet in length with a headwall and curtain wall or a collar cast-in-place around the units provided adequate connection can be made between the collar and units.

When the ends of precast units are skewed, the end section shall be cast monolithically. The skew may be provided by forming, saw cutting, or other methods approved by the Engineer. Regardless of the method used, the variation in the precast unit from the exact skew shall be not greater than 1 1/2 inches at any point.

- e. Pipe openings shall conform to the requirements of 1.b. herein.
- f. Bedding and backfill shall be in accordance with Standard PB-1 for box culverts.

Section 302.03 Procedures is amended to add the following

(d) Post Installation Inspection

In addition to the visual inspection performed by the Department during the initial installation of storm sewer pipes and pipe culverts, a post installation visual/video camera inspection shall be conducted by the Contractor in accordance with the requirements of this specification and VTM 123 on all storm sewer pipe and a selected number of pipe culverts. For the purposes of this Section, a storm sewer pipe is defined as either a component of a storm sewer system as defined in Section 101.02 of the Specifications or any pipe identified on the plans as storm sewer pipe. All other pipe shall be considered pipe culverts. Post installation Inspections shall be performed on straight line and radial installations.

For pipe culverts, a minimum of one pipe installation for each size of each material type utilized on the project will be randomly selected by the Engineer for inspection, however, in no case will the amount of pipe subject to inspection be less than ten percent of the total contract amount for the size and material type indicated. Where possible, for all installations in which the pipe or culvert's size, orientation, or location permit deflection to be easily visually identified, (as verified with the Engineer) the Contractor may perform visual inspections in lieu of video inspections. If defects as described herein are noted during the inspection, the Engineer may require additional pipe installations of that size and/or material be inspected. The Contractor shall coordinate and schedule all post installation inspections so that these are made in the presence of the Engineer. The post installation inspection shall be performed no sooner than 30 days after completion of the pipe installation and placement of final cover (except for pavement structure). The Contractor shall issue a report detailing all issues or deficiencies noted during the inspection (including a remediation plan for each deficiency noted where applicable) no later than 5 days after completion of the inspection.

While the intent of this requirement is to perform the post installation inspection prior to paving, project scheduling may dictate that a particular site be paved before the end of the 30 day period. In such cases, a preliminary inspection of the pipe shall be made, prior to paving over it, to insure that the pipe has been properly installed and is performing well. Performing such a preliminary inspection prior to paving will not relieve the Contractor from the requirement to perform the post installation inspection after the 30 day period.

The Contractor's inspection report shall identify and address any of the following items observed during the post installation inspection including identifying any proposed remediation measures the Contractor plans to perform where applicable. Remediation measures may consist of repairing or replacing the defective pipe section(s) or a combination of the two where differing conditions exist within the same run of pipe. Where permitted as an option, remediation methods for the various installation defects

shall be proposed by the Contractor, reviewed with the Engineer and must have the Engineer's approval prior to implementation of the corrective action. Remediation shall be the sole responsibility of the Contractor. Further, if remediation measures are shown to be necessary, any time associated with such measures shall be reflected in the impact to the Contractor's progress schedule (may take the form of a time impact analysis, where required by the scheduling requirements) and will not relieve the Contractor of his responsibilities to finish the work required by the contract within the contract time limits or form the basis for any claim of delay where such remediation measures are determined to be a result of the Contractor's fault, omission or negligence.

Upon completion of any corrective remedial measures, the corrected installations are to be re-inspected prior to final acceptance of the project utilizing the test methods identified in VTM 123.

The following criteria shall form the basis for inspections for the respective pipe or culvert types listed:

1. **Concrete Pipe\Culverts:**

- a. **Misalignment:** Vertical and horizontal alignment of the pipe culvert or storm drain pipe barrel shall be checked by sighting along the crown, invert and sides of the pipe, and by checking for sagging, faulting and invert heaving. For the purposes of this provision faulting is defined as differential settlement between joints of the pipe, creating a non-uniform profile of the pipe. The person assigned by the Contractor to perform the inspection should take into account pipe or culvert laid with a designed camber or grade change in accordance with project or site requirements. Horizontal alignment shall be checked for straightness or smooth curvature. Any issues involving incorrect horizontal and/or vertical alignment shall be noted in the inspection report. If any vertical and/or horizontal misalignment problems are visually noted by the Engineer or in the inspection report, a further evaluation shall be conducted by the Engineer to determine the impact of the misalignment on the joints and wall of the pipe to ascertain what corrective actions are needed. All corrective actions determined necessary by the Engineer that are a result of the Contractor's negligence, omission or fault shall be the sole responsibility of the Contractor to remedy.
- b. **Joints:** Leaking joints may be detected during low flows by visual observation of the joints or checking around the ends of pipes or culverts for evidence of piping or seepage.

Differential movement, cracks, spalling, improper gasket placement, movement or settlement of pipe\culvert sections, and leakage shall be noted by the Contractor in the report. Joint separation greater than one inch shall be remediated by the Contractor at his expense to the satisfaction of the Engineer. . Evidence of soil migration through the joint will be further evaluated by the Engineer to determine the level of corrective action necessary. All corrective actions determined necessary by the Engineer that are a result of the Contractor's negligence, omission or fault shall be the sole responsibility of the Contractor to remedy.

- c. **Cracks:** Longitudinal cracks with a width less than one hundredth of an inch (0.01) are considered hairline and minor. They shall be noted in the inspection report; however, no remedial action is necessary.

Longitudinal cracks having a width equal to or greater than one hundredth of an inch (0.01) but equal to or less than one tenth of an inch (0.1) and determined by the Engineer to be detrimental to the structure shall be sealed by a method proposed by the pipe\culvert manufacturer and approved by the Engineer. Pipes or culverts having longitudinal cracks with widths greater than one tenth of an inch (0.1) and determined to be beyond the limits of a satisfactory structural repair shall be replaced by the Contractor at his expense to the satisfaction of the Engineer.

Pipes or culverts having displacement across the crack greater than 0.1 inch but less than 0.3 inch shall be remediated. Remediation methods shall be in accordance with recommendations of the pipe or culvert manufacturer, be acceptable to and authorized by the Engineer before implementation and shall be the sole responsibility of the Contractor. Pipes\culverts having displacement across the crack greater than 0.3 inch shall be replaced by the Contractor at his expense to the satisfaction of the Engineer.

Transverse cracks will be evaluated using the same criteria as indicated above for longitudinal cracks.

- d. **Spalls:** Spalling is defined as a localized pop-out of concrete along the wall of the pipe\culvert generally caused by corrosion of the steel reinforcement or at the edges of longitudinal or circumferential cracks. Spalling may be detected by visual examination of the concrete along the edges of the crack. The person conducting the inspection shall check for possible delamination. If delamination is noted or if a hollow sound is produced when the area is tapped with a device such as a hammer, the pipe\culvert shall be remediated. Remediation methods shall be in accordance with recommendations of the pipe\culvert manufacturer, be acceptable to and authorized by the Engineer before proceeding, and shall be the sole responsibility of the Contractor.
- e. **Slabbing:** Any pipe\culvert experiencing slabbing shall be remediated. Slabbing is a structural failure of the pipe\culvert that results from radial or diagonal tension forces in the pipe\culvert. These failures appear as a separation of the concrete from the reinforcing steel near the crown or invert of the pipe\culvert and may span the entire length of a pipe or culvert section (joint to joint). Remediation methods shall be in accordance with recommendations of the pipe or culvert manufacturer, be acceptable to and authorized by the Engineer before proceeding, and shall be the sole responsibility of the Contractor. Where slabbing is of such magnitude that, in the opinion of the Engineer the integrity or service life of the pipe or culvert is severely compromised, the section(s) of pipe or culvert exhibiting such deficiency shall be replaced at the Contractor's expense to the satisfaction of the Engineer.

2. Thermoplastic Pipe\Culvert:

- a. **Misalignment:** Vertical and horizontal alignment of the pipe culvert or storm drain pipe barrel(s) shall be checked by sighting along the crown, invert and sides of the pipe, and by checking for sagging, faulting and invert heaving. The person assigned by the Contractor to perform the inspection should take into account pipes\culverts laid with a designed camber or grade change. Horizontal alignment shall be checked for straightness or smooth curvature. Any issues with horizontal and/or vertical alignment shall be noted in the inspection report. If any vertical and/or horizontal misalignment problems are noted in the inspection, a further evaluation will be performed by the Engineer to determine the impact of the misalignment on the joints and wall of the pipe\culvert to ascertain what corrective actions are needed. All corrective actions determined necessary by the Engineer that are a result of the Contractor's negligence, omission or fault shall be the sole responsibility of the Contractor to remedy.
- b. **Cracks:** Cracks or splits in the interior wall of the pipe shall be remediated. Remediation methods shall be in accordance with recommendations of the pipe manufacturer, be acceptable to and authorized by the Engineer before proceeding, and shall be the sole responsibility of the Contractor
- c. **Joints:** Pipes\culverts showing evidence of crushing at the joints shall be remediated. Differential movement, improper joint sealing, movement or settlement of pipe\culvert sections, and leakage shall be noted in the inspection report. Joint separation of greater than 1 inch shall be remediated. Evidence of soil migration through the joint will be further investigated by the Engineer to determine the level of remedial action required by the Contractor. Remediation methods shall be in accordance with recommendations of the pipe manufacturer, be acceptable to and authorized by the Engineer before proceeding. All corrective actions determined necessary by the Engineer that are a result of the Contractor's negligence, omission or fault shall be the sole responsibility of the Contractor to remedy.
- d. **Buckling, bulging, and racking:** Flat spots or dents at the crown, sides or flow line of the pipe due to racking shall be noted in the inspection report and will be evaluated by the Engineer. Areas of wall buckling and bulging shall also be noted in the inspection report and evaluated by the Engineer for corrective action if deemed necessary by the Engineer. All corrective actions determined necessary by the Engineer shall be the sole responsibility of the Contractor.
- e. **Deflection:** Any one of several methods may be used to measure deflection of thermoplastic pipe\culvert (laser profiler, mandrel, direct manual measure, etc.) If the initial inspection indicates the pipe\culvert has deflected 7.5 percent or more of its original diameter, and if the original inspection was performed using a video camera, then a mandrel test shall also be performed in accordance with VTM 123. All deflections shall be noted in the inspection report. Deflections of less than 5 percent of the original pipe\culvert's diameter shall not require remediation. Deflection of 5 percent up to 7.4 percent will be evaluated by the Engineer. If the pipe\culvert experiences additional defects along with deflection of 5 percent up to 7.4 percent of the original pipe\culvert's

diameter, the pipe\culvert shall be remediated. Remediation methods shall be in accordance with recommendations of the pipe\culvert manufacturer, be acceptable to and authorized by the Engineer before proceeding, and shall be the sole responsibility of the Contractor.

If the pipe\culvert is deflected 7.5 percent or greater of the original diameter, the pipe\culvert shall be replaced by the Contractor at his expense to the satisfaction of the Engineer

In lieu of the options noted above for remediation of deflection in thermoplastic pipe\culvert installations, the Contractor may elect to follow the payment schedule below:

Amount of Deflection	Percent of Payment
0.0 % TO 5.0%	100% of Unit Bid Price
5.1% to 7.5%	75% of Unit Bid Price
Greater than 7.5%	Remove and Replace at Contractor's Expense

Remediation efforts and payment shall apply to the entire section(s) of the deflected pipe or culvert, joint to joint.

3. Metal Pipe\Culvert:

- a. **Misalignment:** Vertical and horizontal alignment of the pipe culvert or storm drain pipe barrel shall be checked by sighting along the crown, invert and sides of the pipe\culvert, and by checking for sagging, faulting and invert heaving. The person assigned by the Contractor to perform the inspection should take into account pipe laid with a designed camber or grade change. Horizontal alignment shall be checked for straightness or smooth curvature. Any issues with horizontal and/or vertical alignment shall be noted in the inspection report for evaluation by the Engineer. If any vertical and/or horizontal misalignment problems are noted in the inspection, further evaluation will be conducted by the Engineer to determine the impact of the misalignment on the joints and wall of the pipe\culvert to ascertain what corrective actions by the Contractor are needed. All corrective actions determined necessary by the Engineer that are a result of the Contractor's negligence, omission or fault shall be the sole responsibility of the Contractor to remedy.
- b. **Buckling, bulging, and racking:** Flat spots or dents at the crown, sides or flow line of the pipe due to racking shall be noted by the Contractor's inspector in the inspection report and will be evaluated by the Engineer for possible remediation by the Contractor. Areas of wall buckling and bulging shall also be noted in the inspection report and evaluated by the Engineer for possible remediation by the Contractor. If the Engineer determines corrective actions are necessary they shall be in accordance with the pipe\culvert manufacturer's recommendations, be acceptable to and authorized by the Engineer prior to implementation and be the sole responsibility of the Contractor.
- c. **Joints: Pipes showing evidence of** crushing at the joints shall be remediated. Differential movement, improper joint sealing, movement or settlement of pipe sections, and leakage shall be noted in the report. Joint separation of greater than 1.0 inch shall be remediated. Evidence of soil migration through the joint will be further investigated by the Engineer to determine the level of remedial action required by the

Contractor. All corrective actions determined necessary by the Engineer that are a result of the Contractor's negligence, omission or fault shall be the sole responsibility of the Contractor to remedy.

- d. **Coating:** Areas of the pipe where the original coating has been scratched, scoured or peeled shall be noted in the inspection report and evaluated by the Engineer to determine the need for immediate repair. If repairs are required they shall be performed by and at the expense of the Contractor in accordance with the recommendations of the pipe\culvert coating manufacturer.
- e. **Deflection:** Any one of several methods may be used to measure deflection of metal pipe\culvert (laser profiler, mandrel, direct manual measure, etc.) If the initial inspection indicates the pipe\culvert has deflected 7.5 percent or more of its original diameter, and if the original inspection was performed using a video camera, then a mandrel test shall also be performed in accordance with VTM 123. All deflections shall be noted in the inspection report. Deflections of less than 5 percent of the original pipe\culvert's diameter shall not require remediation. Deflection of 5 percent up to 7.4 percent will be evaluated by the Engineer. If the pipe\culvert experiences additional defects along with deflection of 5 percent up to 7.4 percent of the original pipe\culvert's diameter, the pipe\culvert shall be remediated. Remediation methods shall be in accordance with recommendations of the pipe\culvert manufacturer, be acceptable to and authorized by the Engineer before proceeding, and shall be the sole responsibility of the Contractor.

If the pipe\culvert is deflected 7.5 percent or greater of the original diameter, the pipe shall be replaced by the Contractor at his expense to the satisfaction of the Engineer

In lieu of the options noted above for remediation of metal pipe\CULVERT, the Contractor may elect to follow the payment schedule below:

Amount of Deflection	Percent of Payment
0.0 % TO 5.0%	100% of Unit Bid Price
5.1% to 7.5%	75% of Unit Bid Price
Greater than 7.5%	Remove and Replace at Contractors Expense

Remediation efforts and percentage of payment shall apply to the entire section(s) of the deflected pipe or culvert, joint to joint.

Section 302.04 Measurement and Payment is amended to add the following:

Post installation inspection shall be measured and paid for at the contract unit price per linear foot. This price shall include performing visual and video camera inspection(s), preparing and furnishing documentation to include narratives and video media in accordance with the requirements herein and VTM 123.

The cost of the remedial measures (including removal and replacement of the pipe, if necessary) and the re-inspection of the remediated pipe necessitated as a result of the Contractor's negligence, omission or fault shall be the contractual and financial responsibility of the Contractor.

Payment will be made under:

Pay Item	Pay Unit	
Post installation inspection SS30305-0911	Linear Foot	May 20, 2011c

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 303—EARTHWORK

SECTION 303—EARTHWORK of the Specifications is amended as follows:

Section 303.02—Materials is amended to add the following:

(e) **Seed** shall conform to Section 244.02(c) of the Specifications.

Section 303.03—Erosion and Siltation Control is amended to replace the second paragraph the following:

Erosion and siltation control devices and measures shall be maintained in a functional condition at all times. Temporary and permanent erosion and siltation control measures shall be inspected in accordance with the requirements of Section 107.16(a) of the Specifications. Deficiencies shall be immediately corrected. The Contractor shall make a daily review of the location of silt fences and filter barriers to ensure that they are properly located for effectiveness. Where deficiencies exist, corrections shall be made immediately as approved or directed by the Engineer.

Section 303.03(b) Soil Stabilization is amended to replace the last paragraph with the following:

Areas that cannot be seeded because of seasonal or adverse weather conditions shall be mulched to provide some protection against erosion to the soil surface. Mulch shall be applied in accordance with the requirements of Section 603.03(e) of the Specifications and paid for in accordance with the requirements of Section 603.04 of the Specifications. Organic mulch shall be used, and the area then seeded as soon as weather or seasonal conditions permit in accordance with the requirements of Section 603.03 of the Specifications. Organic mulch includes: straw or hay, fiber mulch, wood cellulose, or wood chips conforming to the requirements of Section 244.02(g) of the Specifications.

Section 303.03(f) Sediment Traps and Sediment Basins is replaced with the following:

(f) **Sediment Traps and Sediment Basins:** Sediment traps shall be utilized where the storm water runoff from disturbed areas is comprised of flow from a total drainage area of less than 3 acres. Sediment basins shall be utilized where the storm water runoff from disturbed areas is comprised of flow from a total drainage area of 3 or more acres. Once a sediment trap or basin is constructed, the dam and all outfall areas shall be stabilized immediately.

Section 303.03—Erosion and Siltation Control is amended to add the following:

(h) **Temporary Diversion Dike:** This work shall consist of constructing temporary diversion dikes at the locations designated on the plans and in accordance with the plan details and the Specifications, stabilizing with seed and mulch, maintaining, removing when no longer required, and restoration of the area.

Temporary diversion dikes shall be installed as a first step in land-disturbing activities and shall be functional prior to upslope land disturbance. The dike shall be constructed to prevent failure in accordance with Section 303.04 of the Specifications. Seeding and mulch shall be applied to the dike in accordance with Section 603 of the Specifications immediately following its construction. The dikes should be located to minimize damages by construction operations and traffic.

The Contractor shall inspect the temporary diversion dikes after every storm and repairs made to the dike, flow channel, outlet, or sediment trapping facility, as necessary. Once every two weeks, whether a storm event has occurred or not, the measure shall be inspected and repairs made if needed. Damages to the dikes caused by construction traffic or other activity must be repaired before the end of the working day.

Section 303.06(e)—Erosion Control Items is amended to replace “4. **Check dams**” with the following:

4. **Check dams** will be paid for at the contract unit price per each. This price shall include furnishing, excavating, constructing, maintaining, repositioning as may be required during construction and removing the check dams if, or when, no longer required.

Synthetic check dams may be substituted for Type II Rock Check dams (Standard EC-4) at no additional cost to the Department.

Section 303.06(e)—Erosion Control Items is amended to replace “6. **Geotextile fabric**” with the following:

6. **Geotextile fabric** attached to brush barriers or existing fence or used for another function specified on the plans will be measured in square yards, complete-in-place, excluding laps, and will be paid for at the contract unit price per square yard. This price shall include trimming the brush barrier; furnishing, installing, maintaining, and removing the fabric; and dressing and stabilizing the area.

The brush barrier will not be measured for separate payment. The cost thereof shall be included in the price for clearing and grubbing.

Section 303.06(e)—Erosion Control Items is amended to replace “15. **Drop Inlet Silt Trap**” and its corresponding Pay Item and Pay Unit with the following:

15. Inlet protection:

- a. **Inlet Protection Type A** will be measured in units of each and will be paid for at the contract unit price per each location shown or specified. The price shall include furnishing and installing temporary filter barrier including posts and top rails, coarse aggregate and, if required, sediment forebay. This price shall also include maintenance and removal until no longer required. Inlet Protection Type A will be paid for only one time during the duration of the project.
- b. **Inlet Protection Type B** will be measured in units of each and will be paid for at the contract unit price per each location shown or specified. The price shall include furnishing and installing hardware mesh cloth, concrete blocks, wooden studs, coarse aggregate, and maintenance and removal until no longer required. Inlet Protection Type B will be paid for only one time during the duration of the project.

- c. **Inlet Protection Type C** will be measured and paid for in accordance with the individual pay items and pay units shown in the Standard Drawing for EC-6, Type C. The individual pay items for Inlet Protection Type C will be paid for only one time during the duration of the project for each location shown or specified.

Payment will be made under:

Pay Item	Pay Unit
Inlet protection Type A	Each
Inlet protection Type B	Each

Section 303.06(e)—Erosion Control Items is amended to add the following:

18. **Temporary diversion dike** will be measured in linear feet, complete-in-place, and will be paid for at the contract unit price per linear foot. This price shall be full compensation for installing the diversion dike, stabilizing with seed and mulch, maintaining, removing when no longer required, and restoration of the area.

Payment will be made under:

Pay Item	Pay Unit
Temporary diversion dike	Linear foot

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2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 304—CONSTRUCTING DENSITY CONTROL STRIPS

SECTION 304—CONSTRUCTING DENSITY CONTROL STRIPS of the Specifications is amended as follows:

Section 304.04—Procedures is amended to replace the second paragraph with the following:

One control strip shall be constructed at the beginning of work on each roadway and shoulder course and each lift of each course. An additional control strip shall be constructed when a change is made in the type or source of material or whenever a significant change occurs in the composition of the material from the same source. For subgrade and subbase materials, the maximum theoretical density from either one-point proctor test (VTM-12) or three point proctor tests (VTM-1) may be used in lieu of constructing a control strip, at the discretion of the Engineer.

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2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 315—ASPHALT CONCRETE PLACEMENT

SECTION 315—ASPHALT CONCRETE PAVEMENT of the Specifications is amended as follows:

The Table of Contents for the 2007 Road and Bridge Specifications is revised to rename **SECTION 315—ASPHALT CONCRETE PAVEMENT** as **SECTION 315—ASPHALT CONCRETE PLACEMENT**.

Section 315.01—Description is replaced with the following:

This work shall consist of constructing one or more courses of asphalt concrete on a prepared foundation in accordance with the requirements of these specifications and within the specified tolerances for the lines, grades, thicknesses, and cross sections shown on the plans or as established by the Engineer. At the Contractor's option, the asphalt concrete mix may be produced using a warm-mix additive or process approved by the Department. When used, the temperature placement limitations for Warm Mix Asphalt (WMA) shall be applied.

Section 315.02(b) Asphalt for tack coat and prime coat is replaced with the following:

Asphalt for Tack Coat shall conform to the special provision titled "Nontracking Tack Coat." Asphalt for Prime Coat shall conform to the requirements in Section 310 of the Specifications. Asphalt for prime coat may be changed by one viscosity grade by the Engineer at no change in the contract unit price.

Section 315.02(d) Liquid asphalt coating (emulsion) for rumble strip is replaced with the following:

- (d) **Liquid asphalt coating (emulsion) for rumble strip** shall conform to the requirements of Section 210 of the Specifications. For centerline rumble strips, CSS-1h or CQS-1h conforming to Section 210 of the Specifications shall be used. The CSS-1h or CQS-1h may be diluted by up to 30 percent at the emulsion manufacturer's facility.

Section 315.03(a) Hauling Equipment is replaced with the following:

- (a) **Hauling Equipment:** Trucks used for hauling asphalt mixtures shall have tight, clean, smooth metal or other non-absorptive/inert material bodies equipped with a positive locking metal tailgate. Surfaces in contact with asphalt mixtures shall be given a thin coat of aliphatic hydrocarbon invert emulsion release agent (nonpuddling), a lime solution, or other material on the Department's list of approved release agents. Except where a nonpuddling release agent is used, the beds of dump trucks shall be raised to remove excess agent prior to loading. Only a nonpuddling agent shall be used in truck beds that do not dump. Each truck shall be equipped with a tarpaulin or other cover that will protect the mixture from moisture and foreign matter and prevent the rapid loss of heat during transportation.

Section 315.03—Equipment is amended by adding the following:

- (e) **Material Transfer Vehicle (MTV):** When required in the Contract, a MTV shall be a self-propelled storage unit capable of receiving material from trucks, storing the material and

transferring the material from the unit to a paver hopper insert via a conveyor system. The required paver hopper insert and unit shall have a combined minimum storage capacity of 15 tons. Prior to placing the asphalt material on the roadway surface, the storage unit or paver hopper insert must be able to remix the material in order to produce a uniform, non-segregated mix, having a uniform temperature.

Section 315.04—Placement Limitations is replaced with the following:

Asphalt concrete mixtures shall not be placed when weather or surface conditions are such that the material cannot be properly handled, finished, or compacted. The surface upon which asphalt mixtures are to be placed shall be free of standing water, dirt, and mud and the base temperature shall conform to the following:

(a) **Asphalt Concrete Produced with Warm Mix Asphalt Additives or Processes:**

1. **When the base temperature is 40 degrees F and above**, laydown will be permitted at any temperature below the maximum limits given in Section 211.08 of the Specifications.
2. **When the laydown temperature is between 301 degrees F and 325 degrees F**, the number of compaction rollers will be the same number as required for 300 degrees F or less.

(b) **Asphalt Concrete Produced without Warm Mix Asphalt Additives or Processes:**

1. **When the base temperature is above 80 degrees F**, mixture laydown will be permitted at any temperature conforming to the limits specified in Section 211 of the Specifications.
2. **When the base temperature is between 40 degrees F and 80 degrees F**, the Nomograph, Table III-2, shall be used to determine the minimum laydown temperature of the asphalt concrete mixes. At no time should the minimum base temperature for base (BM) and intermediate (IM) mixes be less than 40 degrees F. At no time should the minimum laydown temperature for base (BM) and intermediate (IM) mixes be less than 250 degrees F.

For surface mixes (SM), at no time should the minimum base and laydown temperatures be less than the following:

PG Binder/Mix Designation	Percentage of Reclaimed Asphalt Pavement (RAP) Added to Mix	Minimum Base Temperature	Minimum Placement Temperature
PG 64-22 (A)	<=25%	40 °F	250 °F
PG 64-22 (A)	>25%	50 °F	270 °F
PG 70-22 (D)	<=30%	50 °F	270 °F
PG 76-22 (E)	<=15%	50 °F	290 °F
PG 64-22 (S)	<=30%	50 °F	290 °F

- (3) **When the laydown temperature is between 301 degrees F and 325 degrees F**, the number of compaction rollers will be the same number as required for 300 degrees F.

Intermediate and base courses that are placed at rates of application that exceed the application rates shown in Table III-2 shall conform to the requirements for the maximum application rate shown for 8-minute and 15-minute compaction rolling as per number of rollers used.

Should the Contractor be unable to complete the compaction rolling within the applicable 8-minute or 15-minute period, the placing of asphalt mixture shall either cease until sufficient rollers are used or other corrective action is taken to complete the compaction rolling within the specified period.

Compaction rolling shall be completed prior to the mat cooling down to 175 degrees F. Finish rolling may be performed at a lower mat temperature.

The final asphalt pavement finish course shall not be placed until construction pavement markings are no longer required.

Section 315.05(b) Conditioning Existing Surface is replaced with the following:

- (b) **Conditioning Existing Surface:** When the surface of the existing pavement or base is irregular, it shall be brought to a uniform grade and cross section as directed by the Engineer. The surface on which the asphalt concrete is to be applied shall be prepared in accordance with the requirements of the applicable specifications and shall be graded and compacted to the required profile and cross section.

When specified, prior to placement of asphalt concrete, longitudinal and transverse joints and cracks shall be sealed by the application of an approved crack sealing material per special provision titled "Sealing Cracks in Asphalt Concrete Surfaces or Hydraulic Cement Concrete Pavement".

Contact surfaces of curbing, gutters, manholes, and other structures projecting into or abutting the pavement and cold joints of asphalt shall be painted with a thick, uniform coating of asphalt prior to placement of asphalt mixture.

A tack or prime coat of asphalt will be required as specified below and shall conform to the applicable requirements of Section 311 of the Specifications or the special provision titled "Nontracking Tack Coat". Asphalt classed as cutbacks or emulsions shall be applied ahead of the paving operations, and the time interval between applying and placing the paving mixture shall be sufficient to ensure a tacky residue providing maximum adhesion of the paving mixture to the base. The mixture shall not be placed on tack or prime coats that have been damaged by traffic or contaminated by foreign material. Traffic shall be excluded from such sections.

1. **Priming and Tacking:**

- a. **Priming aggregate base or subbase:** Unless otherwise specified in the contract documents, priming with asphalt material will not be required on aggregate subbase or base material prior to the placement of asphalt base, intermediate or surface layers.
- b. **Tacking:** Application of tack at joints, adjacent to curbs, gutters, or other appurtenances, shall be applied with a hand wand or with spray bar at the rate of 0.2 gallon per square yard. At joints, the tack applied by the hand wand or a spray bar shall be 2 feet in width with 4 to 6 inches protruding beyond the joint for the first pass. Tack for the adjacent pass shall completely cover the vertical face of the mat edge, so that slight puddling of asphalt occurs at the joint, and extend a minimum of 1 foot into the lane to be paved.

Milled faces that are to remain in place shall be tacked in the same way for the adjacent pass. Use of tack at the vertical faces of longitudinal joints will not be required when paving in echelon.

On rich sections or those that have been repaired by the extensive use of asphalt patching mixtures, the tack coat shall be eliminated when directed by the Engineer.

Tack shall not be required atop asphalt stabilized open-graded material drainage layers.

Tack shall be applied between the existing asphalt surface and each asphalt course placed thereafter.

2. **Removing depressions and elevating curves:** Where irregularities in the existing surface will result in a course more than 3 inches in thickness after compaction, the surface shall be brought to a uniform profile by patching with asphalt concrete and thoroughly tamping or rolling until it conforms with the surrounding surface. The mixture used shall be the same as that specified for the course to be placed.

When the Contractor elects to conduct operations to eliminate depressions, elevate curves, and place the surface course simultaneously, he shall furnish such additional spreading and compacting equipment as required to maintain the proper interval between the operations.

Section 315.05(c) Placing and Finishing is amended to replace the second paragraph with the following:

A continuous line to mark the edge of pavement and provide proper control of pavement width and horizontal alignment will not be required for this contract.

And to add the following paragraphs:

Prior to application of tack coat and commencement of paving operations the Contractor shall clean the existing pavement surface of all accumulated dust, mud, or other debris that may affect the bond of the new overlay, as determined by the Engineer. The Contractor shall ensure the surface remains clean until commencement and during paving operations. The cost for cleaning and surface preparation shall be included in the bid price for asphalt concrete.

When required in the Contract, a MTV shall be used during the placement of designated asphalt mixes on full lane width applications.

Section 315.05(c) Placing and Finishing is amended to replace the fifth paragraph with the following:

The Contractor shall have a certified Asphalt Field Level II Technician present during all paving operations. Immediately after placement and screeding, the surface and edges of each layer shall be inspected by the Asphalt Field Level II Technician to ensure compliance with the asphalt placement requirements and straightedged to ensure uniformity and smoothness. The Asphalt Field Level II Technician and shall make necessary corrections, if necessary, prior to compaction. The finished pavement shall be uniform and smooth.

The Contractor's Asphalt Field Level II Technician shall be present during all density testing.

Section 315.05(d) Compacting is amended by replacing the fifth paragraph with the following:

Rolling shall begin at the sides and proceed longitudinally parallel with the center of the pavement, each trip overlapping at least 6 inches, gradually progressing to the crown of the pavement. When abutting a previously placed lane, rolling shall begin at the outside unconfined side and proceed toward the previously placed lane. On superelevated curves, rolling shall begin at the low side and proceed to the high side by overlapping of longitudinal trips parallel with the centerline.

Section 315.05(e) is replaced with the following:

(e) **Density:** Density shall be determined in accordance with the following:

1. The Contractor shall perform roller pattern and control strip density testing on surface, intermediate, and base courses in accordance with the requirements of VTM-76. The Contractor shall have a certified Asphalt Field Technician perform all density testing.

Density shall be determined with a thin-lift nuclear gauge conforming to the requirements of VTM-81 or from the testing of plugs/cores taken from the roadway where the mixture was placed. Density test locations shall be marked and labeled in accordance with the requirements of VTM-76. When acceptance testing is performed with a nuclear gauge, the Contractor shall have had the gauge calibrated within the previous 12 months by approved calibration service. In addition, the Contractor shall maintain documentation of such calibration service for the 12-month period from the date of the calibration service. The required density of the compacted course shall not be less than 98.0 percent and not more than 102.0 percent of the target control strip density.

Nuclear density roller pattern and control strip density testing shall be performed on asphalt concrete overlays placed directly on surface treatment roadways and when overlays are placed at an application rate less than 125 pounds per square yard, based on 110 pounds per square yard per inch, on any surface. In these situations, sawed plugs or core samples will not be required and the minimum control strip densities as specified in Table III-3 will be waived. The required density of the compacted course shall be not less than 98.0 percent and not more than 102.0 percent of the target control strip.

**TABLE III-3
Density Requirements**

Mixture Type	Min. Control Strip Density (%)¹
SM-9.5A, 12.5A	92.5
SM-9.5D, 12.5D	92.2
SM-9.5E, 12.5E	92.2
IM-19.0A, IM-19.0D, IM-19.0E	92.2
BM-25.0A, BM-25.0D	92.2

¹The control strip density requirement is the percentage of theoretical maximum density of the job-mix formula by SUPERPAVE mix design or as established by the Engineer based on two or more production maximum theoretical density tests.

The project will be divided into "control strips" and "test sections" by the Engineer for the purpose of defining areas represented by each series of tests.

- a. Control Strip: Control strips shall be constructed in accordance with the requirements of these specifications and VTM-76.

The term *control strip density* is defined as the average of 10 determinations selected at stratified random locations within the control strip.

One control strip shall be constructed at the beginning of work on each roadway and shoulder course and on each lift of each course. An additional control strip shall be constructed when a change is made in the type or source of materials; whenever a significant change occurs in the composition of the material being placed from the same source; or when there is a failing test strip. During the evaluation of the initial control strip, paving operations may continue. However, paving and production shall be discontinued during construction and evaluation of additional control strips. In the event that two consecutive control strips fail, subsequent paving operations shall cease until corrective action(s) has been taken with the approval of the Engineer. If it is determined with the Engineer's approval that the density cannot be obtained because of the condition of the existing pavement structure, the target control strip density shall be determined from the roller pattern that achieves the optimum density and shall be used on the remainder of the roadway that exhibits similar pavement conditions.

Either the Engineer or Contractor may initiate an additional control strip at any time.

The length of the control strip shall be approximately 300 feet and the width shall not be less than 6 feet. On the first day of construction or beginning of a new course, the control strip shall be started between 500 and 1,000 feet from the beginning of the paving operation. The control strip shall be constructed using the same paving, rolling equipment, procedures, and thickness as shall be used on the remainder of the course being placed.

One reading shall be taken at each of 10 stratified random locations. No determination shall be made within 12 inches of the edge of any application width for surface and intermediate mixes or within 18 inches of the edge of any application width for base mixes. The average of these 10 determinations shall be the control strip density recorded to the nearest 0.1 pound per cubic foot. The minimum control strip density shall be determined in accordance with the requirements of VTM-76.

The control strip shall be considered a lot. If the control strip density conforms to the requirements specified in Table III-3, the control strip will be acceptable and the control strip density shall become the target control strip density. If the density does not conform to the requirements specified in Table III-3, the tonnage placed in the control strip and any subsequent paving prior to construction of another control strip will be paid for in accordance with Table III-4 on the basis of the percentage of the Table III-3 value achieved. The Contractor shall take corrective action(s) to comply with the density requirement specified in Table III-3.

**TABLE III-4
Payment Schedule for Lot Densities**

% of Target Control Strip Density	% of Payment
Greater than 102.0	95
98.0 to 102.0	100
97.0 to less than 98.0	95
96.0 to less than 97.0	90
Less than 96.0	75

- b. **Test section (lot):** For the purposes of acceptance, each day's production shall be considered a lot unless the paving length is less than 3,000 linear feet or greater than 7,500 linear feet. When paving is less than 3,000 feet, it shall be combined with the previous day's production or added to the next day's production to create a lot as described below.

The standard size of a lot shall be 5,000 linear feet, with 1,000 foot sublots, of any pass 6 feet or greater made by the paving train for the thickness of the course. Upon approval by the Engineer, the lot size may be increased to 7,500 linear foot lots with 1,500 foot sublots when the normal daily production is in excess of 7,000 feet. Pavers traveling in echelon will be considered as two passes. When a partial lot occurs at the end of a day's production or upon completion of the project, the lot size shall be redefined as follows:

- If the partial lot contains one or two sublots, the sublots will be added to the previous lot.
- If the partial lot contains three or four sublots, the partial lot will be redefined to be an entire lot.

Each lot shall be tested for density by taking a nuclear density reading from two random test sites selected by the Engineer within each sublot or a single test site when sawn cores are used for acceptance. Test sites shall not be located within 12 inches of the edge of any application width for surface and intermediate mixes or within 18 inches of the edge of any application width for base mixes.

The average of the sublot density measurements will be compared to the target nuclear density, or for cores the target percent of theoretical maximum density achieved, established on the control strip to determine the acceptability of the lot. Once the average density of the lot has been determined, the Contractor will not be permitted to provide additional compaction to raise the average. If two consecutive sublots produce density results less than 98 percent or more than 102 percent of the target control strip density, the Contractor shall immediately notify the Engineer and institute corrective action. At each test site in the sublot, the Longitudinal Joints shall also be tested for density using a nuclear density gauge. For surface and intermediate mixes, the gauge shall be placed within 4 inches of the joint. For base mixes, the gauge shall be placed within 6 inches of the joint. The gauge shall not be placed over top of the joint. The joint density value shall be recorded. If a single longitudinal joint density reading is less than 95 percent of the target control strip density, the Contractor shall institute corrective action. The values obtained from the joint readings will not be used in payment

calculation. By the end of the day's operations, the Contractor shall furnish the test data developed during the day's paving to the Engineer.

When sawn cores are used for density acceptance: The Contractor shall perform acceptance testing for density for each subplot by obtaining one sawed 4 inch by 4 inch specimen, or one 4-inch-diameter cores, at a single random test site specified by the Engineer.

- The sub-lot site shall be marked as described in VTM-76.
- The bulk specific gravity of the cores shall be determined in accordance with VTM-6.
- The density of the cores shall be determined in accordance with the requirements of VTM-22.

Cores or plugs shall be bulked in the presence of the Department. The Department reserves the right to have the cores or plugs bulked on the project site. Sublot test sites shall be numbered sequentially per lot, marked on the pavement, filled with the paving mixture, and compacted prior to completion of each day of production.

The tonnage of each lot will be based on the lot's width and length and the mixture application rate as designated in the Contract or as revised by the Engineer. Payment will be made in accordance with the requirements of Table III-4.

The Engineer at any time on any project may perform lot density verification testing. Lot density verification is performed by testing plugs. The Contractor shall be responsible for taking plugs for testing. Testing of the plugs will be done by the Engineer.

Surface, Intermediate, and Base mixes:

Two plugs shall be taken by the Contractor per Verification, Sampling and Testing (VST) lot at locations identified by the Engineer. If the density of the plugs does not conform to the requirements for the lot in question or the same payment percentage determined by the Contractor's testing for that lot, then the Contractor may request the referee procedure to be invoked. One additional plug from the remaining sublots will be taken. Payment for that lot, based on the results of the initial two plugs/cores or referee procedure, will be in accordance with the specifications in Table III-4 on the basis of the percentage of the control strip bulk density achieved.

2. **Surface, intermediate, and base courses** not having a sufficient quantity of material to run a roller pattern and control strip shall be compacted to a minimum density of 91.5 percent of the theoretical maximum density as determined in accordance with the requirements of VTM-22. The Contractor shall be responsible for cutting cores or sawing plugs for testing by the Department. One set of plugs/cores shall be obtained within the first 20 tons of small quantity paving and every 100 tons thereafter for testing by the Contractor or the Department. Core/plug locations shall be randomly selected. If the density is

less than 91.5 percent, payment will be made in accordance with the requirements of Table III-5.

TABLE III-5

Payment Schedule for Surface, Intermediate and Base Courses (Not sufficient quantity to perform density roller pattern and control strip)

% TMD	% of Payment
Greater than 91.5	100
90.2-91.4	95
88.3-90.1	90
Less than 88.2	75

Any section in which a mixture (e.g., SM-9.0) is being placed at an application rate of less than 125 pounds per square yard, based on 110 pounds per square yard per inch, that does not have a sufficient quantity of material for a roller pattern and control strip shall be compacted by rolling a minimum of three passes with a minimum 8-ton roller. No density testing will be required.

For asphalt patching, the minimum density of 91.5 percent of the maximum theoretical density will be determined in accordance with the requirements of VTM-22. The Contractor is responsible for cutting cores or sawing plugs. One set of plugs/cores shall be obtained within the first 20 tons of patching material and every 500 tons thereafter for testing by the Contractor or the Department. Core/plug locations shall be randomly selected. If the density is less than the 91.5 percent, payment will be made on the tonnage within the 20 or 500 ton lot in accordance with the requirements of Table III-5 of the Specifications.

Section 315.05(g) Rumble Strips is amended to replace fourth paragraph with the following:

Following the cutting and cleaning of the depressions of waste material, the entire rumble strip area shall be coated with liquid asphalt coating (emulsion) using a pressure distributor. For rumble strips installed on the shoulder, the approximate application rate shall be 0.1 gallons per square yard. For rumble strips installed in a new asphalt concrete surface (new construction or overlay) along the centerline, no sealing of the rumble strip area shall be performed. When the rumble strip is installed along the centerline in an existing asphalt concrete surface (i.e. more than one year since placement), the approximate application rate shall be 0.05 gallons per square yard. The application temperature shall be between 160 degrees F and 180 degrees F. For shoulder rumble strips only, overspray shall not extend more than 2 inches beyond the width of the cut depressions and/or shall not come in contact with pavement markings.

Section 315.07(c) Thickness Tolerance is replaced with the following:

- (c) **Thickness Tolerance:** The thickness of the base course will be determined by the measurement of cores as described in VTM-32.

Acceptance of asphalt concrete base course for depth will be based on the mean result of measurements of samples taken from each lot of material placed. A *lot* of material is defined as the quantity being tested for acceptance except that the maximum lot size will be 1 mile of 24-foot-width base course.

A lot will be considered acceptable for depth if the mean result of the tests is within the following tolerance of the plan depth for the number of tests taken:

Plan Depth	1 test	2 tests	3 tests	4 tests
≤ 4"	0.6"	0.5"	0.4"	0.3"
>4." ≤8"	0.9"	0.7"	0.5"	0.4"
>8"≤12"	1"	0.9"	0.7"	0.5"
>12"	1.2"	1"	0.8"	0.6"

If an individual depth test exceeds the one test tolerance for the specified plan depth, that portion of the lot represented by the test will be excluded from the lot. If an individual test result indicates that the depth of material represented by the test is more than the tolerance for one test, the Contractor will not be paid for that material in excess of the tolerance throughout the length and width represented by the test. If an individual test result indicates that the depth of the material represented by the test is deficient by more than the one test tolerance for the plan depth, correction of the base course represented by the test shall be made as specified hereinafter.

If the mean depth, based on two or more tests, of a lot of material is excessive (more than the plan depth), the Contractor will not be paid for that material in excess of the tolerance throughout the length and width represented by the tests.

If the mean depth, based on two or more tests, of a lot of material is deficient (less than the plan depth) by more than the allowable tolerance, the Contractor will be paid for the quantity of material that has been placed in the lot. Any required corrective action will be determined by the Engineer.

For excessive depth base courses, the rate of deduction from the tonnage allowed for payment as base course will be calculated at a weight of 115 pounds per square yard per inch of depth in excess of the tolerance. For sections of base course that are deficient in depth by more than the one test tolerance and less than two and half times the one test tolerance, the Contractor shall furnish and place material specified for the subsequent course to bring the base course depth within the tolerance. This material will be measured on the basis of tonnage actually placed, determined from weigh tickets, and paid for at the contract unit price for the base course material. Such material shall be placed in a separate course. If the deficiency is more than two and half times the one test tolerance, the Contractor shall furnish and place base course material to bring the base course thickness within the tolerance. Corrections for deficient base course depth shall be made in a manner to provide a finished pavement that is smooth and uniform. Sections requiring significant grade adjustments which have been previously identified and documented by the Engineer as being outside of the control of the Contractor will be exempt from deduction or corrective action.

When the Contract provides for the construction or reconstruction of the entire pavement structure, the surface and intermediate courses shall be placed at the rate of application shown on the plans within an allowable tolerance of ±5 percent of the specified application rate for application rates of 100 pounds per square yard or greater and within 5 pounds per square yard for application rates of less than 100 pounds per square yard. The amount of material exceeding the allowable tolerance will be deducted from the pay quantities.

When the Contract provides for the placement of surface or intermediate courses over existing pavement, over pavements constructed between combination curb and gutter, or in the construction or reconstruction of shoulders, such courses shall be placed at the approximate rate of application shown on the plans. However, the specified rate of application shall be altered where necessary to produce the required riding quality.

Section 315.08—Measurement and Payment is amended to include the following:

Material Transfer Vehicle (MTV), when required in the Contract, will not be measured for separate payment. The cost for furnishing and operating the MTV shall be included in the price bid for other appropriate items.

Warm Mix Asphalt (WMA) additive or process will not be measured for separate payment, the cost of which, shall be included in the price bid for other appropriate items.

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
HOT MIX ASPHALT PATCHES

December 28, 2006

I. DESCRIPTION

This work shall consist of repairing specified sections of existing flexible or existing composite pavements by removing all or part of the defective materials in the sections and replacing them with hot mix asphalt (HMA) paving material. The locations of the repairs will be specified in the Contract document and specific locations as directed by the Engineer.

II. SCOPE OF WORK

Patching repair shall consist of the removal of areas of unsound pavement material as determined by the Engineer and replaced with hot mix asphalt (HMA).

III. MATERIALS

All hot mix asphalt (HMA) shall conform to the requirements of Section 211 of the specifications.

IV. PROCEDURES

Asphalt patches shall be placed in accordance with the requirements of Section 315 of the Specifications. The existing pavement shall be removed with a minimum disturbance to the aggregate base material and the faces of the remaining pavement shall be cut to a smooth, vertical face without ragged edges.

The existing pavement shall be removed by milling, grinding, saw cutting or any other approved method to the specified depth for the full perimeter of the designated area. A tack coat of CRS-2 (or other asphalt material approved by the Engineer) at a rate of 0.2 gallon per square yard shall be applied to surface and vertical faces of exposed asphalt concrete. Exposed base aggregate shall be primed with liquid asphalt CRS-2 at an application rate of 0.4 gallon per square yard. Where concrete is encountered prior to reaching the specified depth, the depth of the patch shall then be limited to the top elevation of the concrete. Prior to application of the patch, the bottom of the excavation of all patches shall be cleaned of all loose and foreign materials and stabilized by hand or mechanical tamping.

Manual placement will be permitted for installation of the HMA. Control strip and pavement profile measurements will be waived. Variation between surfaces at the run on and run off joints shall not be more than 1/4 inch when tested with a 10-foot straight edge.

The existing pavement materials that are removed shall be hauled away from the repair site immediately, and disposed of properly by the Contractor in accordance with Section 106.04 of the Specifications.

Minimum and maximum lift thickness for patching with HMA Superpave mixes shall be maintained during construction of the patches in conformance with the following:

HMA SUPERPAVE LIFT THICKNESS (PATCHING)

MIX TYPE	MINIMUM (in.)	MAXIMUM (in.)	RECOMMENDED (in.)
SM-9.0	0.75	1.5	1.0
SM-9.5	1.25	2.0	1.5
SM-12.5	1.5	2.0	1.75
IM-19.0	2.0	3.0	2.0
BM-25.0	2.5	4.0	3.0

V. MEASUREMENT AND PAYMENT

Asphalt concrete patching will be measured and paid for at the contract unit price per square yard of pavement surface for the mix and depth specified. The payment shall be full compensation for furnishing materials and installing pavement patches complete in place. The work shall include, but not be limited to supplying materials, saw cutting, milling, grinding, removing and disposing of existing material, the cost to haul and place asphalt concrete, and all labor, equipment, tools, supervision, fuel and incidentals necessary to complete the work.

Liquid Asphalt tack or prime will not be measured for separate payment and the cost thereof to furnish and apply the liquid asphalt shall be included in the bid price for patching.

Payment will be made under:

Pay Item	Pay Unit
Asphalt Concrete Patch (Depth)	Square Yard

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
DYNAMIC PILE TESTING FOR END BEARING PILES (LRFD)

February 7, 2014

I. DESCRIPTION

This work shall consist of dynamic testing of piles by the use of electronic monitoring equipment, reprocessing the data and furnishing a written report of the results.

II. EQUIPMENT

All equipment necessary for the dynamic monitoring such as gages, cables, etc. shall be furnished by the Dynamic Testing Consultant. The equipment shall conform to the requirements of ASTM-4945-08, Standard Test Method for High Strain Dynamic Testing of Piles.

III. PERSONNEL

The Contractor shall employ a Dynamic Testing Consultant to install or supervise the installation of the necessary equipment, to perform the dynamic monitoring and to prepare the Dynamic Testing Report.

The dynamic monitoring operator shall have a minimum of two years experience, at least one of which shall have been in data acquisition from high strain dynamic pile testing and successful performance on at least two projects in similar geotechnical conditions, or who has a Certificate of Testing: Basic Level or better on the Foundation QA Examination for Providers of Pile Dynamic Analyzer (PDA) Testing Services.

The Dynamic Pile Testing Report shall be prepared by a Registered Professional Engineer with a minimum of five years experience, at least two of which shall have been in data interpretation from high strain dynamic pile testing and successful completion of at least five projects in similar geotechnical conditions, or who has a Certificate of Interpretation: Advanced Level or better on the Foundation QA Examination for Providers of PDA Testing Services.

IV. TESTING

Dynamic testing shall be conducted in the presence of the Engineer and during the entire time piles are initially driven or redriven and during pile restrrike testing.

The Contractor shall notify the Engineer of the date and time for dynamic testing at least 48 hours prior to testing. Such notice shall be given during the normal work hours of the Department. If additional dynamic testing is ordered by the Engineer, the Contractor shall schedule the tests in cooperation with the availability of the Engineer.

Where possible, splices to the pile(s) shall be made prior to the start of driving so that dynamic testing can be performed without interruption.

The Contractor shall fasten a pair of transducers and a pair of accelerometers in place prior to testing. Piles shall be driven until the soil resistance measured is equal to or greater than the Nominal Pile Resistance as measured during driving shown on the plans and the required minimum tip elevation and penetration have been obtained or as directed by the plans, approved

wave equation analysis or as approved by the Engineer. The Contractor shall remove the transducers and accelerometers after the dynamic testing is completed.

All signals resulting from initial testing and any restrike testing shall be recorded and made available upon the request of the Engineer.

V. REPORTS

If requested by the Engineer, the following information shall be provided within 24 hours after completion of the testing: for each blow from the Dynamic Driving Records provide the Depth, Maximum Transferred Energy, Blows per Minute (include strokes, fuel settings, bounce chamber pressures, etc. as applicable), Maximum Tensile Stress, Maximum Compressive Stress and Pile Capacity.

The Contractor shall furnish the Engineer a Dynamic Pile Testing Report with the production pile order list.

The Dynamic Pile Testing Report shall include the following information for each pile tested:

Project identification and location

Location of test,

Date of test,

Description of the subsurface soil condition including log of nearest boring

Description of the test pile

Description of pile installation equipment, the lead type and any special installation equipment

Description of dynamic testing equipment, including model and software version(s) utilized in obtaining, evaluating and reporting dynamic data.

A copy of the Pile Driving Record

Pile Installation Details and Comments

Discussion of the hammer performance

Discussion of pile integrity

For at least every fifth blow from the Dynamic Driving Records: the Depth, Maximum Transferred Energy, Blows per Minute (including strokes, fuel settings, bounce chamber pressures, etc. as applicable), Maximum Tensile and Compressive Stress and Pile Capacity

A graphical presentation of the following: Pile Penetration versus Maximum Transferred Energy, Maximum Compressive Stress, Maximum Tension Stress and Mobilized Pile Capacity

The results from a signal-matching program that estimates static soil resistance and simulates static load test results including Mobilized Pile Capacity for the shaft and toe with the associated parameters used in the estimation

A summary tabulation of the following information: Pile Location and Designation, Date Driven, Pile Tip Elevation, Visual Blow Count Rate, Transferred Energy, Hammer Efficiency, Maximum Driving Stresses, Dynamic Testing Mobilized Pile Capacity, Signal-Matched Mobilized Pile Capacity for Shaft, Toe and Combined.

Recommendations for production pile driving criteria based on the results of the testing program. Driving criteria shall include: blow count to obtain the required Mobilized Pile Capacity (include: stroke(s), fuel setting(s), bounce chamber pressure(s), etc. as applicable), criteria for controlling driving stresses in the pile including maximum allowable hammer stroke to control driving stresses in the pile and criteria for terminating driving in the event of high blow count before reaching the approved tip elevation. Pile driving criteria shall be approved by the Engineer.

IV. MEASUREMENT AND PAYMENT

Dynamic pile testing (End Bearing) will be measured and paid for at the contract unit price per each, which price shall be full compensation for providing all services of the testing consultant and dynamic monitoring operator as specified herein including providing, installing, monitoring and removing the dynamic testing equipment, for providing the data and preparing the written documentation specified, and for all tools, labor, materials, and incidentals necessary to complete the work.

Payment will be made under:

Pay Item	Pay Unit
Dynamic Pile Test (End Bearing)	Each

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
WAVE EQUATION ANALYSIS (LRFD)

February 7, 2014

SECTION 403.06 (d) 1. and 2. of the Specifications is replaced by the following:

Pile driving equipment furnishing by the Contractor shall be subject to the approval of the Engineer.

Prior to driving test piles, the Contractor shall furnish the Engineer the following information pertaining to the proposed pile driving equipment:

1. Completed Pile and Driving Equipment Data Form for each proposed pile hammer and pile type combination (Attachment 1).
2. At each driving test location, where different subsurface conditions exist, the Contractor shall furnish a Wave Equation Analysis of pile driving performed by a Professional Engineer experienced in such work, demonstrating that the piles can be driven with reasonable effort to the required penetration, length and capacity without damage. This analysis shall include the following:

Copies of computer input and output sheets and graphs showing soil resistance versus blow count as well as maximum tensile and compressive stresses versus blow count. Analyses shall be run at the estimated tip elevation as well as other higher elevations to define maximum stress levels in the pile during driving or a drivability analysis can be performed.

The Contractor shall use a hammer of suitable size and type for the indicated pile and subsurface conditions at the structure site. Unless documentation supporting other values can be provided, the following hammer efficiencies shall be used in a wave equation analysis:

<u>Hammer Type</u>	<u>Efficiency in Percent</u>
Single acting air/steam	67
Double acting air/steam	50
Diesel	80
Hydraulic	90

The criteria which the Engineer will use to evaluate the driving equipment will include both the required number of hammer blows per inch and the pile stresses at the required Nominal Pile Resistance as measured during driving. The required number of hammer blows indicated by calculations at the required Nominal Pile Resistance as measured during driving shall be a maximum of 6 per inch for the driving equipment to be acceptable and shall be on the rising (or linear) portion of the resistance versus blow count curve.

Should the Wave Equation Analysis indicate the possibility of excessive driving stresses, the Contractor shall submit to the Engineer proposed corrective measures (modification of hammer stroke or other appropriate action) for approval.

Soil setup (pile freeze effect) may be considered when establishing initial driving criteria. If soil setup is considered, two wave equation analyses, one modeling the end of initial drive conditions and the second modeling the beginning of restrike conditions, must be performed. In lieu of performing the two additional wave equation analyses, a pile drivability analysis may be performed when considering

soil setup. However, hammers requiring the consideration of soil setup for approval may require restrikes of the driving test piles, at the Contractors expense, for verification purposes.

Contractor notification of acceptance or rejection of pile driving equipment will be made within 20 days of receipt of the data form and Wave Equation Analysis.

After the driving test piles have been installed, if initial parameters selected are judged to be inappropriate, the Contractor may be required to submit a refined wave equation analysis along with the pile order list. The refined analysis shall include any modifications or changes deemed appropriate from the results of any Dynamic Pile Testing and/or pile load test that are required to be performed.

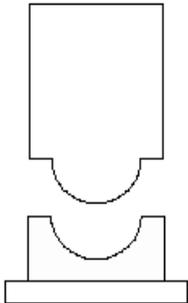
The Engineer will determine driving resistance criteria and/or minimum tip elevations to be used for production piles from the above information.

During production pile driving operations, the Contractor shall use the approved system. Any change in the driving system will only be considered after the Contractor has submitted revised pile driving equipment data and wave equation analysis.

Approval of pile driving equipment shall not relieve the Contractor of the responsibility to drive piles, free of damage, to the bearing and tip elevation shown on the plans, specified in the special provisions, or mandated by the Engineer. In addition, approval of pile driving equipment relative to driving stress damage shall not relieve the Contractor of responsibility for piles damaged because of misalignment of the leads, failure of capblock or cushion material, failure of splices, malfunctioning of the pile hammer, or other improper construction methods.

VIRGINIA DEPARTMENT OF TRANSPORTATION
PILE AND DRIVING EQUIPMENT DATA FORM

Project: _____
Pile Driving Contractor Or Subcontractor (Driven by): _____



HAMMER Manufacture: _____ Model: _____
Type: _____
Rated Energy: _____ @ _____ Length of Stroke
Modifications: _____

RAM Ram Mass: _____

ANVIL OR BASE Mass: _____



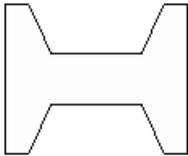
STRIKER PLATE Material: _____
Thickness: _____ Area: _____
Modulus of Elasticity - E: _____ (p.s.i.)
Coefficient of Restitution: _____



CAP BLOCK Material: _____
Thickness: _____ Area: _____
Modulus of Elasticity - E: _____ (p.s.i.)
Coefficient of Restitution: _____



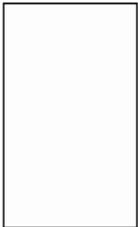
PILE CAP Helmet _____ Mass: _____
Bonnet _____ Materials: _____
Anvil Block _____
Remarks: _____
Drive head _____
Accessories _____



CUSHION Cushion Material: _____
Thickness: _____ Area: _____
Modulus of Elasticity - E: _____ (p.s.i.)
Coefficient of Restitution: _____



PILE Type: _____
Pile Size: _____ Length: _____ Diameter: _____
Cross Sectional Area: _____
Material: _____ Mass/m: _____
Nominal Pile Resistance _____ (tons)
Description of Splice: _____



Tip Treatment Description: _____

Remarks: _____

Submitted By: _____ Date: _____
Company: _____ Phone: _____

Cc: District Bridge Engineer
State Bridge Engineer
Construction Manager

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 404—HYDRAULIC CEMENT CONCRETE OPERATIONS

SECTION 404—HYDRAULIC CEMENT CONCRETE OPERATIONS of the Specifications is amended as follows:

Section 404.02(e) Prestressed concrete deck panels is deleted.

Section 404.03(a) Forms is amended to replace the first paragraph with the following:

- (a) **Forms:** On concrete beam bridges, the Contractor shall have the option of using corrugated metal bridge deck forms or wood forms to form that portion of bridge decks between beams unless otherwise specified on the plans. On steel beam bridges, the Contractor shall have the option of using corrugated metal bridge deck forms or wood forms to form that portion of bridge decks between beams or girders unless otherwise specified on the plans. However, corrugated metal forms shall not be used to form overhangs or portions of slabs where a longitudinal joint occurs between beams or girders.

The Contractor shall submit calculations and layout details of the overhang supports and formwork, including fabrication and erection details, to the Engineer for review in accordance with the requirements of Section 105.10. Overhang formwork details shall be signed and sealed by a Professional Engineer, holding a valid license to practice engineering in the Commonwealth of Virginia.

Section 404.03(a)2 Prestressed deck panel forms is deleted.

Section 404.03(j) Removing Formwork and Forming for and Placing Superimposed Elements is amended to replace “1. **Formwork**” with the following:

1. **Formwork** may be removed as follows:
 - a. **Side forms or elements not immediately subjected to loading** (for example: footings and walls or columns with height to width ratios less than 10:1 [$h/w < 10:1$]): 48 hours or 30 percent concrete strength (f'_c). For the purposes herein, width will be considered the narrowest portion of the element measured horizontally across its surface.

The time period noted for form removal shall begin at the completion of the concrete placement and is exclusive of hours when any portion of the surface of the concrete element is below 40 degrees F.
 - b. **All other elements** (for example: soffits of pile caps, bent caps and pier caps): 60 percent concrete strength (f'_c).

Section 404.04—Bridge Deck Construction of the Specifications is amended to replace the first paragraph with the following:

Prior to the beginning of deck placement, screeds shall be approved by the Engineer. Fogging or misting devices attached to the screed shall not be permitted. No fogging or misting above concrete shall be permitted prior to the screeding operation. Fogging or misting shall only be

permitted immediately after the screeding operation and any hand-finishing that has been completed to the concrete surface, and prior to applying the wet-curing mechanism.

Section 404.08—Measurement and Payment is amended to replace the second paragraph with the following:

The volume of bridge deck slab concrete allowed for payment will be computed using the actual thickness of the slab, not to exceed the plan thickness plus 1/2 inch, for the area between faces of sidewalks, curb lines, railings, or parapets. The area beneath sidewalks, curbs, railings, or parapets will be based on the plan thickness.

Section 404.08—Measurement and Payment is amended to replace the fourth paragraph with the following:

If corrugated metal bridge deck forms are used in lieu of removable forms, the price for concrete shall include furnishing and placing metal forms, additional concrete required to fill corrugations, work necessary to facilitate inspection of the underside of the deck, repairing deficiencies, and strengthening beams or girders to maintain the design live-load rating of the bridge.

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 405—PRESTRESSED CONCRETE

SECTION 405—PRESTRESSED CONCRETE of the Specifications is amended as follows:

Section 405.02(a) Concrete is amended to replace 3. with the following:

3. Fully or partially embedded attachments to the prestressed concrete members required for supporting forms shall be galvanized in accordance with Section 233 of the Specifications.

Section 405.03—Plant Review is amended to replace the first paragraph with the following:

Plants that manufacture precast, prestressed concrete elements shall have PCI certification for applicable product groups and categories except that plants supplying only piles will not be required to be certified. PCI inspection reports shall be on file at the plant and available for review by the Department. Plants that have not previously produced products for the Department will be inspected by the Engineer prior to commencement of production. The Contractor shall provide suitable office space for use by the Engineer's representatives.

Section 405.05(e) Finishing is amended to delete the fifth paragraph.

Section 405.05 (h) Handling, Storing, and Erecting is amended to replace the fourth paragraph with the following:

Lifting and support points for units other than piles shall be as shown on the plans or not less than 6 inches or more than 2/3 of the depth of the unit from the end of the unit. Piles shall be supported and lifted at points shown on the plans. The Contractor shall be responsible for the design and safety of the lifting device used.

Section 405.05(h) Handling, Storing and Erecting is amended to add the following:

Continuity diaphragms for prestressed beams shall not be cast until at least 90 days after the strands in the beams have been detensioned.

Section 405.06(c) Prestressed Deck Panels is deleted.

Section 405.07—Measurement and Payment is amended to delete the "Prestressed concrete panels" paragraph, pay item and pay unit.

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS**SUPPLEMENTAL SECTION 406—REINFORCING STEEL**

SECTION 406—REINFORCING STEEL is completely replaced by the following:

406.01—Description

This work shall consist of furnishing; coating, if required; and placing reinforcing steel or wire mesh used in concrete operations, except prestressed strands and wires, in accordance with these specifications and in conformity to the lines and details shown on the plans.

406.02—Materials

- (a) **Steel used for reinforcement** shall conform to the requirements of Section 223 of the Specifications. Except for spiral bars, bars more than 1/4 inch in diameter shall be deformed bars.
- (b) **Welded wire fabric** shall conform to the requirements of Section 223 of the Specifications.
- (c) **Bar mat reinforcement** shall conform to the requirements of Section 223 of the Specifications.
- (d) **Corrosion resistant steel used for reinforcement** shall conform to the requirements of Section 223 of the Specifications.

406.03—Procedures

- (a) **Order Lists and Bending Diagrams:** Copies of order lists and bending diagrams shall be furnished the Engineer when required.
- (b) **Protecting Material:** Reinforcing steel shall be stored on platforms, skids, or other supports that will keep the steel above ground, well drained, and protected against deformation.

When placed in the work, steel reinforcement shall be free from dirt, paint, oil, or other foreign substances. Steel reinforcement with rust or mill scale will be permitted provided samples wire brushed by hand conform to the requirements for weight and height of deformation.

- (c) **Fabrication:** Bent bar reinforcement shall be cold bent to the shape shown on the plans. Fabrication shall be in accordance with the requirements of the *Manual of Standard Practice for Detailing Reinforced Concrete Structures* (ACI 315).

Spiral bars shall be fabricated to have the proper diameter when placed in position at the pitch shown on the plans. Each end of a spiral bar shall have 1 1/2 finishing turns at each end in a plane perpendicular to the axis of the spiral.

- (d) **Placing and Fastening:** Steel reinforcement shall be firmly held during the placing and setting of concrete. Bars, except those to be placed in vertical mats, shall be tied at every intersection where the spacing is more than 12 inches in any direction. Bars in vertical mats and in other mats where the spacing is 12 inches or less in each direction shall be tied at every intersection or at alternate intersections provided such alternate ties accurately maintain the position of steel reinforcement during the placing and setting of concrete.

Tie wires used with corrosion resistant reinforcing steel shall be solid stainless or plastic coated.

The minimum clear distance from the face of the concrete to any reinforcing bar shall be maintained as specified herein. In superstructures, the cover shall be at least 2 1/2 inches except as follows:

1. **Bottom of slab:** 1 1/4 inches.
2. **Stirrups and ties in T-beams:** 1 1/2 inches.
3. **Rails, rail posts, curbs, and parapets:** 1 inch.

In substructures, the cover shall be at least 3 inches except as follows:

1. **Abutment neat work and pier caps:** 2 1/2 inches.
2. **Spirals and ties:** 2 inches.

In corrosive or marine environments or under other severe exposure conditions, the minimum cover shall be increased 1 inch. Bars that must be positioned by maintaining clearances from more than one face shall be centered so that clearances indicated by the plan dimension of bars are equalized.

Bars shall be placed so that the concrete cover as indicated on the plans will be maintained within a tolerance of 0 to +1/2 inch in the finally cast concrete.

Where anchor bolts interfere with reinforcing steel, the steel position shall be adjusted without cutting to permit placing anchors in their proper locations.

Reinforcement in bridge deck slabs and slab spans shall be supported by standard CRSI metal or precast concrete bar supports. Bar supports shall be spaced as recommended by CRSI but not more than 4 feet apart transversely or longitudinally. Precast concrete supports shall be less than 1 foot in length and staggered so as not to form a continuous line. The lower mat of steel reinforcement shall be supported by a bolster block or individual bar chair supports, and the upper mat shall be supported by high chair supports. Bar supports shall be firmly stabilized so as not to displace under construction activities. Reinforcing bar supports (Standees) may be used for the top mat of steel of simple slab spans provided they hold the reinforcing steel to the requirements specified herein and are firmly tied to the lower mat to prevent slippage. The use of standees will not be permitted for the top mat of steel on any continuous slab spans.

Precast concrete bar supports shall have a 28-day design compressive strength of at least 4,500 pounds per square inch and shall be from the Department's list of approved products for the use specified. Supports shall be furnished with plastic ties or shaped to prevent slippage from beneath the reinforcing bar. Metal bar supports shall be fabricated from one of the following: (1) stainless steel wire conforming to the requirements of ASTM A493, or (2) cold-drawn wire protected by plastic coating conforming to CRSI standards, or other protective coating as approved by the Engineer.

In reinforced concrete sections other than bridge slabs, the specified clear distance from the face of concrete to any reinforcing bar and the specified spacing between bars shall be maintained by means of approved types of stays, ties, hangers, or other supports. The use of pieces of gravel, stone, brick, concrete, metal pipe, or wooden blocks will not be permitted as supports or spacers for reinforcing steel. The use of precast concrete block supports will be permitted provided blocks are furnished in correct thicknesses and are shaped or tied to prevent slippage from

beneath reinforcing bars. The clear distance between bars shall be at least 1 1/2 times the specified maximum size of coarse aggregate but not less than 1 1/2 inches. Before concrete is placed, reinforcing steel will be inspected and approved for proper position and the adequacy of the method for maintaining position.

- (e) **Splicing and Lapping:** Reinforcement shall be furnished in full lengths as indicated on the plans. Except where shown on the plans, splicing bars will not be permitted without the written approval of the Engineer. Splices shall be as far apart as possible.

In lapped splices, bars shall be placed in contact and wired together. Lap lengths shall be as indicated on the plans. When reinforcing bars cannot be fabricated with the lengths shown on the plans, the bars may be lapped at no additional cost to the Department. Lap lengths shall be in accordance with the *AASHTO LRFD Bridge Design Specifications*.

Mechanical butt splicing will be permitted at locations shown on the plans. The mechanical connection shall develop in tension or compression, as required, 125 percent of the specified yield strength of the bar. The total slip of the bar within the splice sleeve of the connector after loading in tension to 30.0 ksi and relaxing to 3.0 ksi shall not exceed the following measured displacements between the gage points clear of the splice sleeve:

For bar sizes up to No. 14: 0.01 inch
For No. 18 bars: 0.03 inch

For corrosion resistant reinforcing bars, mechanical butt splicers shall be of the same material as the bars being spliced except for stainless clad bars for which the splicers shall be stainless steel.

Reinforcing steel shall be welded only if specified on the plans. Welding shall be in accordance with the requirements of Section 407.04(a) of the Specifications. Reinforcing steel conforming to ASTM A615 Grade 60 shall not be welded. Corrosion resistant reinforcing steels shall not be welded.

Lap lengths for welded wire fabric or bar mat reinforcement shall be in accordance with the current *AASHTO LRFD Bridge Design Specifications*.

406.04—Measurement and Payment

Reinforcing steel will be measured in pounds of steel placed in the structure as shown on the plans. The weight of **welded wire fabric** will be computed from the theoretical weight per square yard placed, including allowance for laps not to exceed 8 percent of the net area. Reinforcing steel or welded wire fabric will be paid for at the contract unit price per pound. These prices shall include furnishing, fabricating, and placing reinforcement in the structure. In structures of reinforced concrete where there are no structural steel contract items, expansion joints, plates, rockers, bolts, and similar minor metal parts will be paid for at the contract unit price for reinforcement.

Corrosion resistant reinforcing steel, when a pay item, will be measured in pounds and paid for at the contract unit price per pound of the designated type of steel indicated and placed in the structure in the location(s) shown on the plans. This price shall include fabricating, shipping, furnishing and placement.

No payment will be made for fastening devices that may be used by the Contractor for keeping reinforcing bars in their correct position. When the substitution of larger bars than those specified is allowed, payment will be made for only the amount of metal that would have been required if the specified size of bar had been used. When full-length bars are shown on the plans and the Contractor

obtains approval to use short bars for his convenience, the weight paid for will be based on the full-length dimensions with no allowance made for splices.

Payment will be made under:

Pay Item	Pay Unit
Reinforcing steel	Pound
Welded wire fabric	Pound
Corrosion resistant reinforcing steel, Class I	Pound
Corrosion resistant reinforcing steel, Class II	Pound
Corrosion resistant reinforcing steel, Class III	Pound

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 408—BEARING DEVICES AND ANCHORS

SECTION 408—BEARING DEVICES AND ANCHORS of the Specifications is amended as follows:

Section 408.04—Measurement and Payment is amended to replace the first paragraph with the following:

Metal bearing and expansion plates and anchors will be measured by shop scales in pounds of actual material placed in accordance with the plans. When not a separate pay item, the Department will include the weights of plates and anchors in the weight of structural steel or reinforcing steel for payment. When a pay item, bearing plates will be paid for at the contract unit price per pound and shall include elastomeric and other flexible bearing pads. The cost of bedding and preparation for metal bearing plates shall be included in the prices for superstructure items. This price shall include furnishing material, galvanizing, painting, and lubricating.

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS**SUPPLEMENTAL SECTION 413—DISMANTLING AND REMOVING EXISTING STRUCTURES OR
REMOVING PORTIONS OF EXISTING STRUCTURES**

SECTION 413—DISMANTLING AND REMOVING EXISTING STRUCTURES OR REMOVING PORTIONS OF EXISTING STRUCTURES of the Specifications is amended as follows:

Section 413.02(b) Removing Portion of Existing Structure is replaced with the following:

- (b) **Removing Portion of Existing Structure:** The portions to be removed shall be the areas designated on the plans. No portion of the structure shall be removed by blasting or other methods that may damage any portion of the structure that will remain in place. When pneumatic hammers are used to remove concrete, the weight of the hammer alone shall be not more than a nominal 90 pounds for widening work or a nominal 35 pounds for deck repair work. The use of tractor-mounted demolition hammers with a maximum manufacturer's rated striking energy of 1,000 foot-pounds will be permitted for the removal of concrete parapets down to the top of deck and for that portion of the deck where the reinforcing steel will be removed. The use of tractor-mounted demolition hammers or pneumatic hammers weighing more than a nominal 35 pounds shall not be allowed for the removal of that portion of the deck that is within 6 inches of the top flange of the beams/girders to remain in the structure. With the written approval of the Engineer, hydraulically actuated, jaw type, concrete crushers may be used for the removal of concrete parapets down to the top of the deck. The approval of hydraulically actuated, jaw type, concrete crushers shall be contingent upon continuous satisfactory results with no damage to any portion of the structure that is to remain in place. The removal of concrete parapet on prestressed concrete slab spans or prestressed concrete box beam spans shall be limited to nominal 35-pound pneumatic hammers within 2 inches of the deck and not more than nominal 90-pound pneumatic hammers for the remainder of the parapet unless otherwise approved by the Engineer.

Disturbed areas shall be uniformly graded to natural ground contours in a manner that will facilitate drainage and prevent impoundment of water.

Materials or portions of existing structures removed shall be handled in accordance with the requirements of (a)1. herein.

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 414—RIPRAP

SECTION 414—RIPRAP of the Specifications is amended as follows:

Section 414.04—Measurement and Payment is amended to replace the ninth and tenth paragraphs with the following:

Riprap will be paid for at the contract unit price. This price shall include furnishing and placing riprap, including welded wire fabric, mortar, or grout; excavation; and riprap bedding. These prices shall include geotextile bedding material when required. The price bid shall include preparing the surface, furnishing and installing geotextile bedding material, overlaps, repair work, and excavating and backfilling toe-ins.

(c512I00-1012) **TYPE III BARRICADE** — Type III barricades specified in this contract shall refer to the Type 3 barricades in the 2011 edition of the *Virginia Work Area Protection Manual*, the 2009 edition of the *MUTCD* and the current *Virginia Supplement to the MUTCD*. Materials, procedures, measurement and payment for the Type 3 barricades specified in these publications shall be in accordance with the Type III barricades specified in this contract.

10-3-12 (SPCN)

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
CG-12 DETECTABLE WARNING SURFACE

September 18, 2013

I. DESCRIPTION

This work shall consist of providing all labor, tools, equipment, and materials required to furnish and install detectable warning surfaces in the location(s) specified on the plans or in the proposal. The Contractor shall perform the work according to the details shown on the plans or in this special provision, Section 504 of the Specifications, and as directed by the Engineer.

II. MATERIALS

Materials shall conform to the requirements of Section 504 of the Specifications except as follows:

Permanent, durable materials suitable for heavy traffic outdoor areas or concrete pavers approved by the Department may be used to construct the detectable warning surfaces where called for in the plans and other contract documents. Concrete paver units shall conform to the current ASTM C936 specifications and the details and requirements shown in the plans. Other durable materials shall be in accordance with Department approved manufacturer's design and specification requirements.

Products not on the Departments Materials Approved Product list shall be submitted to the Standards & Special Design Section and the appropriate District Materials Engineer for approval prior to use.

All detectable warning surfaces shall meet the ADA Standards as set forth by the United States Access Board.

The detectable warning shall be "safety yellow" unless otherwise noted in the plans or directed by the Engineer.

When visual contrast other than "safety yellow" is specified in the plans or contract documents, the *detectable warning* surfaces shall contrast visually with adjacent walking surfaces either light-on-dark, or dark-on-light. Verification of visual contrast is required prior to installation.

III. PROCEDURES

Construct sidewalk ramp according to Section 504 of the Specifications except for detectable warning/truncated domes that shall be furnished or constructed in accordance with the details in this specification, the manufacturer's recommendations, the Standard Drawings and the Plans.

All permanent installations of detectable warning surfaces shall be "wet set" in freshly placed concrete.

Surface mounted detectable warning surfaces are permitted only for temporary installations where the detectable warning will be in service 6 months or less.

The Contractor shall provide the Department with the manufacturers installation instructions.

IV. MEASUREMENT AND PAYMENT

CG-12 Detectable Warning Surface will be measured in square yards and paid for at the contract unit price per square yard, complete-in-place. This price shall be full compensation for furnishing and installing approved truncated dome finished materials including but not limited to concrete pavers, other Department approved materials, integral visual contrast, dowels and all other labor, tools, equipment, materials and incidentals necessary to fully complete the work.

Payment will be made under:

Pay Item	Pay Unit
CG-12 Detectable Warning Surface	Square yard

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
WORK ZONE TRAFFIC CONTROL MANAGEMENT

January 14, 2008

I. GENERAL DESCRIPTION

This work shall consist of providing work zone traffic control management in strict compliance with the contract, plans, specifications, the Virginia Work Area Protection Manual and the Manual on Uniform Traffic Control Devices (MUTCD), including supervision of personnel and the installation, inspection, and maintenance of all traffic control devices on the project.

II. REQUIREMENTS

The Contractor shall assign a traffic control supervisor (TCS) to provide work zone traffic control management for the project. If the Contractor assigns more than one TCS to provide work zone traffic control management, a weekly schedule identifying who will be in charge of providing work zone traffic control management on a daily basis shall be submitted to the VDOT Area Construction Engineer by the Contractor.

The TCS shall have a set of traffic control plans and a copy of the edition of the Virginia Work Area Protection Manual specified on the plan sheet or in the contract readily available at all times.

A. Certification

Prior to commencing work requiring work zone traffic control management, the Contractor shall submit to the Area Construction Engineer a valid copy of the Traffic Control Supervisor certificate (wallet size card) issued by the American Traffic Safety Services Association (ATSSA), or another similarly accredited agency or firm approved by the Department.

The Department will accept the certification by ATSSA or any approved agency or firm only if all of the following minimum requirements are met:

1. Successful completion of an Intermediate or Advanced work zone traffic control training course approved by the Department.
2. Passing a written examination given by the agency or firm on the approved work zone traffic control training course.
3. A minimum of two years full-time field experience in work zone traffic control. The experience may be verified by the Department at its discretion.

The TCS certification shall be renewed every four years by the TCS taking and passing a recertification test. The recertification test shall be taken through ATSSA or an agency or firm approved by the Department. Recertification shall be done in the fourth year prior to the expiration date.

B. Duties

The TCS's main responsibility shall be work zone traffic control management. The TCS may have other assigned duties on the project as approved in writing by the Area Construction Engineer. The following is a listing of the TCS's primary duties:

1. The TCS(s) shall personally provide work zone traffic control management and supervision services at the project site.
2. The TCS(s) shall coordinate the training of flagging and signing personnel.
3. The TCS(s) shall supervise the flagging and signing personnel.
4. The TCS(s) shall coordinate all work zone traffic control operations for the duration of the contract, including those of subcontractors, utility companies, and suppliers, to ensure that all work zone traffic control is in place and fully operational prior to the commencement of any work.

The Department recognizes that the Contractor does not have direct control over the work zone traffic control operations of the utility companies. The coordination provided by the TCS when dealing with utility companies is for the purpose of coordinating concurrent utility work zone traffic control with any other construction/maintenance work zone traffic control to avoid conflicts.

5. The TCS(s) shall perform daily reviews of work zone traffic control when work activities are underway and document in the work zone traffic control daily diary activities taking place and any deviation from the traffic control plan, length and timing and mitigation of excessive traffic queues, and instances or conflicts or problems with the work zone traffic control and corrective actions taken. In addition, the TCS(s) shall perform weekly reviews of the work zone traffic control and document in detail using Forms TE-97001 and 97002. Every other detailed weekly review shall be performed during nighttime hours or as directed by the Area Construction Engineer.

The TCS shall inspect traffic control devices in use for compliance with the ATSSA Quality Standards for Work Zone Traffic Control Devices, the Road and Bridge Specifications, and the Virginia Work Area Protection Manual. The TCS shall provide for the immediate repair, cleaning, or replacement of traffic control devices not functioning as required to ensure the safety of the motorists and construction personnel.

The traffic control devices shall be inspected by the TCS during working and nonworking hours on a schedule approved in writing by the Area Construction Engineer, but as a minimum at the beginning and end of each work day or night and once during non-working weekends and holidays, and daily on restricted days due to inclement weather or during any work shutdown.

Traffic control devices in use longer than fourteen (14) days shall be inspected by the TCS at least once every other week during nighttime periods.

6. The TCS(s) shall prepare and submit statements concerning road closures, delays, and other project activities to the District Public Affairs office as required.
7. The TCS(s) shall be responsible for notifying the VDOT project Maintenance of Traffic (MOT) Coordinator or designee, of all accidents related to the project traffic control. The time and date of notification shall be documented in the daily diary.

8. The TCS(s) assigned to the project shall attend the preconstruction conference and any other meeting which involves traffic control.
9. The TCS(s) shall be responsible for the maintenance, cleanliness, and replacement of traffic control devices of the existing traffic control plan during working and non-working hours.

C. Documentation - Traffic Control Diary

The TCS shall maintain a project work zone traffic control diary in a bound book. The Contractor shall provide a sufficient number of diaries for his or her use.

The TCS shall keep the work zone traffic control diary current on a daily basis, and shall sign each daily entry. Entries shall be made in ink in a format approved by the Area Construction Engineer, and there shall be no erasures or white-outs. Incorrect entries shall be struck out and then replaced with the correct entry. Photographs may be used to supplement the written text.

The work zone traffic control diary shall, at all times, be available for inspection by the VDOT Maintenance of Traffic Coordinator and a copy of the diary shall be submitted to the MOT Coordinator on a weekly basis.

The work zone traffic control diary(s) shall become the property of the Department at the completion of the project. Failure to submit the diary shall result in the withholding of final payment until the diary(s) is submitted.

D. Availability of TCS

Traffic control management shall be provided under the supervision and direction of the TCS on a 24-hour-per-day basis throughout the duration of the project.

The TCS shall be available on every working day—on call at all times—and available upon the Area Construction Engineer's request during normal working hours and during other than normal working hours in the case of emergency. The provisions for availability of the TCS shall also be met during times of partial or full project suspension. Contact telephone numbers for the TCS(s) shall be provided to Department project personnel, the Area Construction Engineer, the Residency Administrator, and the region Smart Traffic Center prior to the Contractor commencing work requiring work zone traffic control management.

E. Failure to Comply

The Area Construction Engineer may suspend all or part of the Contractor's operation(s) for failure to comply with the approved "Traffic Control Plan" or failure to correct unsafe traffic conditions within 24 hours for critical items and 72 hours for non-critical items after such notification is given to the Contractor in writing.

In the event that the Contractor does not take appropriate action to bring the deficient work zone traffic control into compliance with the approved traffic control plan or fails to correct the unsafe traffic conditions, the Department may proceed with the corrective action using its own forces, equipment, and material to maintain the project and such costs, plus 25 percent for supervisory and administrative personnel, will be deducted from the money owed to the Contractor for the project.

The Contractor shall not be relieved of the responsibility to provide work zone traffic control safety to the traveling public when a project is under full or partial suspension.

When a project is under suspension due to the Contractor's failure to comply with this section, or when the contract is under liquidated damages, the Contractor shall continue to provide work zone traffic control management and no additional measurement or payment will be made.

If suspensions or partial suspensions are requested by the Contractor, the additional work zone traffic control management costs will be at the Contractor's expense.

III. MEASUREMENT AND PAYMENT

Work Zone Traffic Control Management will be paid for at the contract lump sum price. This price shall be full compensation for furnishing 24 hour services as specified, including preparing and furnishing Work Zone Traffic Control diaries.

When work zone traffic control management is paid for by the lump sum, monthly partial payments for work zone traffic control management will be made on a pro rata basis for the estimate period being vouchered for payment.

In the event the contract time is authorized to be extended in accordance with the provisions of Section 108.04 of the Specifications, the provisions of Section 104.02 of the Specifications will not apply. The payment for this item will be compensated on a daily basis by dividing the original lump sum bid amount by the number of calendar days in the original contract time and the resultant daily dollar value assigned to this item.

Payment will be made under:

Pay Item	Pay Unit
Work Zone Traffic Control Management	Lump Sum

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
COLD PLANING (MILLING) ASPHALT CONCRETE OPERATIONS

October 1, 2012

I. DESCRIPTION

This provision shall govern cold planing (milling) asphalt concrete operations in preparation for pavement repair and/or pavement overlay. Cold planing or milling of asphalt concrete pavement shall be performed according to Section 515 of the Specifications and the requirements herein.

II. GENERAL PROCEDURES

The Contractor is permitted to perform either regular pavement planing or performance pavement planing to the contract specified depth or as directed by the Engineer in order to provide a uniform sound substrate prior to paving roadways designated in the schedules according to Section 315, the requirements herein or elsewhere in the Contract documents.

When the Contractor elects to performance plane on roadways specified to be planed to a depth of 2 inches or less, the Contractor shall performance plane only that amount of pavement which can be paved back within 14 calendar days of completion of planing the roadway or portion of roadway. The Contractor is required to perform pavement surface testing as specified in Section 515.04 of the Specifications to verify he has achieved the acceptable surface texture specified in that Section prior to opening the performance planed surface to traffic. The additional traffic control devices and signage required for the 14 calendar day pave back operation allowance for performance planing operations versus the traffic control devices required for 96 hour pave back operations for regular pavement planing operations shall be at the Contractor's expense.

Limitations of operations for planing shall be performed according to the requirements of Section 108.02 of the Specifications, other Contract specific requirements and as specified herein.

Where appropriate according to contract requirements and site specific conditions, the existing asphalt concrete layers shall be planed to permit the transition of the top course of the asphalt concrete overlay according to the details of the ACOT-1 Standard. Any sub-courses termination may be notched into the existing pavement or blended with the next course of pavement.

The Contractor will not be permitted to plane a portion of the width of a travel lane, ramp, loop or shoulder and leave it unpaved and open to traffic. Abutting shoulders may also be planed during single and multiple lane planing operations. Planing operations shall be planned and performed to maintain positive drainage according to the requirements of Section 315.05(c) of the Specifications.

Where the depth of planing designated in the Contract or directed by the Engineer is 2 inches or less, the Contractor shall have the option of planing the abutting lane or shoulder on alternate days or squaring up the planing operation at the end of each work shift. However, abutting lanes or shoulders shall be planed and squared up regardless of planing depth prior to holidays or any temporary shutdowns.

In the event an emergency or an unforeseen circumstance such as equipment failure or breakdown occurs during the Contractor's operations and such emergency or unforeseen

circumstance within his control prevents the Contractor from squaring up the planed surface on adjacent lanes prior to a holiday or temporary shutdown, any additional signage, traffic control devices or temporary markings or markers required to protect the traveling public shall be the Contractor's responsibility and at his expense.

Where the depth of planing designated in the Contract or directed by the Engineer is greater than 2 inches in the Contract documents, the Contractor shall square up the planing operation at the end of each workday or plane adjacent lanes including abutting shoulders within the same day for the length of that day's planing operation.

Where uneven pavement joints exist either transversely or longitudinally at the edges of travel lanes, the Contractor shall provide advance warning signage and traffic control devices to inform the traveling public according to the details provided in the Contract for the scope of operation he is performing. The cost for such advance warning signage and traffic control devices shall be included in the cost of other appropriate items.

III. ROADWAY CLASSIFICATION LIMITATIONS

The following restrictions, based on the type of roadway, shall apply:

A. Roadways with Posted Speed Limit of 55 Mph or Greater

Performance planing may be performed in multiple lanes across the entire widths of the lanes up 4 miles of travel lane unless otherwise stated in the Contract. Performance planed surfaces must be paved back within 14 calendar days from the start of the performance planing operation.

Where the Contractor decides to performance plane multiple lanes, the Contractor shall be responsible for furnishing and installing advance warning signage and traffic control devices to inform the traveling public according to the details provided in the Contract. Temporary pavement markings required by such operations will be handled according to the requirements of Section 704.03 and the *Special Provision for **TEMPORARY CONSTRUCTION AND PERMANENT PAVEMENT MARKINGS*** included in the Contract. The cost for such warning devices and advance signage required by multiple lane planing operations shall be included in the cost of other appropriate items unless otherwise specified in the contract by a specific pay item(s) for separate payment.

Ramps and exits shall be planed in such a manner that a longitudinal joint is not left for vehicles to cross within the posted speed limits in a "run on" situation (approaching a higher elevation surface difference of greater than 1 inch). To prevent this, the Contractor can 1.) plane ramps and exits to the extent that the joint line between new and existing pavement crossed by traffic is traversed at an angle close to ninety degrees per the ACOT-1 Standard for temporary transverse joints or 2.) perform tapered planing along the ramp/exit longitudinal joint to provide a smooth transition for vehicles to cross or 3.) square up ramp or exit pavement with the adjacent mainline lane at the time of installation.

The following additional restrictions will also apply to roadways where regular pavement planing is applicable:

- On roadways with a combination of 4 or more lanes and shoulders (i.e. 2 or more travel lanes and 2 shoulders [each shoulder a minimum 6 feet wide]) in one direction, all travel lanes must be paved back before the weekend. Up to two thousand five hundred (2,500) feet of shoulder may be planed and left over the

weekend provided the portion of planed shoulder left unpaved over the weekend is paved within 48 hours after the end of the weekend period.

- The Contractor shall pave all ramps and loops that have been regular planed during the week before the weekend.

B. All Other Roadways

If the Contractor elects to perform regular pavement planing he will be permitted to leave up to two miles of travel lane open to the traveling public provided such planing (milling) is performed across the entire lane width. These same length restrictions will apply in cases where multiple-lane regular pavement planing is permitted in the Contract or allowed by the Engineer. The Contractor will be limited in the case of regular pavement planing, whether in a single lane or multiple lane operation, to only that amount of pavement that can be paved back within 96 hours of completion of planing that roadway or portion of roadway.

When the Contractor elects to performance plane on roadways specified to be planed to a depth of 2 inches or less, the Contractor shall plane only the amount of pavement that can be paved back within 14 calendar days of completion of planing that roadway or portion of roadway. The Contractor is required to perform pavement surface testing as specified in Section 515.04 of the Specifications to verify he has achieved the acceptable surface texture prior to opening the performance planed surface to traffic. The additional traffic control devices and signage required for the 14 calendar day pave back operation allowance for performance planing operations versus the traffic control devices required for 96 hour pave back operations for regular pavement planing operations shall be at the Contractor's expense.

Roadways on which the roadway edges (i.e. edge milling) are to be planed shall be paved back within 10 days from the completion of the planing operation.

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 512—MAINTAINING TRAFFIC

SECTION 512—MAINTAINING TRAFFIC of the Specifications is amended as follows:

Section 512.03(a) Signs is amended to replace the last paragraph with the following:

When construction signs are covered to prevent the display of the message, the entire sign shall be covered with silt fence or other materials approved by the Engineer such that no portion of the message side of the sign shall be visible. Plywood shall be used on ground-mounted construction signs only. Attachment methods used to attach the covering material to the signs shall be of a durable construction that will prevent the unintentional detachment of the material from the sign. At no times shall a construction sign and/or post be rotated to prevent the display of the message. In addition, the posts where the signs are being covered shall have two ED-3 Type II delineators mounting vertically on the post below the signs at a height of 4 feet to the top of the topmost delineator. The bottom delineator shall be mounted 6 inches below the top delineator.

Section 512.03(b) Flagger Service and Pilot Vehicles is amended to replace the last paragraph with the following:

Portable traffic control signals conforming to the requirements of Section 512.03(h)2 of the Specifications may be used in lieu of flagger service when specified or approved by the Regional Traffic Engineer. When portable traffic control signals are used in lieu of flagger service, the portable traffic control signals will be measured and paid for separately.

Section 512.03(e)b. Group 2 devices is amended to replace the first paragraph with the following:

- b. **Group 2 devices** shall be drums or vertical panels. Drums shall be round, or partially round with no more than one flat side; made from plastic; have a minimum height of 36 inches, have a cross-sectional width no less than 18 inches in any direction; and conform to the requirements of the *Virginia Work Area Protection Manual*. Drums shall be designed to allow for separation of ballast and drum upon vehicular impact but not from wind and vacuum created by passing vehicles. Drums of two-piece design, i.e., drum and associated base, shall utilize sufficient amounts of enclosed sand at the base in accordance with the manufacturer's recommendations to provide stable drum support. The base shall be not greater than 5 inches in height. Two-piece drums may also utilize a flared drum foundation and collar of not more than 5 inches in height and of suitable shape and weight to provide stable support. One-piece drums may be used provided they comply with these above requirements.

Section 512.03 Procedures is amended to add (r) **Work Zone Traffic Control** as the following:

- (r) **Work Zone Traffic Control:** The Contractor shall provide individuals trained in Work Zone Traffic Control in accordance with the requirements of Section 105.14 of the Specifications.

Section 512.04 Measurement and Payment is amended to add the following:

Basic Work Zone Traffic Control – Separate payment will not be made for providing a person to meet the requirements of Section 105.14 of the Specifications. The cost thereof shall be included in the price of other appropriate pay items.

Intermediate Work Zone Traffic Control - Separate payment will not be made for providing a person to meet the requirements of Section 105.14 of the Specifications. The cost thereof shall be included in the price of other appropriate pay items.

Section 512.04 Measurement and Payment is amended to replace the pay item and corresponding pay unit for “**Eradication of existing pavement markings**” with the following:

Eradication of existing pavement markings will be measured in linear feet of a 6-inch width or portion thereof as specified herein. Widths that exceed a 6-inch increment by more than 1/2 inch will be measured as the next 6-inch increment. Measurement and payment for eradication of existing pavement markings specified herein shall be limited to linear pavement line markings. Eradication of existing pavement markings will be paid for at the contract unit price per linear foot. This price shall include removing linear pavement line markings and disposing of residue.

Eradication of existing nonlinear pavement markings will be measured in square feet based on a theoretical box defined by the outermost limits of the nonlinear pavement marking. Nonlinear pavement markings shall include but not be limited to stop bars, arrows, images and messages. Eradication of existing nonlinear pavement markings will be paid for at the contract unit price per square foot. This price shall include removing nonlinear pavement markings and disposing of residue.

Payment will be made under:

Pay Item	Pay Unit
Eradication of existing pavement marking	Linear foot
Eradication of existing nonlinear pavement marking	Square foot

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 514—FIELD OFFICE

SECTION 514—FIELD OFFICE of the Specifications is amended as follows:

Section 514.02—Procedures of the Specifications is amended to replace (j) with the following:

- (j) **Miscellaneous Items:** The field office shall also include the following:
1. A certification that the office is free of asbestos and other hazardous material.
 2. A broom, dust pan, mop, mop bucket, general cleaning supplies, and trash bags.
 3. An all weather parking area for either twelve vehicles (for a Type I office) or six vehicles (for either a Type II or a Type III office), and all weather graveled access to the public roadway. The Contractor shall maintain the parking area and graveled access such that it is passable with a compact sedan without causing vehicular damage. The parking lot shall be sufficiently lighted to illuminate all areas of the lot.
 4. Security measures for the Field Office during other than normal working hours shall be equivalent to that used by the Contractor for his job site and office facilities.

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS**SUPPLEMENTAL SECTION 515—PLANING OR MILLING PAVEMENT**

SECTION 515—PLANING PAVEMENT of the Specifications is completely replaced with the following:

SECTION 515—PLANING OR MILLING PAVEMENT**515.01—Description**

This work shall consist of planing (milling) of rigid or flexible pavement to the designated depth specified in the plans or other Contract documents in preparation for pavement repair or pavement overlay. For the purposes of this section, rigid pavement shall mean hydraulic cement concrete pavement or hydraulic cement concrete surfaced pavements. Flexible pavement shall mean asphalt concrete or asphalt concrete surface pavements. Planing as used herein is also referred to as milling or grinding. Milled cuttings shall be removed and disposed of by the Contractor in accordance with the requirements of Section 106.04 of the Specifications or used in the work if permitted in the Contract or directed by the Engineer.

515.02—Equipment

Planing shall be performed with a pavement planing or pavement grinding machine of a type that has operated successfully on work comparable to that specified in the Contract. Milling and cold planing equipment shall be capable of accurately cutting to the length, width, depth and typical section specified in the Contract in flexible pavement or rigid pavement while leaving a uniformly cut or ground roadway surface capable of handling traffic prior to overlay placement. The milling equipment shall not damage the underlying pavement surface. The milling machine shall be equipped with an automatic grade control system that will control the longitudinal profile and cross slope of the existing pavement milled surface as the milling operations proceed. The ground speeds of the machine and the cutting equipment shall be independent. The machine shall have a self-contained water system for the control of dust and fine particles. The width of the machine shall allow for the passage of controlled public traffic while in use. The machine shall have a dust collection system or have a system to minimize dust created by the planing (milling) operation from escaping into the atmosphere.

The Contractor shall continuously monitor the cutting or grinding head of the machine so as to ensure and maintain the creation of a uniformly textured milled surface. Equipment and vehicles in use under traffic shall be equipped according to the requirements of the Work Area Protection Manual.

515.03—Procedures

Limitations of operations for planing operations shall be in accordance with the requirements of Section 108.02 of the Specifications and as specified in the Contract.

The Contractor may perform either regular planing or performance based planing at his option unless otherwise specified in the Contract. Unless otherwise directed by the Engineer, the finished surface for regular pavement planing and performance planing shall have a tolerance of plus or minus 1/4 inch per foot between any two contacts of the resultant surface and the testing edge of a 10-foot straightedge.

No application of pavement overlay shall decrease the vertical clearance under a bridge. In situations where the existing pavement under the overpass cannot be planed in direct proportion to the proposed overlay, the new pavement is to be tied down to the existing pavement under the overpass no less than 75 feet from the outer edges of the overpass in accordance with Standards.

The finished surface macrotexture for performance planing shall have a pavement macrotexture MTD (mean texture depth) of less than 2.0 millimeters. Testing for performance pavement planing shall be as described hereinafter.

Irregularities and high spots of existing pavement shall be eliminated. The pavement surface shall be milled, ground or planed to the designated grade or gradient as specified on the plans, or where not specified as a grade, shall parallel that of the existing roadway. Transversely, the cross slopes of tangent sections shall be planed to approximately 1/4 inch per foot or as directed by the Engineer. Superelevated curves shall be planed as directed by the Engineer. Where the pavement is to be resurfaced by means of the application of an overlay on curb and gutter roadways, a 1-inch shoulder shall be cut along the gutter line to eliminate the necessity of feathering the edge of the new surface. Payment for providing the 1-inch shoulder shall be based on the total square yards of removed material regardless of the variable depth of the pass.

The finished planed surface shall be true to grade, free from gouges, grooves, ridges, soot, oil film, and other imperfections and shall have a uniformly textured appearance suitable as a temporary riding surface.

Humps and depressions that exceed the specified tolerances and require additional grinding or planing will be subject to correction or replacement as directed by the Engineer at no additional cost to the Department.

The Contractor shall ensure positive drainage is provided for all planed surfaces in accordance with the requirements of Section 315.05(c) of the Specifications. When planing curb and gutter sections the Contractor shall endeavor to work with existing drainage and grades to maintain positive flow. In the event of significant buildup of standing water, the Contractor may be required to erect signage to warn motorists, sweep the roadway to vacate the water, or in extreme cases, close the lane to traffic until proper drainage of the planed surface can be restored.

Temporary transverse pavement-wedge tie-ins shall be constructed where planed existing pavement is to remain temporarily without overlay to the extent allowed or required herein, in Section 315 of the Specifications, elsewhere in the Contract documents, or by the Engineer. Each tie-in shall be constructed no less than 3 feet in length for every inch of depth of pavement planing performed and shall consist of a mix that is suitable for a riding surface that provides a smooth transition between planed existing pavement and existing pavement or bridge decks. Such tie-ins shall be constructed prior to the planed surface being opened to traffic.

When planing to a depth of 2 inches or less at a bridge, the planed (milled) surface at the bridge may be left unpaved for up to 10 days.

Additional or other limitations and conditions to planing operations will be as specified and applicable to the Contract.

515.04—Performance Pavement Planing Testing

This section gives testing procedures and criteria for opening a section of performance planed pavement to public traffic on roadways with posted speed limits of 55 mph or greater as specified herein. The test procedure performed by the Contractor shall measure the mean texture depth

(MTD) of the resultant macrotexture surface after performance planing operations have been completed. The measurement for performance planed surface texture shall be conducted in accordance with the requirements of ASTM E965 using a volumetric technique. The Contractor shall randomly select 10 locations at each site. Each individual location shall be tested and the average MTD of the entire 10 locations per site determined. Prior to opening a lane or roadway to traffic the average MTD of the performance planed site shall be less than 2.0 millimeters and the upper limit for any one MTD measurement shall not exceed 3.10 millimeters in order for that site to be exposed to traffic.

515.05—Measurement and Payment

Where pavement is to be planed to a uniform depth, planing will be measured in square yards of removed pavement of the surface area to the depth(s) specified in the contract documents. The Engineer may direct the depth to be adjusted during the initial pass $\pm \frac{1}{2}$ inch due to field conditions at no additional cost, except where such adjustment constitutes a changed condition as explained herein. The planed area is defined as the actual length and width of the planed pavement surface visually verified and accepted by the Engineer for payment. If scabbing or laminations still exist after planing to the maximum potential depth of the initial pass, the Engineer may direct the Contractor to perform additional passes or to increase the depth beyond the maximum potential depth of the initial pass. Such additional passes or increased depth beyond the maximum potential depth of the initial pass will also be measured and paid for in square yards for the depth authorized by the Engineer. Such additional depth passes (beyond the maximum potential depth of the original pass) will not be adjusted, as in averaging or as a percentage of original depth or maximum potential depth of the initial pass, to achieve final measurement or payment. In the event the authorized adjustment of the $\frac{1}{2}$ inch for field conditions by the Engineer changes the requirements of the “square up” provisions (in excess of 2 inches), this will be considered a changed condition in accordance with the provisions of Section 104.02 of the Specifications.

Where planing is variable depth and used to tie into existing structures such as curbs and combination curb and gutters and at bridges, except in cases as mentioned below, such tie-in planing will be measured in square yards of removed pavement for the full surface area (the actual length and width of the planed pavement surface visually verified and accepted by the Engineer for payment) within the range of depth specified in the contract documents. **Note:** The Engineer may direct the depth to be adjusted during the initial pass $\pm \frac{1}{2}$ inch of the specified depth due to field conditions such as scabbing or delamination at no additional cost, except where such adjustment constitutes a changed condition as explained herein.

If scabbing or laminations still exist after planing to the maximum potential depth of the initial tie-in planing pass, the Engineer may direct the Contractor to perform additional passes or to increase the depth beyond the maximum potential depth of the initial **pass**. Additional passes or depths beyond the maximum potential depth of the initial **pass**, authorized by the Engineer, will also be measured and paid for in square yards of removed pavement of the additional surface area for the depth authorized by the Engineer. Areas of variable depth tie-in planing will not be adjusted, as in averaging or as a percentage of original depth, to achieve final measurement or payment. In the event the authorized adjustment of the $\frac{1}{2}$ inch for field conditions by the Engineer changes the requirements of the “square up” provisions, this will be considered a changed condition in accordance with Section 104.02 of the Specifications.

Planing performed to tie-in overlaid pavement to existing pavement or bridge decks that is determined by the Engineer to be a part of the mainline planing operations will not be measured for separate payment, the cost of which, shall be included in the price bid for the appropriate depth range of flexible or rigid pavement planing.

This price shall include furnishing vehicles, labor, tools, materials, incidentals, safety equipment, warning devices, and removing and disposing of existing pavement.
Payment will be made under:

Pay Item	Pay Unit
Flexible pavement planing (0-2" depth)	Square yard
Flexible pavement planing (Above 2"-4" depth)	Square yard
Flexible pavement tie-in planing (0-2" depth)	Square yard
Flexible pavement tie-in planing (Above 2"-4" depth)	Square yard
Flexible pavement planing (over 4" depth)	Square yard
Rigid pavement planing (0-2" depth)	Square yard
Rigid pavement tie-in planing (0-2" depth)	Square yard

(c700i00-0313) **SECTION 700—GENERAL** of the Specifications is amended as follows:

Section 700.04—Procedures is amended to include the following:

(k) **Anchor Bolts**

Traffic control device foundations shall have a bolt template positioned for correct orientation of the structure with respect to the structure location and roadway alignment and to maintain the anchor bolts vertical (plumb) and level during construction.

Bolt and/or anchor nut covers shall not be installed on any traffic control device structures, unless otherwise specified on the plans.

Anchor bolts in double-nut connections shall extend a minimum of $\frac{1}{4}$ " past the second top nut.

The threaded portion of the anchor bolts shall be lubricated with beeswax, the bolt manufacturer's recommended lubricant, or other lubricant as approved by the Engineer for proper tensioning before the structure is installed.

Double-nut connections installation procedure: (A minimum of three nuts and two hardened washers shall be provided for each anchor bolt.)

1. If bolt(s) are not plumb (vertical), determine if beveled washer(s) may be required prior to erection of the structure. Beveled washers shall be used on top of the leveling nut and/or under the first top nut if any face of the base plate has a slope greater than 1:20 and/or any nut could not be brought into firm contact with the base plate.
2. Clean and lubricate the exposed thread of all anchor bolts, nuts and all bearing surfaces of all leveling nuts. Re-lubricate the exposed threads of the anchor bolts and the threads of the nuts if more than 24 hours has elapsed since earlier lubrication, or if the anchor bolts and nuts have become wet since they were first lubricated.
3. Verify that the nuts can be turned onto the bolts the full length of the threads by hand.
4. Turn the leveling nuts onto the anchor bolts and align the nuts to the required elevation shown on the shop drawings. The maximum distance between the bottom of the leveling nut and the top of the foundation shall be one inch.
5. Place structural hardened washers on top of the leveling nuts (one washer corresponding to each anchor bolt).
6. The post or end frame shall be plumbed or aligned as shown on the shop drawings. The maximum space between the bottom of the base plate and the top of the foundation shall be the diameter of the anchor bolt plus one inch. Place structural hardened

- washers on top of the base plate (one washer corresponding to each anchor bolt), and turn the first top nuts onto the anchor bolts.
7. Tighten first top nuts to a snug-tight condition in a star pattern. Snug-tight is defined as the maximum nut rotation resulting from the full effort of one person using a 12-inch long wrench or equivalent. A star tightening pattern is one in which the nuts on opposite or near-opposite sides of the bolt circle are successively tightened in a pattern resembling a star.
 8. Tighten bottom leveling nuts to a snug-tight condition in a star pattern.
 9. At this point, verify again if beveled washers are necessary using the criteria from step 1. If a beveled washer is required, remove the structure if necessary, add the beveled washer(s) and retighten first top nuts and bottom leveling nuts (in a star pattern) to a snug-tight condition.
 10. Mark the reference position of each first top nut in a snug-tight condition with a suitable method on one flat surface of the nut with a corresponding reference mark on the base plate at each bolt before final tightening of the first top nuts. Then rotate the first top nuts incrementally to one half the required nut rotation specified in Table 1 using a star pattern until achieving. Rotate the first top nuts again, using a star pattern, to the full required nut rotation specified in Table 1. For example, if total rotation from snug tight is 1/6 turn (60°), rotate 30° in each cycle.

Table 1

Anchor Bolt Diameter, (in.)	Nut Rotation beyond Snug - Tight	
	ASTM F 1554 Grade 36 (M314)	ASTM F 1554 Grade 55 (M 314)
≤1½	1/6 turn (60°)	1/3 turn (120°)
>1½	1/12 turn (30°)	1/6 turn (60°)

Nut rotation is relative to anchor bolt. Anchor bolt nut tensioning shall not exceed plus 20°.

Unified Thread Standard (UNC) tensioning is applicable.

Lock nuts and/or split washers shall not be allowed with anchor bolts.

11. Anchor bolt connections that have been tightened shall be inspected in the presence of the Engineer by a calibrated torque wrench. The torque wrench shall be used to verify that a torque at least equal to the verification torque as provided in Table 2 is achieved. A minimum of every other bolt shall be inspected.

Table 2

Anchor Bolt Diameter,	Verification Torque
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(in.)	ASTM F 1554 Grade 36 (M314) Tension/Torque kips/ft-lbs.	ASTM F 1554 Grade 55 (M 314) Tension/Torque kips/ft-lbs.
1	18 / 180	27 / 270
1 1/4	28 / 350	44 / 550
1 1/2	41 / 615	63 / 945
1 3/4	55 / 962	86 / 1,505
2	73 / 1,460	113 / 2,260
2 1/4	94 / 2,115	146 / 3,285
2 1/2	116 / 2,900	180 / 4,500
2 3/4	143 / 3,932	222 / 6,105
3	173 / 5,190	269 / 8,070
3 1/4	206 / 6,695	320 / 10,400
3 1/2	242 / 8,470	375 / 13,125
3 3/4	280 / 10,500	435 / 16,312
4	321 / 12,840	499 / 19,960

12. Install second top nut on each bolt to snug tight.
13. Contractor shall perform an Ultrasonic test on all anchor bolts in accordance with ASTM E114- Ultrasonic Pulse Echo Straight Beam Testing by the Contact Method. Ultrasonic testing personnel shall be qualified in accordance with ASNT SNT-TC-1A Level II and certified by VDOT Materials Division. Equipment shall be qualified in accordance with AWS D1.5 Section 6, Part C Anchor bolts shall have no indications that are above 10% Full Screen Height at the prescribed scanning level. All indications shall be noted on the report and reported to the Project Engineer and VDOT Materials Division.

Section 700.05—Measurement and Payment for Concrete foundations is replaced with the following:

Concrete foundations will be measured and paid for in units of each or cubic yards of concrete as applicable. When paid for in cubic yards of concrete, no payment will be made for concrete in excess of the cubic yards of concrete required by the foundation design unless otherwise approved by the Engineer. This price shall include foundation design, concrete, reinforcing steel, stub poles, anchor bolts, bolt circle templates, lubricant, torque, UT testing, grounding equipment, conduits, excavating, backfilling, compacting, disposing of surplus and unsuitable material, and restoring existing areas.

2-21-13 (SPCN)

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
TYPE B, CLASS VI PAVEMENT LINE MARKING TAPE

October 21, 2011

I. DESCRIPTION

This work shall consist of furnishing and installing a profiled (non-flat), permanent, white or yellow preformed pavement line marking tape at locations shown on the plans and as directed by the Engineer.

II. MATERIALS

Marking tape shall be a retro-reflective pliant polymer material consisting of a mixture of polymeric materials, pigments and glass beads (reflective optics) distributed throughout its cross-sectional area with a reflective layer of beads (reflective optics) embedded into the surface. The surface of the tape shall exhibit raised areas resulting in a profiled (non-flat) surface.

The shelf life of the tape for use on facilities constructed or maintained by the Department shall be one year from the date of manufacture when stored in accordance with the manufacturer's requirements.

The marking tape shall not be formulated with any compounds of the heavy metals listed in 40 CFR 261.24 Table 1, except that barium sulfate is allowed. Total heavy metals, with the exception of barium sulfate, shall not exceed 20 times the specified regulatory limits. Materials that must be heated for application shall not exude fumes that are toxic or injurious to persons or property when heated to the application temperature.

The marking tape shall be capable of conforming to pavement contours, breaks and faults through the action of traffic at normal range of pavement temperatures. The marking tape shall be capable of application to new and existing asphalt or hydraulic cement concrete at pavement surface temperatures of 45 to 180 degrees Fahrenheit. Where installed with adhesive, the adhesive shall be per the manufacturer's instructions. The marking tape shall also be capable of being inlaid during installation of the final riding surface during paving operation on new, dense, or open-graded asphalt concrete and shall be ready for traffic immediately after application.

Marking tape shall be weather resistant and after installation shall show no significant tearing, roll back, lifting, shrinkage, or other signs of poor adhesion, nor appreciable bleeding or discoloring (fading), which will impair the intended use of the marking tape throughout its intended service life.

The marking tape shall not deteriorate because of contact with sodium chloride, magnesium chloride, calcium chloride, mild alkalies and acids, or other ice control materials, oils in the pavement material, or oil and gasoline drippings from vehicles.

When the pay item specifies Type B, Class VI Contrast pavement marking tape, the tape shall be an additional 3 inches minimum wider than the width specified in the pay item. This additional tape width shall be black non-reflective with 1 ½ inches minimum on both sides of the white.

A. Initial Approval Requirements:

Marking tape products will be included on the Department's Materials Division Approved Products List after the Department determines conformance to these specifications. Determination of conformance will include, but will not be limited to, the evaluation of initial and one year test data from AASHTO's National Transportation Product Evaluation Program (NTPEP) on a northern deck or other VDOT approved facilities.

If tested through AASHTO/NTPEP, the marking tape shall have been installed, tested, and met the following requirements on asphalt and concrete surfaces. If tested on another VDOT approved facility, VDOT reserves the right to test and approve tapes based upon in-service performance data on either asphalt or hydraulic cement concrete or both types of concrete surfaces.

AASHTO/NTPEP Testing – Test data values used for approval shall be based upon the data generated per the NTPEP, Pavement Marking Material (PMM) Work Plan.

VDOT Test Facility – Test data values used for approval shall be based upon the data generated by following the testing requirements in Virginia Test Method (VTM)-125 to define the evaluation sections and number of measurements needed. VDOT reserves the right to evaluate durability, skid resistance, and no Track Time based upon field (in-service) performance, VDOT lab testing, or third party testing.

The manufacturer shall certify each batch or lot of material supplied is the same product (binder and reflective optics) that was tested and approved on the NTPEP or VDOT test facility in accordance with the Materials Division, Manual of Instructions for Certification II materials.

1. Retroreflectivity

Tapes shall have the following retroreflectance values after installation when measured in accordance with the requirements of ASTM E 1710. The reflectance values for NTPEP acceptance will be determined from outside of the wheel path. The photometric quantity to be measured shall be Coefficient of Retroreflected Luminance (R_L) and shall be expressed as Millicandelas per square foot per footcandle $[(mcd \cdot ft^{-2}) \cdot fc^{-1}]$.

Coefficient of Retroreflected Luminance(R_L) ($mcd \cdot ft^{-2} \cdot fc^{-1}$)		
Color	New	1 Year
White	500	300
Yellow	300	200

2. Day and Nighttime Color:

Daytime and Nighttime Color including Luminance Factor (Cap Y) shall conform to the requirements of ASTM D 6628 when initially installed and then after 1 year. Color and Luminance Factor values for NTPEP acceptance will be determined from outside of the wheel path. Night color may be measured in accordance with VTM-111 or with portable night color instrumentation per ASTM D 6628.

3. Durability Rating:

No tape line shall be displaced, torn or missing. The tape shall have a durability rating of at least 4 (40% retained) when evaluated in the wheel path area after 1 year when tested in accordance with NTPEP, PMM Work Plan.

4. Skid Resistance:

The surface of the tape shall provide an initial minimum skid resistance value of 45 BPN when tested in accordance with ASTM E 303.

III. INSTALLATION

Marking configurations shall be installed in accordance with the latest edition of the "Manual on Uniform Traffic Control Devices" (MUTCD), the Virginia Supplement to the MUTCD and the Virginia Work Area Protection Manual (latest edition).

Markings shall be installed either under the guidance of the manufacturer's representative or by the manufacturer's certified installer.

Markings to be installed on existing asphalt concrete roadway surfaces or existing and new hydraulic cement concrete surfaces shall be applied in strict accordance with the manufacturer's recommendations for pavement surface preparation and installation techniques for non-embedded surface applications.

Upon delivery of the material to the Contractor, the Contractor shall store all tape in accordance with the manufacturer's requirements until the day of installation, unless otherwise approved. Tape shall not be installed if the material has exceeded its shelf life, has been improperly stored, has deteriorated or is otherwise damaged.

Type B, Class VI markings to be inlaid in new asphalt surfaces shall be installed in accordance with the manufacturer's recommendations for surface preparation and installation techniques. Temperature requirements of the asphalt concrete and the type and size of roller allowed shall be in accordance with the tape manufacturer's recommendations. The Contractor shall maintain the road design cross section unless otherwise modified by the contract requirements and ensure that markings are not degraded by the paving operations.

Markings shall not be installed directly over longitudinal pavement joints or existing markings.

IV. POST-INSTALLATION EVALUATION

Following installation, and prior to final acceptance, a visual evaluation will be made to assess the condition, retroreflectivity, and color of the marking tape. If problem areas are found, an inspection will be made by the Department, the Contractor, and tape manufacturer's representative to identify specific areas of concern. If needed, the suspect areas shall be tested by the Contractor and/or VDOT representative in accordance with VTM-125 to define the evaluation sections and the number of measurements needed. Acceptable test result shall meet the requirements for reflectivity and color specified in Section II, Initial Approval Requirements. Those markings found to be less than the values listed in Initial Approval Requirements for Retroreflectivity and Day and Nighttime Color (1 Year) shall be eradicated and replaced by the Manufacturer at no cost to the Department. Tape that exhibits signs of significant tearing, roll back, lifting, shrinkage, or other signs of poor adhesion will be replaced by the Contractor at no cost to the Department. All costs associated with testing the marking tape for retroreflectivity, color, and adhesion, including the cost of maintenance of traffic, shall be borne by the Contractor.

V. WARRANTY

The pavement marking tape shall be warranted against failure resulting from material defects regardless of method of manufacturer's prescribed application or pavement type. The material shall be warranted to retain its color, retroreflectivity, adherence to the pavement and shall be free of other obvious defects or failures. All pavement marking tape that has failed to meet the warranty conditions shall be replaced with no additional payment.

The warranty shall cover all pavement striping materials (regardless of method of installation), labor, equipment, mobilization\demobilization, tools, incidentals required to remove (eradicate) and replace the pavement striping including maintenance of traffic during the removal and reinstallation operations.

Material guarantees that are given by the manufacturer shall be obtained by the Contractor and assigned to the Commonwealth in writing prior to final acceptance.

A. Retroreflectivity

White and Yellow longitudinal pavement marking tape shall remain effective for its intended use under normal traffic conditions and meet the minimum Coefficient of Retroreflected Luminance (R_L) of 100 millicandelas per square foot per footcandle [$(\text{mcd}\cdot\text{ft}^{-2})\cdot\text{fc}^{-1}$] when measured in accordance with the requirements of ASTM E 1710 for the following duration:

Longitudinal Marking Tape Retroreflective Warranty Period

New Asphalt Concrete Pavement (Inlay)	6 Years
Existing Asphalt Concrete Pavement (Overlay)	6 Years
Portland Cement Concrete (PCC) Surfaces	6 Years

B. Color

Longitudinal pavement marking tape shall remain effective for its intended use under normal traffic conditions and meet the minimum Daytime and Nighttime color including Luminance Factor (Cap Y) per ASTM D 6628 for the following duration:

Longitudinal Marking Tape Color Warranty Period

New Asphalt Concrete Pavement (Inlay)	4 Years
Existing Asphalt Concrete Pavement (Overlay)	4 Years
Portland Cement Concrete (PCC) Pavement Surfaces	4 Years

C. Material Loss

Solid Longitudinal Line – more than five percent of the substrate is exposed in any 2000 ft section_of pavement marking_or 50 ft or more of continuous loss.

Broken Line – more than five percent of the substrate is exposed in any 2000 ft section_of pavement marking or the loss of two consecutive skips.

VI. MEASUREMENT AND PAYMENT

Type B, Class VI pavement line marking tape will be measured in linear feet for the width specified and will be paid for at the contract unit price per linear foot, which price shall be full compensation for furnishing and installing pavement line markings, surface preparation, and testing and warranty.

Payment will be made under:

Pay Item	Pay Unit
Type B, Class VI pavement line marking (Width)	Linear foot
Type B, Class VI contrast pavement line marking (Width)	Linear foot

S704M03-1012

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
TEMPORARY CONSTRUCTION AND PERMANENT PAVEMENT MARKINGS

September 28, 2012

SECTION 704—PAVEMENT MARKING AND MARKERS of the Specifications is amended as follows:

Section 704.02—Materials is amended to add the following:

- (d) **Flexible temporary pavement markers (FTPMS)** shall consist of products from the Department's current Approved List found in the Materials Division's *Manual of Instructions* (See Flexible temporary pavement marker (FTPM) or web site <http://www.virginiadot.org/business/materials-download-docs.asp>). All FTPMs shall be new product. FTPMs are suitable for use one year after the date of receipt when stored in accordance with the manufacturer's recommendations.

Section 704.03—Procedures is amended to replace the first six paragraphs with the following:

PERMANENT AND TEMPORARY PAVEMENT MARKINGS AND FLEXIBLE TEMPORARY PAVEMENT MARKERS (FTPMS)

- **Permanent pavement markings** are durable pavement markings that, when installed, provide final traffic guidance after all operations related to the project are complete in accordance with the provisions herein, Section 704 of the Specifications and as specified elsewhere in the Contract.

Permanent pavement markings shall include skip-line and solid-line centerline markings, skip-line and solid-line lane-division markings and, solid-line edge-line markings installed on the newly-placed roadways once the surface has cured.

- **Temporary construction pavement markings** are construction zone pavement markings that, when installed, provide limited-duration traffic guidance until permanent pavement markings are installed in accordance with Section 704 of the Specifications, as specified elsewhere in the Contract, and as follows:

Temporary construction pavement markings for surface treatment, slurry seal, latex emulsion treatment, and plant mix shall be:

Type F, Class I pavement markings in accordance with the provisions of Section 704 of the Specifications except with a modified application for paved surfaces. Such modification shall consist of the light application of Type F, Class I temporary traffic paint, 8 to 10 mils thick representing 75 percent of the final pavement marking width and with 3 pounds of glass beads per gallon of material.

Temporary construction pavement markings applied to planed (milled) surfaces to be overlaid shall consist of a light application of Type F, Class I temporary traffic paint 15 mils thick, representing 75 percent of the final pavement marking width and with 6 pounds of glass beads per gallon of material.

Glass beads shall conform to the requirements of Section 234 of the Specifications. Skip lines shall be applied in 8-foot lengths and approximately 32 foot gaps. Temporary Type F, Class I pavement markings shall be arranged and spaced on their installation so as to be completely covered by the application of permanent pavement markings. Failure to place Type F, Class I temporary markings at the application rate and spacing specified herein may result in the non-payment for such markings. No eradication of such modified Type F, Class I temporary markings will be required when the Contractor installs such temporary construction pavement markings as detailed herein and such markings have been in place for no less than 3 days prior to the application of permanent pavement markings.

Temporary construction pavement markings for plant mix shall also include:

- Type D construction pavement markings in accordance with the requirements of Section 704 of the Specifications.
- **Flexible temporary pavement markers (FTPMS)** are pavement markings that the Contractor may choose to substitute for Type D or Type F, Class I pavement markings. FTPMs may be used on surface treatment, slurry seal, latex emulsion treatment, and plant mix.

FTPMS used for surface treatment, slurry seal or latex emulsion treatment operations shall include a removable material covering the reflective lens to protect the lens from being obscured or damaged by the paving operation.

The color of FTPM units and their reflective surfaces (white or yellow) shall be the same as the temporary construction pavement markings for the type of application (skip-line, solid line) they are being used in substitution.

FTPMS may be used to simulate skip-line and solid-line centerline markings and to simulate skip-line and solid-line lane-division markings (in accordance with the details furnished herein) installed on the newly-placed roadways once the surface has cured. **Please note:** Temporary edge-line markings will not be required.

Temporary construction pavement markings (and FTPMS) shall include skip-line and solid-line centerline markings, and skip-line and solid-line, lane-division line markings installed on the newly-placed roadways once the surface has cured or on milled surfaces when the time limits for unmarked pavement for the respective volumes of vehicles in Section 704 has been exceeded . **Please note:** Temporary edge-line markings will not be required.

MAINTENANCE OF TEMPORARY PAVEMENT MARKINGS AND FLEXIBLE TEMPORARY PAVEMENT MARKERS (FTPMS)

Maintenance of Temporary construction pavement markings applied to paved surfaces shall be in accordance with the following requirements:

While in place, temporary construction pavement markings sizes, shapes and retroreflectivity shall be at least minimally visible under full nighttime conditions from any point adjacent to such

marking for no less than 120 feet (3 skip lines). If temporary construction pavement markings meet the requirement for this visual evaluation, no additional application (refreshing) is required. If temporary construction pavement markings are Type F, Class I and these markings do not meet this visual evaluation prior to the time limit for the application of permanent markings, such temporary markings shall be refreshed by the application of a lighter application (applied so as to enhance visibility but not as to require eradication before application of permanent markings) of Type F, Class I marking at the Contractor's expense when required by the Engineer. Under such circumstances no payment for the eradication of pavement markings will be permitted if required before the application of permanent markings. If other types of permitted temporary pavement markings are used and these fail the visual evaluation or in any other respect are deficient prior to the time for the installation of permanent markings, these types shall be reapplied at the Contractor's expense when required by the Engineer. These requirements will apply until permanent pavement markings are installed in accordance with the time restrictions in Section 704.

FTPMS shall be installed and maintained in accordance with the manufacturer's recommendations and the requirements of the following:

The Contractor shall maintain FTPMs for the time period specified herein or until permanent pavement markings are installed in accordance with Section 704 of the Specifications. Damaged or missing FTPMs shall be replaced with new FTPMs of the same manufacturing type, color and model. No more than one FTPM may be damaged or missing out of every broken line simulated segment. No two consecutive FTPMs may be damaged or missing on a simulated solid line application, and no more than 30 percent of the FTPMs may be damaged or missing on any measured 100-foot segment of simulated solid line.

The acceptable ambient air temperature, ambient moisture condition and pavement surface condition prior to the installation of the appropriate FTPMs shall be in accordance with the manufacturer's recommendations, a copy of which shall be provided to the Engineer prior to installation.

Once applied, FTPMs will be considered for a single use. If a FTPM is removed before permanent markings are installed, it shall be replaced with a new FTPM. FTPMs may remain in place, undamaged, after installation for up to 14 consecutive days. When FTPMs are applied prior to pavement placement, such as with surface treatment, slurry seal and latex emulsion treatment, this 14 consecutive-day time limit shall begin at the time of actual installation of the FTPMs, not at the time of pavement placement completion. In no case shall any installed FTPMs be permitted to remain once time limits require permanent pavement marking installation.

PAVEMENT MARKING AND FLEXIBLE TEMPORARY PAVEMENT MARKER (FTPMS) OPERATIONS

The Contractor shall have a Pavement Marking Technician, certified in accordance with the Department's Materials Certification Program for Pavement Marking, present during all pavement marking and marker operations except FTPMS operations. When the Contractor chooses to substitute FTPMs for temporary construction pavement markings a certified Pavement Marking Technician will not be required for the FTPMS operations.

- **Permanent Pavement Markings:** The type, class, installation procedures and time limits of permanent pavement markings shall be in accordance with the provisions specified herein and Section 704 of the Specifications.

Installation of permanent pavement marking shall not exceed the 14 calendar-day time limitation between pavement placement and completion of permanent pavement marking installation. Once permanent pavement marking operations have begun; all skip-line and solid-line centerline markings and skip-line and solid-line lane-division markings shall be completed before the operation is stopped. While the installation of edge lines will not be required during the same operation as permanent centerline and lane-division markings; edge lines shall be completed within 14 calendar days after the end of the workday when the pavement to be marked was placed.

- **Temporary construction pavement markings:** The type, class, installation procedures and time limits of temporary construction pavement markings shall be in accordance with the provisions specified herein and Section 704 of the Specifications.

Temporary construction pavement markings, including skip lines, and solid lines shall be installed at the same locations that permanent pavement markings shall be installed.

Once temporary construction pavement marking operations have begun, all skip-line and solid-line centerline markings, and skip-line and solid-line lane-division markings shall be completed before the marking operation is stopped. The installation of temporary edge-line markings will not be required.

Installation and refreshing of (as authorized by the Engineer, if necessary) temporary construction pavement markings shall not affect the 14 calendar-day time limitation between pavement placement and completion of permanent pavement marking installation.

- **Flexible temporary pavement markers (FTPMS):** The type, installation procedures and time limits for the use of FTPMS shall be in accordance with the manufacturer's recommendations, the provisions specified herein and Section 704 of the Specifications.

Prior to installing FTPMS the Contractor shall submit a plan for substituting FTPMS for temporary construction pavement markings to the Engineer for approval. The Contractor's plan for FTPMS shall be in accordance with the requirements and drawings designated as "**TYPICAL PLAN FOR FTPM PLACEMENT**" included herein.

For surface treatment, slurry seal or latex emulsion treatment operations, the appropriate FTPMS shall be installed prior to placing new pavement or treatment. Upon completion of surface treatment, slurry seal or latex emulsion treatment placement, the Contractor shall remove the protective covering from the reflective lens of the FTPM prior to leaving the work site. Failure to remove such covering may result in the non-payment for that portion type (skip or solid) of temporary pavement marking.

For plant mix operations, the appropriate FTPMS shall be installed on the newly-placed pavement after the pavement is thoroughly compacted, has cooled to the FTPMS manufacturer's recommended temperature for installation, and the surface has cured.

Prior to installing FTPMS, the pavement surface shall be free of dirt, dust, debris, moisture, oil, and any residue that may be detrimental to successful application. If such is present, the Contractor shall prepare the pavement surface by air blowing or thorough brushing.

FTPMS used to simulate skip lines and solid lines shall be installed at the same locations that permanent pavement markings shall be installed.

Once FTPM operations have begun, all skip-line and solid-line centerline markings, and skip-line and solid-line lane-division markings shall be completed before the operation is stopped. Please note: Temporary edge-line markings will not be required.

FTPMS shall be removed and properly disposed of when permanent pavement marking is required in accordance with the time limits specified herein. Used FTPMS removed from the pavement when no longer needed or permitted, including all containers, packaging, damaged FTPMS and all other miscellaneous items of waste shall be appropriately disposed of in a properly permitted waste container in accordance with applicable local, state and federal laws and regulations.

Replacement of FTPMS, required to maintain temporary marking, shall not affect the 14 calendar-day time limitation between pavement placement and completion of permanent pavement marking installation.

For newly-placed roadways, permanent pavement marking, temporary construction pavement marking or FTPM installation shall be completed in accordance with the time limits specified below unless otherwise directed by the Engineer. Exceptions to the below time limits will be granted only for weather restrictions and for installation of Type B, Class VI and epoxy resin pavement markings on plant mix roadways. Installation of Type B, Class VI, pavement markings on plant mix roadways are not applicable to these requirements if they are inlaid with the last pass of the asphalt roller or directly after the asphalt roller using a separate roller. Installation of epoxy resin pavement markings on newly placed plant mix pavement shall not commence until after 24 hours of final surface placement.

PERMANENT PAVEMENT MARKINGS, TEMPORARY CONSTRUCTION PAVEMENT MARKINGS AND FLEXIBLE TEMPORARY PAVEMENT MARKERS (FTPMS) INSTALLATION TIME LIMITS ON ROADWAYS OPEN TO TRAFFIC:

Surface Treatment Operations

The Contractor shall maintain temporary construction pavement markings until the permanent pavement markings are installed. The Contractor shall sweep surface treated roadways prior to installation of permanent pavement markings as directed by the Engineer but no earlier than 7 days after completion of surface treatment placement. Permanent pavement marking installation shall be completed after sweeping but within 14 calendar days after the end of the workday when the surface treatment pavement surface to be marked was placed.

The following governs the installation time limits for temporary construction markings or FTPMS:

- **Roads having traffic volumes of 10,000 ADT or more:** Temporary construction pavement markings shall be installed within 24 hours after the end of the workday the unmarked new surface treatment is placed, and maintained until the permanent pavement markings are installed. If FTPMS are used they shall be installed prior to placement of surface treatment.
- **Roads having traffic volumes between 3,000 and 10,000 ADT:** Temporary construction pavement markings shall be installed within 48 hours after the end of the workday the unmarked new surface treatment is placed, and maintained until the permanent pavement markings are installed. If FTPMS are used they shall be installed prior to placement of surface treatment.

- **Roads having traffic volumes of 3,000 ADT or less:** Temporary construction pavement markings or FTPMs will not be required unless determined and authorized by the Engineer to be necessary to ensure the safety of the traveling public. If the Engineer requires FTPMs, such markers shall be installed prior to placement of surface treatment.

Slurry Seal or Latex Emulsion Treatment Operations

Permanent pavement marking installation shall be completed within 14 calendar days after the end of the workday when the slurry seal or latex emulsion treatment pavement surface to be marked was placed.

The following governs the installation time limits for temporary construction markings or FTPMs. The Contractor shall maintain temporary construction pavement markings until the permanent pavement markings are installed:

- **Roads having traffic volumes of 10,000 ADT or more:** Temporary construction pavement markings shall be installed within 24 hours after the end of the workday the unmarked new slurry seal or latex emulsion is placed, and maintained until the permanent pavement markings are installed. If FTPMs are used they shall be installed prior to placement of slurry seal or latex emulsion treatment.
- **Roads having traffic volumes between 3,000 and 10,000 ADT:** Temporary construction pavement markings shall be installed within 48 hours after the end of the workday the unmarked new slurry seal or latex emulsion is placed, and maintained until the permanent pavement markings are installed. If FTPMs are used they shall be installed prior to placement of slurry seal or latex emulsion treatment. .
- **Roads having traffic volumes of 3,000 ADT or less:** Temporary construction pavement markings shall be installed within 72 hours after the end of the workday the unmarked new slurry seal or latex emulsion is placed, and maintained until the permanent pavement markings are installed. If FTPMs are used they shall be installed prior to placement of slurry seal or latex emulsion treatment.

Plant Mix Operations

Prior to the end of the workday the Contractor shall determine whether permanent pavement markings can be installed within 24 hours after the end of the workday. If the Contractor determines that permanent pavement markings can be installed within such time limits, the permanent pavement markings shall be installed. If the Contractor determines that permanent pavement markings cannot be installed within such time limits he shall install and maintain temporary construction pavement markings or FTPMs until the permanent pavement markings are installed. **Permanent pavement marking installation shall be completed within 14 calendar days after the end of the workday when the plant mix pavement surface to be marked was placed.**

- **Roads having traffic volumes of 10,000 ADT or more:** Permanent pavement markings, temporary construction pavement markings or FTPMs shall be installed within 24 hours after the end of the workday the unmarked plant mix is placed.
- **Roads having traffic volumes between 3,000 and 10,000 ADT:** Permanent pavement markings, temporary construction pavement markings or FTPMs shall be installed within 48 hours after the end of the workday the unmarked plant mix is placed.

- **Roads having traffic volumes of 3,000 ADT or less:** Permanent pavement markings, temporary construction pavement markings or FTPMs shall be installed within 72 hours after the end of the workday the unmarked plant mix is placed.

Section 704.04—Measurement and Payment is amended to add the following:

Permanent pavement markings will be measured and paid for as the appropriate pavement line marking or pavement message marking pay items and pay units specified in the Contract. For roadways that are surface treated, the cost of sweeping the roadway prior to installing permanent pavement markings shall be included in the price bid for such pavement line or message marking items.

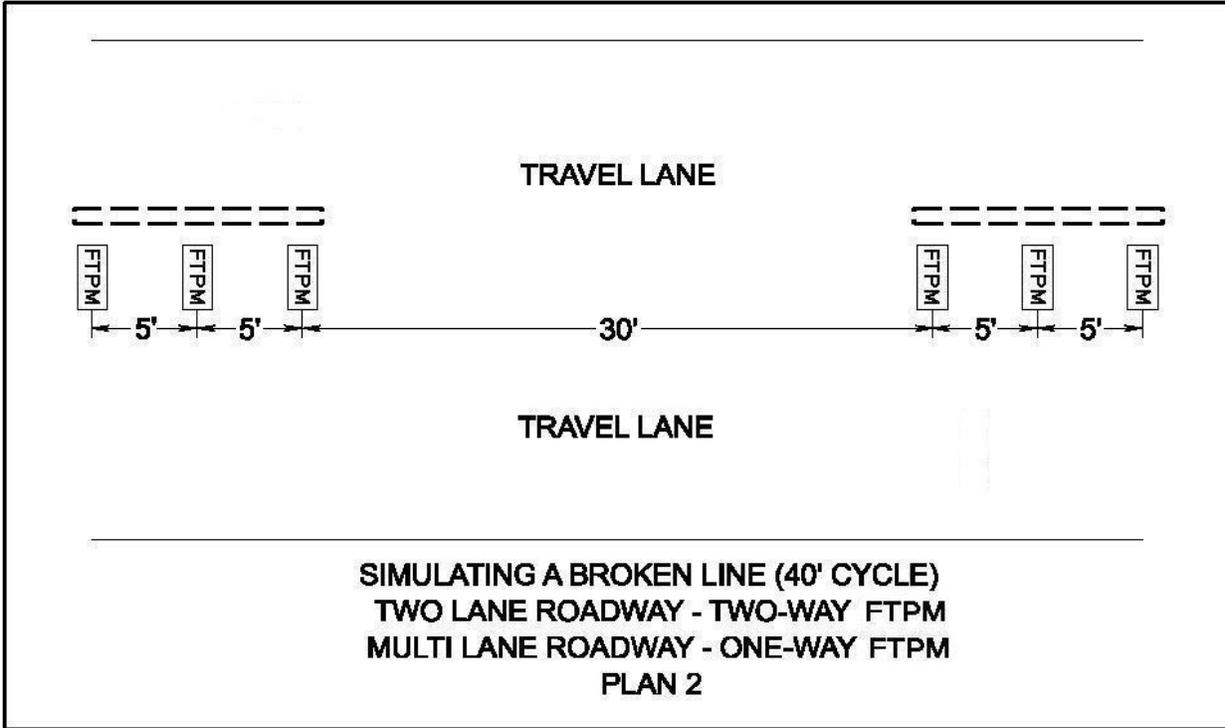
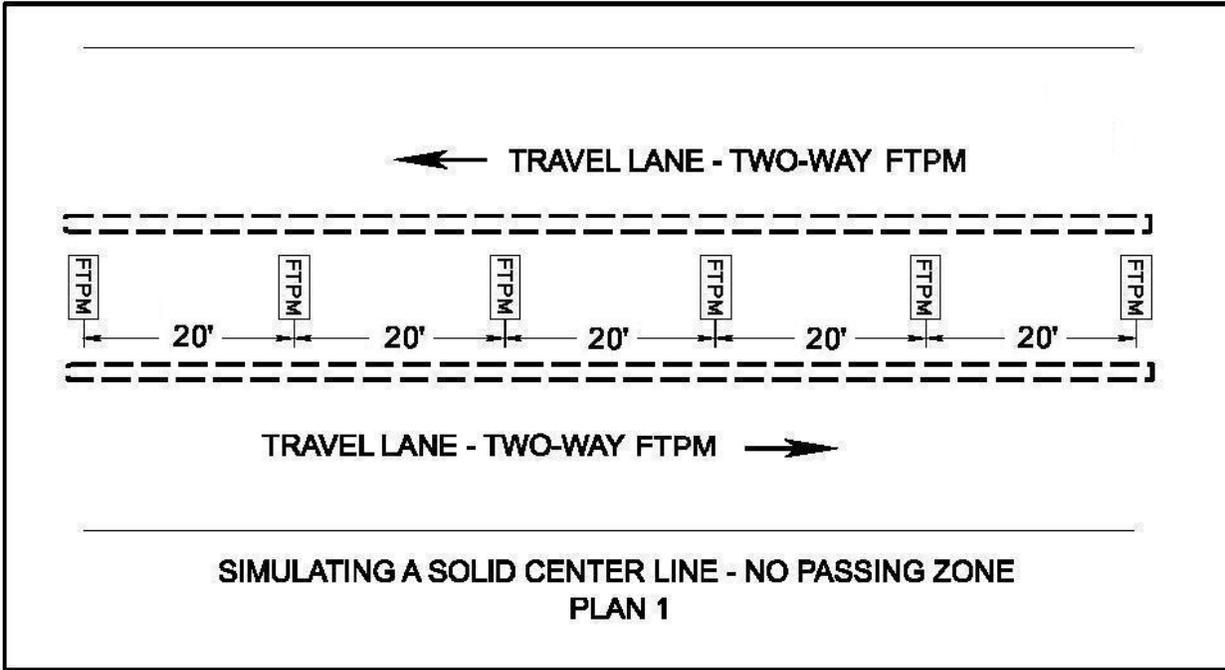
Temporary construction pavement markings, including **flexible temporary pavement markers (FTPMS)** used in substitution of temporary construction pavement markings, will be measured and paid for at the contract unit price per linear foot for the appropriate pavement line marking pay items and pay units specified in the Contract. Where FTPMs are used to simulate skip-line and solid-line centerline markings and skip-line and solid-line lane-division markings, the linear foot pay unit shall represent all FTPMs required in accordance **TYPICAL PLAN FOR FTPM PLACEMENT** and the requirements herein to simulate that solid or skip line temporary construction line marking. This cost shall include furnishing and application of the temporary construction pavement markings or FTPMs, surface preparation, furnishing, installing and maintaining temporary construction pavement markings (or FTPMs) for the entire 14 calendar day time limit.

Please note: Quantities for temporary construction markings listed in the contract are based on one cycle of marking for the 14 day time limitation before permanent markings must be installed. If temporary markings require refreshing or reapplication before the expiration of the 14 day time limit for the application of permanent markings, refreshing or reapplication shall be at the Contractor's expense. Such prices shall also include quality control daily logs, traffic control and all materials, labor, equipment and incidentals.

Payment will be made under:

Pay Item	Pay Unit
Temporary construction pavement markings and (FTPMS)	Linear Foot
Temporary construction pavement markings	Square Foot

TYPICAL PLAN FOR FTPM PLACEMENT



VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 700—GENERAL

SECTION 700—GENERAL of the Specifications is amended as follows:

Section 700.02(i) the first sentence is replaced with the following:

Poles, posts, and overhead sign structures shall conform to the following:

Section 700.02(i)2. is replaced with the following:

2. **Overhead sign structures, signal poles (mast arm and strain), and high-mast lighting poles** shall be steel.

Section 700.02(i)4. Poles, posts, and overhead sign structures is replaced with the following:

4. **Sign posts** shall be wood or steel. Square tube post shall be hot-rolled, carbon sheet steel, structural steel quality, conforming to the requirements of ASTM A 1011, Grade 50 except the yield strength after cold-forming shall be 60,000-psi minimum. Steel mounting brackets shall conform to the requirements of ASTM A36. Posts (inside and outside) shall be galvanized in accordance with the requirements of ASTM A653, Coating Designation G-90.

Section 700.02(i) the first and second paragraph is replaced with the following:

Lighting, signal, pedestal poles; sign posts; and overhead sign structures not designed to support variable message signs shall conform to the requirements of the 1994 Edition of AASHTO's *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*.

Overhead sign structures, including "butterfly" structures, designed to support variable message signs shall conform to the requirements of the 2001 Edition of AASHTO's *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals* and the following clarifications:

- Basic wind speed shall be used in the designs. The alternate method for wind pressures provided in Appendix C shall not be used.
- When the installation location of the structures lies between isotachs, the basic wind speed shall be determined by using the higher adjacent isotach.
- Any optional design parameters indicated in the AASHTO specification that are "allowed when acceptable to the owner" shall not be used for the designs.

Steel poles, posts, and overhead sign structures shall be hot-dip galvanized after fabrication. Except when shop painting is required, steel poles and posts shall be given one shop coat of primer and two field coats of paint and the galvanization finish of overhead sign structures shall be field treated for paint retention and two coats of paint applied.

Section 700.04(a)1. Grounding Electrodes is amended to replace the seventh paragraph with the following:

- The Contractor shall install a junction box at the primary grounding electrode location for access to the electrode for connection and testing. Grounding electrode conductors shall be installed under the bottom flange of the junction box. The grounding electrode shall be centered in the bottom of the junction box with a minimum of 6 inches exposed. The junction box cover shall have the letters “VDOT ELEC” cast in the depression on the top.

Section 700.04(a)2. Grounding electrode testing is replaced with the following:

2. **Grounding electrode testing:** Primary grounding electrodes shall be tested after each 10-foot grounding electrode and/or section thereof is installed using the fall of potential (three-point measurement) method. After the primary grounding electrode is installed and tested, the Contractor shall connect to the augmented electrode(s) to conduct a system test. The Contractor shall disconnect the grounding electrode conductor from the service equipment ground bus and bonding bushing before testing the grounding electrodes/system. The Contractor shall test the grounding electrode as required by the manufacturer’s instructions for the type of earth testing equipment. The Contractor shall record the readings on a form provided by the Regional Traffic Engineering Office. The completed form shall be signed and submitted to the Engineer after installation of the electrical service grounding.

Section 700.04(e) Poles, Posts, and Sign Structures is amended to include the following:

Square tube sign post shall have 7/16-inch (+/- 1/64-inch) openings or knockouts spaced 1-inch on centers on all four sides. When specified on the plans a 2 3/16-inch inner-post shall be used with the 2 1/2-inch post for additional strength. The inner-post shall be no less than 6 feet long.

Where posts are to be mounted on a retaining wall or barrier, the Contractor shall provide a mounting bracket, fabricated from steel conforming to the requirements of ASTM A36 and hot dipped galvanized in accordance with ASTM A123. Mounting bracket shall be designed so no connection to the barrier is made on the traffic side of the barrier and shall be secured to the barrier and wall using stainless steel chemically adhesive anchors.

Section 700.04(g)1. Electrical service and lighting conductor identification is amended to replace the fifth paragraph with the following:

Color-coding shall be as follows:

2-wire circuits, 120 Volts; 3-wire circuits, 120/240 Volts; 3-phase, 4-wire wye circuits, 208/120 Volts and; 3-phase, 4-wire delta circuits, 240 Volts

Circuit Designation	Color Code
Phase A or Line A	Black
Phase B or Line B	Red or orange*
Phase C	Blue
Grounded Conductor (Neutral)	White or gray** (see exception above)
Equipment Grounding Conductor	Bare, green, or green with one/more yellow stripes

3-phase, 4-wire wye circuits, 480/277 Volts; 3-phase, 3-wire delta circuits, 480 volts

Circuit Designation	Color Code
Phase A	Brown
Phase B	Orange
Phase C	Yellow

Grounded Conductor (Neutral)	White or gray** (see exception above)
Equipment Grounding Conductor	Bare, green, or green with one/more yellow stripes

* For 3-phase, 4-wire delta circuits, Phase B shall be the high leg and shall be orange.

** For outer covering of conductors of different systems that is contained within the same enclosure, refer to Article 200 of the NEC.

Section 700.04(h) Conduit Systems is amended to include the following:

When a conduit enters a box, fitting, or other enclosure, a bushing shall be provided to protect the conductor cable from abrasion unless the design of the box, fitting, or enclosure is such to afford equivalent protection of the conductor cable.

Section 700.04(h)2. Buried conduit systems is amended to replace the second paragraph with the following:

When conduit is to be installed under an existing roadway, entrance, or fixed object and open cutting is not permitted, conduit shall be installed by an approved directional boring method. Conduit for the directional boring method shall be PVC designed specifically for the directional boring operation or high-density PE. When the plans show more than one conduit at a location to be installed by directional boring, with the Engineers approval the Contractor may elect to install multiple conduits into a single bore at no additional cost to the Department.

MAXIMUM PILOT OR BACK REAMER BIT DIAMETER WHEN ROATED 360 ⁰	
NOMINAL INSIDE PIPE DIAMETER INCHES	BIT (REAMER) DIAMETER INCHES
1 - 2"	4" BORE HOLE
2 - 2"	5" BORE HOLE
3 - 2"	8" BORE HOLE
1 - 3"	5" BORE HOLE
2 - 3"	6 ½ " BORE HOLE
3 - 3"	8" BORE HOLE
1 - 4"	6 ½ " BORE HOLE

The Contractor shall use an approved stabilizing agent mixed with potable water to create the drilling fluid (mud slurry) for lubrication and soil stabilization. The fluid viscosity may vary to best fit the soil conditions encountered. Do not use any chemicals or polymer surfactants in the drilling fluid without written consent from the Engineer. The Contractor shall certify to the Engineer in writing that any chemical added to the drilling fluid is environmentally safe and not harmful or corrosive to the conduit system.

The Contractor may elect to use the jacked method to install a pipe sleeve for installation of the required conduit at no additional cost to the Department.

If an obstruction is encountered during the directional boring or jacking operation that requires abandonment of the hole (tunnel), it shall be backfilled with a flowable fill immediately, at no additional cost to the Department.

Section 700.04(i) Junction Box Covers is replaced with the following:

(i) **Junction Boxes** shall be installed as follows:

The junction box site shall be excavated such that the depth of the excavation shall be the height of the junction box plus at least twelve inches to allow for bedding aggregate material and such that the width shall be six to eight inches wider than the junction box.

Bedding material shall be No. 68, No. 78, or No. 8 aggregate or Crushed Glass conforming to No. 78, or No. 8 gradation requirements. Aggregate shall be a minimum of twelve inches in depth and entirely cover the bottom of the junction box excavation. The bedding aggregate shall be leveled and tamped prior to installing the junction box.

Junction box shall be installed and leveled to grade prior to backfilling.

Prior to backfilling the interior of polymer concrete junction boxes (JB-S1, JB-S2 and JB-S3) shall be braced with 2 inch by 4 inch lumber using two braces across the width and one brace across the length of the box or as required by the manufacturer. Bracing shall be installed to facilitate removal once back filling and compaction have been completed. The Contractor shall remove internal bracing after the backfilling and compacting operation has been completed.

The cover of the junction box shall be installed prior to backfilling.

The junction box shall be backfilled and compacted around its perimeter utilizing six to eight inch horizontal lifts to where the concrete collar is to begin. Once the concrete collar has cured the remaining area around the collar shall be backfilled and compacted as stated above. Compaction shall be at least ninety percent of the theoretical maximum density as defined in Section 101.02 of the Specifications. A mechanical tamping device shall be used to compact the backfill and soil layer by layer around the perimeter of the junction box. The wheel of a backhoe or other type vehicle shall not be used for compaction of backfill and soil. The internal bracing shall be removed after backfilling and compaction has been completed. The area around the junction box shall be graded and restored as stated in the Specifications.

Junction boxes shall not be installed or backfilled in standing water. Backfill material shall be free of large stones, wood or other debris and shall not be saturated with water.

If a special tool or wrench is required to remove the cover, the Contractor shall furnish the Engineer with five such tools.

Section 700.04—Procedures is amended to include the following:

(k) Anchor Bolts

Traffic control device foundations shall have a bolt template positioned for correct orientation of the structure with respect to the structure location and roadway alignment and to maintain the anchor bolts vertical (plumb) and level during construction.

Bolt and/or anchor nut covers shall not be installed on any traffic control device structures, unless otherwise specified on the plans.

Anchor bolts in double-nut connections shall extend a minimum of $\frac{1}{4}$ " past the second top nut.

The threaded portion of the anchor bolts shall be lubricated with beeswax, the bolt manufacturer's recommended lubricant, or other lubricant as approved by the Engineer for proper tensioning before the structure is installed.

Double-nut connections installation procedure: (A minimum of three nuts and two hardened washers shall be provided for each anchor bolt.)

1. If bolt(s) are not plumb (vertical), determine if beveled washer(s) may be required prior to erection of the structure. Beveled washers shall be used on top of the leveling nut and/or under the first top nut if any face of the base plate has a slope greater than 1:20 and/or any nut could not be brought into firm contact with the base plate.
2. Clean and lubricate the exposed thread of all anchor bolts, nuts and all bearing surfaces of all leveling nuts. Re-lubricate the exposed threads of the anchor bolts and the threads of the nuts if more than 24 hours has elapsed since earlier lubrication, or if the anchor bolts and nuts have become wet since they were first lubricated.
3. Verify that the nuts can be turned onto the bolts the full length of the threads by hand.
4. Turn the leveling nuts onto the anchor bolts and align the nuts to the required elevation shown on the shop drawings. The maximum distance between the bottom of the leveling nut and the top of the foundation shall be one inch.
5. Place structural hardened washers on top of the leveling nuts (one washer corresponding to each anchor bolt).
6. The post or end frame shall be plumbed or aligned as shown on the shop drawings. The maximum space between the bottom of the base plate and the top of the foundation shall be the diameter of the anchor bolt plus one inch. Place structural hardened washers on top of the base plate (one washer corresponding to each anchor bolt), and turn the first top nuts onto the anchor bolts.
7. Tighten first top nuts to a snug-tight condition in a star pattern. Snug-tight is defined as the maximum nut rotation resulting from the full effort of one person using a 12-inch long wrench or equivalent. A star tightening pattern is one in which the nuts on opposite or near-opposite sides of the bolt circle are successively tightened in a pattern resembling a star.
8. Tighten bottom leveling nuts to a snug-tight condition in a star pattern.
9. At this point, verify again if beveled washers are necessary using the criteria from step 1. If a beveled washer is required, remove the structure if necessary, add the beveled washer(s) and retighten first top nuts and bottom leveling nuts (in a star pattern) to a snug-tight condition.
10. Mark the reference position of each first top nut in a snug-tight condition with a suitable method on one flat surface of the nut with a corresponding reference mark on the base plate at each bolt before final tightening of the first top nuts. Then rotate the first top nuts incrementally to one half the required nut rotation specified in Table 1 using a star pattern until achieving. Rotate the first top nuts again, using a star pattern, to the full required nut rotation specified in Table 1. For example, if total rotation from snug tight is 1/6 turn (60°), rotate 30° in each cycle.

Table 1

Anchor Bolt Diameter, (in.)	Nut Rotation beyond Snug - Tight	
	ASTM F 1554 Grade 36 (M314)	ASTM F 1554 Grade 55 (M 314)

≤1½	1/6 turn (60°)	1/3 turn (120°)
>1½	1/12 turn (30°)	1/6 turn (60°)

Nut rotation is relative to anchor bolt. Anchor bolt nut tensioning shall not exceed plus 20°.

Unified Thread Standard (UNC) tensioning is applicable.

Lock nuts and/or split washers shall not be allowed with anchor bolts.

- Anchor bolt connections that have been tightened shall be inspected in the presence of the Engineer by a calibrated torque wrench. The torque wrench shall be used to verify that a torque at least equal to the verification torque as provided in Table 2 is achieved. A minimum of every other bolt shall be inspected.

Table 2

Anchor Bolt Diameter, (in.)	Verification Torque	
	ASTM F 1554 Grade 36 (M314) Tension/Torque kips/ft-lbs.	ASTM F 1554 Grade 55 (M 314) Tension/Torque kips/ft-lbs.
1	18 / 180	27 / 270
1 ¼	28 / 350	44 / 550
1 ½	41 / 615	63 / 945
1 ¾	55 / 962	86 / 1,505
2	73 / 1,460	113 / 2,260
2 ¼	94 / 2,115	146 / 3,285
2 ½	116 / 2,900	180 / 4,500
2 ¾	143 / 3,932	222 / 6,105
3	173 / 5,190	269 / 8,070
3 ¼	206 / 6,695	320 / 10,400
3 ½	242 / 8,470	375 / 13,125
3 ¾	280 / 10,500	435 / 16,312
4	321 / 12,840	499 / 19,960

- Install second top nut on each bolt to snug tight.
- Contractor shall perform an Ultrasonic test on all anchor bolts in accordance with ASTM E114- Ultrasonic Pulse Echo Straight Beam Testing by the Contact Method. Ultrasonic testing personnel shall be qualified in accordance with ASNT SNT-TC-1A Level II and certified by VDOT Materials Division. Equipment shall be qualified in accordance with AWS D1.5 Section 6, Part C Anchor bolts shall have no indications that are above 10% Full Screen Height at the prescribed scanning level. All indications shall be noted on the report and reported to the Project Engineer and VDOT Materials Division.

Section 700.05—Measurement and Payment for Concrete foundations is replaced with the following:

Concrete foundations will be measured and paid for in units of each or cubic yards of concrete as applicable. When paid for in cubic yards of concrete, no payment will be made for concrete in excess of the cubic yards of concrete required by the foundation design unless otherwise approved by the Engineer. This price shall include foundation design, concrete, reinforcing steel, stub poles, anchor bolts, bolt circle templates, lubricant, torque, UT testing, grounding equipment, conduits, excavating, backfilling, compacting, disposing of surplus and unsuitable material, and restoring existing areas.

Section 700.05—Measurement and Payment for Overhead and bridge-mounted sign structures is replaced with the following:

Overhead sign structures will be measured in units of each and will be paid for at the contract unit price per each. This price shall include structural units and supports, hand holes and covers, grounding lugs, electrical systems including conduit and fittings, and identification tags.

Section 700.05—Measurement and Payment for, Junction boxes is replaced with the following:

Junction boxes will be measured in units of each and will be paid for at the contract unit price per each. This price shall include concrete collars, frames and covers, tools to remove the cover, ground rods, ground conductors, grounding lugs, knockouts, cable racks, bracing, aggregate, excavating, backfilling, compacting, disposing of surplus and unsuitable material, and restoring existing areas.

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 701—TRAFFIC SIGNS

SECTION 701—TRAFFIC SIGNS of the Specifications is amended as follows:

Section 701.03—Procedures is amended as follows:

Section 701.03(a)2. Sign panels is amended to include the following:

Extruded sign panels shall be in accordance with the drawings and Section 229.02(c) of the Specifications.

Section 701.03(d) Erection is amended to replace the first sentence of the first paragraph with the following:

Vertical clearance for overhead sign structures shall be no less than 19 feet 0 inch and no more than 21 feet 0 inch from the bottom of the lowest mounted sign panel to the crown of the roadway unless otherwise specified on the plans

Section 701.03(d) Erection is amended to delete the last sentence of the first paragraph:

Section 701.03(d) Erection is amended to delete the last paragraph:

Section 701.03(d) Erection is amended to include the following:

Overlay panels shall be preformed on a flat surface with no protruding bolts or bolt heads on the existing sign panel.

Overlay of overhead sign panels shall be in accordance with the plan details.

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 703—TRAFFIC SIGNALS

SECTION 703—TRAFFIC SIGNALS of the Specifications is amended as follows:

Section 703.02—Equipment is amended as follows:

Section 703.02(g)—Detectors is amended to delete 1. Magnetic detectors and 2. Magnetic detector amplifiers.

Section 703.03—Procedures is amended as follows:

Section 703.03(e) Installing signal heads is amended to replace the last sentence of the second paragraph with the following:

Joints shall be rendered weatherproof by an approved method.

Section 703.03(g)1.—Magnetic Detectors is deleted.

Section 703.04—Measurement and Payment is amended as follows:

Section 703.04—Measurement and Payment is amended to delete the sixth paragraph, **Magnetic detector sensing elements** and the fourteenth paragraph, **Cable terminal enclosures**.

Section 703.04—Measurement and Payment is amended to include the following:

Pedestrian actuation will be measured in units of each and will be paid for at the contract unit price per each. This price shall include pedestrian pushbutton, fittings, sign(s), conduit, conduit when required, supplementary grounding electrode, grounding conductor, and concrete foundation when required.

Flashing beacon will be measured in units of each and will be paid for at the contract unit price per each. This price shall include galvanized post, conduit, concrete foundation, grounding electrode, ground conductor, signal heads, breakaway connectors, sign panels and mounting hardware.

Payment will be made under:

Pay Item	Pay Unit
Pedestrian actuation (Standard)	Each
Flashing beacon (Standard)	Each

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 704—PAVEMENT MARKINGS AND MARKERS

SECTION 704—PAVEMENT MARKINGS AND MARKERS of the Specifications is amended as follows:

TABLE VII-1 PAVEMENT MARKINGS is replaced with the following:

**TABLE VII-1
Pavement Markings**

Type	Class	Name	Surface Temp. at Time of Application	Film Thickness (mils)	Pavement Surface	Application Limitations
A		Traffic paint	50°F+	15 ± 1 when wet	AC HCC	May be applied directly after paving operations
B	I	Thermoplastic Alkyd	50°F+	90 ± 5 when set	AC	May be applied directly after paving operations
	I	Thermoplastic Hydrocarbon	50°F+	90 ± 5 when set	AC	Do not apply less than 30 days after paving operations
	II	Preformed Thermoplastic	50°F+	120-130	AC HCC	Manufacturer's recommendations
	III	Epoxy resin	50°F+	20 ± 1 when wet	AC HCC	Pavement surface needs to be at least 1 day old
	IV	Plastic-backed preformed Tape	(Note 1)	60 - 90	AC HCC	Manufacturer's recommendations
	VI	Profiled preformed Tape	(Note 1)	(Note 1)	AC HCC	Manufacturer's recommendations
	VII	Polyurea	(Note 1)	20 ± 1 when wet	AC HCC	Manufacturer's recommendations
D	I & II	Removable tape	(Note 1)	(Note 1)	AC HCC	Construction zone pavement marking
E		Removable Black tape (Non-Reflective)	(Note 1)	(Note 1)	AC	Construction zone pavement marking for covering existing markings
F	I & II	Temporary markings	(Note 1)	40 max	AC HCC	Construction zone pavement marking

Note 1: In accordance with manufacturer's recommendation.

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION
PREFORMED THERMOPLASTIC PAVEMENT MARKINGS

November 29, 2011b

I. DESCRIPTION

These specifications provide criteria for furnishing and installing durable, retroreflective preformed thermoplastic material for use in installing pavement markings, message markings and pavement marker applications. Lines, legends and symbol material shall be capable of being affixed (fusing) to asphalt concrete (bituminous) pavements by the use of a heating source.

II. DETAIL REQUIREMENTS

Prefomed thermoplastic marking materials shall be in accordance with the Department's [approved products list](#).

Material shall be a preformed, beaded reflectorized thermoplastic pavement marking material that is applied to the road surface using a heat source such as a propane torch. Upon cooling to normal pavement temperature, the material shall produce a reflectorized message, legend or symbol of specified thickness, width or design capable of resisting deformation to traffic. Material shall not distort because of temperature variations prior to application. The Contractor shall ensure that the pavement surface is clean, dry and free of debris or other deleterious material which may affect performance by removing all dust, dirt, loose particles heavy oil residues and other deleterious materials that may affect proper installation. Manufacturer\Supplier must enclose application instructions (multilingual) in with each box/package of materials.

Material shall be suitable for use on asphalt concrete surfaces and shall be capable of being applied to previously applied pavement marking material of the same composition under normal conditions of use. Marking material must be capable of conforming to pavement contours, breaks and faults through the action of traffic within the range of temperatures as specified herein. The markings shall have resealing characteristics, such that it is capable of fusing with itself and previously applied thermoplastic when heated with the heat source. In addition to being capable of fusing itself over existing markings such new markings shall be furnished to match the size dimensions and shape of existing markings.

Material shall not exude fumes that are toxic or injurious to persons, animals or property when heated to the application temperature.

Material shall withstand air and roadway temperature variations from 0 degrees F to 140 degrees F without deforming, bleeding, staining, discoloring and shall maintain their original dimensions and placement without chipping, spalling, or cracking. Material shall not deteriorate because of contact with sodium chloride, calcium chloride, mild alkalies and acids, or other ice control material; oil in the pavement material; or oil and gasoline drippings from vehicles.

Material, except for reversible arrows, shall have factory applied coated surface and intermixed beads. Intermixed beads shall be uniformly distributed throughout the material at a minimum of 30 percent by weight. Reversible arrows shall have intermixed beads only. Surface beads for reversible arrows shall conform to the requirements of Section 234 and be furnished and applied by the installer.

Initial skid resistance value shall be at least 45 BPN when tested in accordance with ASTM E 303.

Retained retroreflectivity, durability and color of markings shall conform to the following requirements after being installed on a northern region test deck for one year.

Retroreflectivity: Photometric quantity to be measured is coefficient of retroreflected luminance (R_L) in accordance with the requirements of ASTM E 1710. R_L shall be expressed in millicandelas per square foot per foot per foot-candle and shall be at least the following values when measured in the wheel path area.

	Initial	Retained (after 1 Year)
White	300	90
Yellow	200	70

Durability: Material shall have a durability rating of at least 4 when determined in the wheel path area.

Retained Daytime Color: Retained daytime color of markings shall conform to the requirements of ASTM D 6628.

Initial Nighttime Color: Initial nighttime color of preformed thermoplastic plastic pavement marking material shall conform to the following CIE chromaticity coordinate requirements when tested in accordance with VTM 111.

CIE CHROMATICITY COORDINATE LIMITS (INITIAL WITH DROP-ON BEADS)								
Color	1		2		3		4	
	x	y	x	y	x	y	x	y
Yellow	0.486	0.439	0.520	0.480	0.560	0.440	0.498	0.426

Material shall not be formulated with any compounds of the heavy metals listed in 40 CFR 261.24 Table 1 except that barium sulfate is allowed. Total heavy metal levels, with the exception of barium sulfate, shall not exceed 20 times the specified regulatory limits.

Amount and type of yellow pigment and inert filler for yellow material shall be at the option of the manufacturer provided the material complies with all other requirements of this specification.

Material to be supplied may be of either of the following types:

- Type where the manufacturer requires preheating of the roadway surface to a specified temperature prior to installation of the preformed thermoplastic material.
- Type where the manufacturer requires preheating of the roadway surface prior to installation of the preformed thermoplastic material to only remove moisture when necessary.

Current manufacturer installation instructions will be used to determine which type material a manufacturer produces. A copy of the instructions shall be provided to the Engineer.

When installing over existing thermoplastic markings new preformed thermoplastic pavement markings shall conform to the shape and completely adhere (fuse) to the old existing markings. Materials on this list determined not to conform to these requirements based on this verification testing will not be acceptable.

Materials failing any of the requirements of this provision will be deemed unacceptable and the Contractor shall then furnish acceptable materials meeting these requirements at no additional cost to the contract.

III. DESIGN APPLICATIONS

Crosswalks and stop lines shall be installed using preformed thermoplastic pavement markings conforming to the details and dimensions of the contract. Crosswalk lines shall be one foot wide and stop lines shall be two feet in width.

Pavement message markings and symbols shall be installed using preformed thermoplastic pavement markings conforming to the designs and dimensions detailed in the contract.

IV. MEASUREMENT AND PAYMENT

Preformed thermoplastic pavement marking will be measured in linear feet or each depending on the configuration of the message marking (linear, message or symbol) as designated in the contract and will be paid for at the contract unit price per linear foot or each as specified by the individual message marking. This price shall include furnishing pavement marking material, message or symbol, surface preparation, primer-sealer, additional surface glass beads, installation, daily log (Form C-85), guarding devices, or other incidentals recommended for installation by the manufacturer.

Payment will be made under:

Pay Item	Pay Unit
Preformed (width) Thermoplastic	Linear foot or Each

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
CONSTRUCTION QUALITY CONTROL PLAN

August 29, 2008

I. GENERAL

Minimally, the Construction Quality Control (QC) Plan must address the following:

1. Describe the Contractor's Quality Control organization, including the number of full-time equivalent employees or Sub-Contractors with specific Quality Control responsibilities, including an organizational chart showing lines of authority and reporting responsibilities.
2. List by discipline the name, qualifications, duties, responsibilities and authorities for all persons proposed to be responsible for Construction Quality Control;
3. Provide Quality Control sampling, testing and analysis plan with methods that include a description of how random locations for testing and sampling are determined;
4. Identify the laboratory(s) to be used for each type of testing;
5. Specify documentation for QC activities;
6. Provide procedures to meet contract requirements for corrective action when QC criteria are not met.

The Contractor's QC Plan shall utilize industry standard inspection procedures as well as those outlined in VDOT's Construction Manual, Materials Manual of Instruction, Road and Bridge Specifications and the minimum requirements outlined in Table 3, below.

II. CITY/VDOT RESPONSIBILITIES

Quality Assurance (QA) and Independent Assurance (IA) sampling and testing shall be performed by the City and/or VDOT to validate the Contractor's QC sampling and testing.

The City shall hold final authority for determining the acceptance of materials incorporated into the Project. The acceptance decision shall consider results of the Contractor's QC sampling and testing at specified frequencies and locations, the City/VDOT QA and IA sampling and testing at specific frequencies and locations, inspection by the City of the attributes and processes that may affect the quality of the finished product and any dispute resolution procedures to resolve discrepancies between the verification and Contractor's sampling and testing.

III. CONTRACTOR'S RESPONSIBILITIES

The Contractor shall be responsible for the quality of construction and materials incorporated into the Project. The Contractor's QC measures shall ensure that operational techniques and activities provide material of acceptable quality. Contractor sampling and testing shall be performed to control the processes and determine the degree of material compliance with the Contract.

The following Table 1 details comparison tolerances for testing which will trigger the referee and disputes processes:

Table 1 – QC/QA/IA Tolerances		
Tests	Tolerance	Source
Soil/Aggregate Wet Density using Nuclear Gauge in Direct Transmission	CL Soil – 1.91 pcf ML Soil – 2.15 pcf SP Soil – 1.86 pcf	AASHTO T 310
Soil/Aggregate Density using Sand Cone	2.0 pcf	ASTM D1556
Soil/Aggregate Moisture using Nuclear Gauge in Backscatter Position	CL Soil – 1.44 pcf ML Soil – 1.63 pcf SP Soil – 2.10 pcf	AASHTO T 310
Soil/Aggregate Moisture determined by Oven Dry	14% difference*	ASTM D2216
One Point Proctor - Density	4.5 pcf	AASHTO T 99
One Point Proctor - Moisture	15% difference*	AASHTO T 99
Concrete Slump	0.82 inch for 1" to 2" slump 1.10 inch for 3" to 4" slump 1.50 inch for 5" to 6" slump	ASTM C143
Concrete Air	0.8% points using pressuremeter 32% difference using rollerometer	AASHTO T 152 AASHTO T 196
Concrete Temperature	1 degree F	ASTM C1064
Concrete Unit Weight	2.31 pcf	AASHTO T 121
Concrete Permeability	51% difference*	AASHTO T 277
Concrete Strength	8% difference in the average of 3 cylinders	ASTM C39 ASTM C31
Asphalt Bulk Specific Gravity	0.02	AASHTO T 166
*Percent difference calculation shall be % diff $\leq \left(\frac{\text{absolute value}[W_1 - W_2]}{\{[1/2] * [W_1 + W_2]\}} \right) * 100$		

The testing of referee samples to resolve disputes shall be performed by the City/VDOT.

IV. PREPARATORY INSPECTION MEETINGS

Prior to the start of work, the Contractor shall hold a Preparatory Inspection Meeting to ensure that all project personnel have a thorough understanding of the upcoming work. The purpose of the Preparatory Inspection Meeting is to provide coordination and communication between the Contractor's production personnel, QC personnel and the City. Pay items correspond to the sections of VDOT's Road and Bridge Specifications, such as clearing and grubbing, aggregate base material and asphalt concrete items.

V. CONTRACTOR SAMPLING AND TESTING

Contractor shall perform all Quality Control (QC) testing and sampling for the project. All QC testing and sampling shall be in accordance with Virginia Department of Transportation (VDOT) ²⁰⁰⁷ Road and Bridge Specifications and the Materials Division Manual of Instructions, except that sampling and testing frequencies, at a minimum, shall conform to "Locality QC/QA/IA Frequency and Acceptance" tables included herein. All QC testing and sampling shall be performed by technicians certified by VDOT and all laboratory testing shall be performed by AASHTO Materials Reference Laboratory (AMRL) and Cement and Concrete Reference Laboratory (CCRL) accredited laboratories. All materials used in the project shall meet the requirements of the 2007 VDOT Road and Bridges Specifications as well as the Special Provisions contained herein. All materials utilized on the project shall be from VDOT approved sources and all mix designs shall be VDOT approved.

Contractor shall furnish copies of all test results to the Project Manager or other authorized City representative within 24 hours of completing the test of the acquired sample or the next day of business.

VI. RECORDS

The Contractor shall prepare separate test reports meeting the requirements of AASHTO R18 or may use the current appropriate VDOT forms. The Contractor shall also prepare, maintain and submit completed test records and final materials certification in accordance with the requirements of VDOT's Construction Manual, Materials Manual of Instruction and this Section.

VII. ACCEPTANCE

All plant manufactured materials shall be tested at the plant and accepted by VDOT in accordance with VDOT's QA/QC Programs as described in the Materials Manual of Instruction. Field testing for density shall be the responsibility of the Contractor for QC. See Section VIII VDOT Inspected and Tested Items for more information.

A cooperative effort by the Contractor and the City to identify the cause of any non-specification material or any discrepancy in the test results will include the following actions:

- i. A check of test data, calculation and results;
- ii. Observation of the Contractor's sampling and testing by the City;
- iii. Check of test equipment by the City.

When the source of test result discrepancies between the Contractor and the City/VDOT cannot be resolved, a referee split sample shall be obtained and tested; this work shall be performed by the City/VDOT. The testing of the sample shall be performed in duplicate by the laboratory without knowledge of the specific project conditions such as the identity of the Contractor, the test results of the City/VDOT and Contractor or the specification targets. The results of these tests shall be binding on both the Contractor and the City. The Contractor or its representative may witness the testing if requested. Costs incurred for referee testing shall be paid by the party found in error.

The City may elect to accept small quantities of material without normal sampling and testing frequencies. The determination to accept materials using this provision rests solely with the City. Structural Concrete shall not be considered under the small quantity definition.

An item can be accepted as a small quantity if the proposed project quantity for a specific item is less than one subplot or one-half of a subplot for mainline paving.

Factors that the City shall consider prior to use of small quantity acceptance are:

- i. Has the material been previously approved?
- ii. Is the material certified?
- iii. Is there a current mix design or reference design?
- iv. Has it been recently tested with satisfactory results?
- v. Is the material structurally significant?

Small quantity acceptance may be accomplished by visual, certification or other methods. Acceptance of small quantities of materials by these methods must be fully documented. Documentation of materials under these methods must be provided by the City. For visual documentation, an entry shall be noted on field records, with a statement as to the basis of

acceptance of the material and the approximate quantity involved. A separate list of items and quantities acceptance on visual inspection shall be maintained by the City.

VIII. VDOT INSPECTED AND TESTED ITEMS

The Contactor shall identify to the City any and all off-site fabricated materials from producers not in an existing VDOT QA/QC Program. The inspection of project-specific fabricated items shall be accomplished by VDOT. To facilitate these inspections, the Contractor shall promptly notify the City of the intended fabricator and provide two (2) copies of the Approved Shop Drawings. In addition, the Contractor shall submit a Source of Materials, Form C25, for all materials for which VDOT retains responsibility for testing.

See Table 2 below for a listing of materials for which VDOT retains responsibility for testing:

Table 2 – VDOT Off-Site Fabrication Inspection and Testing	
Item	Point of Contact
Pre-Stressed Concrete Structural Elements (AASHTO and Bulb-T beams, girders and piles)	VDOT District Materials Section
Metal Traffic Signal and Light Poles and Arms	VDOT Central Office Materials – Structures Section
Structural Steel Elements (beams and girders)	VDOT Central Office Materials – Structures Section
Pre-Cast Concrete Structures	VDOT District Materials Section
Pipe (concrete, steel, aluminum and high density polyethylene) for culverts, storm drains and underdrains	VDOT District Materials Section
Asphalt Concrete Mixtures	VDOT District Materials Section
Hydraulic Concrete Mixtures	VDOT District Materials Section
Aggregate (dense and open-graded mixes)	VDOT District Materials Section

IX. PAYMENT

The costs of all material, labor, personnel, equipment, sampling, testing, documentation and report preparation for QC sampling and testing of material under the above Construction Quality Control Plan shall be incidental to the contract bid price of the respective material. No additional compensation shall be provided for these items.

Locality QC/QA/IA Frequency / Acceptance

Soil & Aggregate

Material Type	Spec Section	Test Reference	Contractor QC Frequency/ Acceptance Testing	QA Frequency City / VDOT	IA Frequency - VDOT
Backfill	Contract Special Provisions				
Moisture Density Relations-Standard Proctor, Atterberg Limits & Grain Size Analysis (All Backfill Types)		VTM-1, VTM-7, & VTM-25	Once bi-weekly during production and with change in material	Once every 5 weeks during production	1 test per year during production; minimally perform one (1) in first five (5) tests taken for QA
In Place Density Tests:					
Box Culverts & Pipes		VTM-10	One (1) per 200 LF length, every other lift, minimum one (1) test per 500 CY; minimum one (1) test per work shift at each location and whenever there is a change in material or compaction equipment/method	One Test per 1500 CY with a minimum 1 test every 10 days of production	One per 15,000 CY, minimally perform one (1) test in first five (5) tests taken for QA
Abutments, Retaining Walls and MSE Walls		VTM-10	One (1) per 100 LF length, each lift, minimum one (1) test per 150 CY; minimum one (1) test per work shift at each location and whenever there is a change in material or compaction equipment/method	One Test per 1500 CY with a minimum 1 test every 10 days of production	One per 15,000 CY, minimally perform one (1) test in first five (5) tests taken for QA
SOILS/EMBANKMENT					
Moisture Density Relations-Standard Proctor, Atterberg Limits & Grain Size Analysis (Soils/Embankment)		VTM-1, VTM-7, & VTM-25	Once weekly during production and with change in material (Proctor for backfill will suffice if same source)	Once every 5 weeks during production	1 test per year during production; minimally perform one (1) in first five (5) tests taken for QA
Embankment in Place Density (Soils/Embankment)		VTM-10	One (1) per 500 LF interval each lift; minimum one (1) test per 500 CY; minimum one (1) test per work shift at each location and whenever there is a change in material or compaction equipment/method	One test per 5000 CY with a minimum 1 test every 10 days of production	One test per 1000 CY, or fraction thereof, with minimum of one test per project.
Subgrade -Nuclear Gauge	Sec. 305	VTM-10	One (1) test per 750 SY	One (1) test per 7,500 SY	One (1) test per 75,000 SY, minimally perform one (1) in first five (5) tests taken for QA

Locality QC/QA/IA Frequency / Acceptance

Soil & Aggregate

Material Type	Spec Section	Test Reference	Contractor QC Frequency/ Acceptance Testing	QA Frequency City / VDOT	IA Frequency - VDOT
Treated Subgrade/Subbase, Aggregate Base Material, and Cement Treated Aggregate Base Material	VDOT Sections 306, 307, & 309				
Depth Checks		VTM-38B	One test per every half mile per lane width	One test for every five miles per lane width.	One test per 4 roadway miles, or fraction thereof. Minimum of one per project, unless quantity of individual material (Base, sub- base, etc.) is less than 500 tons per project, in which case no IA test required for that material
In Place Density		VTM-10	One test per every half mile of stabilization per lane width; average of 5 readings for each nuclear test	One test for every five miles per lane width.	One test per 4 roadway miles, or fraction thereof, consisting of the average of 5 readings. Minimum of 5 readings per project, unless total quantity of individual material(Base, sub-base, etc.) is less than 500 tons per project, in which case no IA test required for that material.
Clearing and Grubbing	VDOT Section 301 & Table 105-5				
Ensure activities are confined to limits and seeded within 30 days of disturbance		N/A	Weekly during this activity	Weekly	
Erosion and Siltation Control	VDOT Section 303.03 & Current Virginia DCR Specifications & Table 105-5				
Monitor for correct installation and Maintenance		N/A	Weekly or after significant rain event.	Bi-weekly or after significant rain event.	

Locality QC/QA/IA Frequency / Acceptance

Hydraulic Cement Concrete

Material Type	Spec Section	Test Reference	Contractor QC Frequency/ Acceptance Testing	QA Frequency City / VDOT	IA Frequency - VDOT
Cast-In-Place Structures and Bridge Concrete	VDOT Section 217				
Concrete Entrained Air Content (CIP Concrete)		ASTM C231 or C173	Test every load	1 per 100 CY	One test shall be made on the same batches of concrete from which cylinders taken
Slump of Hydraulic Cement Concrete (CIP Concrete)		ASTM 143	Test every load/batch	1 per 100 CY	One test shall be made on the same batches of concrete from which cylinders taken
Temperature of Concrete (CIP Concrete)		ASTM C1064	Test every load	1 per 100 CY	One per 500 CY, minimally one (1) in first five (5) tests taken for QA
Concrete Unit Weight		ASTM C138	Test one per day of production one every 100 CY	1 per 1000 CY	One per 500 CY, minimally one (1) in first five (5) tests taken for QA
Compressive Strength of Concrete Cylinders (CIP Concrete) (Separate Deck, Superstructure tests)		ASTM C31 & C39	One (1) set of three (3) cylinders per every 100 CY and at least one set per day	One (1) set of three (3) cylinders per every 1000 CY	Minimum one set per 1000 cubic yards of structural concrete, except that IAS will not be required for projects having less than 300 cubic yards. If more than one set is needed per project, the samples should be taken from different classes. One set of 3 cylinders from the same batch as acceptance samples. At job site. All cylinders to be tested at 28 days.
Chloride Permeability Concrete Cylinders (CIP Concrete)		VTM-112	One (1) set of two (2) cylinders per every 100 CY and at least one set per day	One (1) set of two (2) cylinders per every 1000 CY	Minimum one set per 1000 cubic yards of structural concrete, except that IAS will not be required for projects having less than 300 cubic yards. If more than one set is needed per project, the samples should be taken from different classes. One set of 3 cylinders from the same batch as acceptance samples. At job site. All cylinders to be tested at 28 days.
Concrete Reinforcing Steel (CIP Concrete) elongation, yield strength and ultimate strength		ASTM A615	Verify manufacturers certificates for every shipment for acceptance prior to placement	1 sample per manufacturer per most common size per structure	1 sample per project

Locality QC/QA/IA Frequency / Acceptance

Hydraulic Cement Concrete

Material Type	Spec Section	Test Reference	Contractor QC Frequency/ Acceptance Testing	QC / QA Frequency City / VDOT	IA Frequency VDOT
Miscellaneous Concrete	VDOT Section 217				
Concrete Entrained Air Content (Miscellaneous Concrete)		ASTM C231 & C173	1 test per 100 CY with a min. 1 test per day and when cylinders are cast.	1 test per 1,000 CY with a min. 1 test every 10 days of production	One per 10,000 CY, minimally one (1) in first five (5) tests taken for QA
Slump of Hydraulic Cement Concrete (Miscellaneous Concrete)		ASTM C143	1 test per 100 CY with a min. 1 test per day and when cylinders are cast.	1 test per 1,000 CY with a min. 1 test every 10 days of production	One per 10,000 CY, minimally one (1) in first five (5) tests taken for QA
Temperature of Concrete (Miscellaneous Concrete)		ASTM C1064	1 test per 100 CY with a min. 1 test per day and when cylinders are cast.	1 test per 1,000 CY with a min. 1 test every 10 days of production	One per 10,000 CY, minimally one (1) in first five (5) tests taken for QA
Concrete Unit Weight		ASTM C138	1 test per 100 CY with a min. 1 test per day and when cylinders are cast.	1 test per 1,000 CY with a min. 1 test every 10 days of production	One per 10,000 CY, minimally one (1) in first five (5) tests taken for QA
Compressive Strength of Concrete Cylinders (Miscellaneous Concrete)		ASTM C31 & C 39	One (1) set of three (3) cylinders per every 250 CY and at least one set per day	One (1) set of three (3) cylinders per every 2500 CY (cumulative)	One (1) set of three (3) cylinders per every 25,000 CY (cumulative)
Concrete Reinforcing Steel (Miscellaneous Concrete)		ASTM A615	Verify manufacturers certificates for every shipment for acceptance prior to placement	1 sample per manufacture per most common size per structure	One (1) sample per project
Concrete Curing Materials	VDOT Section 220				
All types		See LAP Manual	Verification of LM and lot numbers from QA Supplier Approved List		

Locality QC/QA/IA Frequency / Acceptance

Asphalt Concrete Pavement

Material Type	Spec Section	Test Reference	Contractor QC Frequency/ Acceptance Testing	QA Frequency City / VDOT	IA Frequency -VDOT
Asphalt Concrete Pavement	VDOT Section 315				
By Nuclear Method In Place Pavement Density (for all asphalt except stone matrix asphalt)		VTM-76, VTM-6	Establish Roller pattern, control strips and test sections, 10 stratified random density test sites per test section (5,000 ft.)	QA=20%*QC Lots 1) e.g. 25000 ft. (7500 m) per lane width. Ten (10) stratified random samples per QA lot. Limits of QA lot should match limits of one QC lot.	IA=10%*QC Readings Observe and witness QC testing to assure gauge is calibrated and accurate. Observe and verify test sites are random and match selected sites. Verify that QC tests are done using proper procedures.
In Place Pavement Density by cores (for all asphalt except Stone Matrix Asphalt (SMA))		VTM-006; VTM-32	Density - min. 1 core per location not long enough to establish roller pattern/control strip	Density - One (1) random core per 10 QC locations	One test per 2 roadway miles, or fraction thereof. Minimum of one per project, unless combined total quantity of all asphalt concrete material is less than 500 tons per project, in which case no IA test required.
Depth Checks		VTM-32	One (1) per per 1/4 mile per lane width minimum one (1) test per roadway, maximum lot size 1 mile (4 tests)	One test per every 2.5 miles per lane width, minimum one (1) test per roadway	Future version: One test for every fifty (50) miles per lane width, minimum one test per roadway
Permanent Pavement Marking	VDOT Section 512				
Permanent Pavement Marking - Preformed Tape		VTM-94	Daily at start up with periodic checks every three hours of operation	Randomly select ten (10) twenty-foot in place sections of markings per day and measure thickness and width. Observe the bead embedment, color (night and day) and brightness/reflectivity	Review two (2) C-85 reports per month during production to verify that calculated quantities match application rates and that daily measurements are performed according to VTM 94.
Permanent Pavement Marking - Liquid Materials (Paint, thermoplastic and epoxy)		VTM-94	Daily at start up with periodic checks every three hours of operation	Randomly select ten (10) twenty-foot in place sections of markings per day and measure thickness and width. Observe the bead embedment, color (night and day) and brightness/reflectivity	Review two (2) C-85 reports per month during production to verify that calculated quantities match application rates and that daily measurements are performed according to VTM 94.

Locality QC/QA/IA Frequency / Acceptance

Miscellaneous Roadway and Structure

Material Type	Spec Section	Test Reference	Contractor QC Frequency/ Acceptance Testing	QC / QA Frequency City / VDOT	IA Frequency VDOT
Pre-cast Structures	VDOT Section 404 & Table 105-5				
Verify bedding material is installed properly and that pre-cast materials are not chipped or cracked		N/A		Daily	
Underdrains	VDOT Section 501 & Table 105-5				
Inspect to ensure no deficiencies		VTM 108	All accessible outlet locations; Additionally a minimum of 10% of longitudinal sections	Observe 10% of outlet locations; Additionally a minimum of 1% of longitudinal sections	
Guardrail	VDOT Section 505 & Table 105-5				
Verify that guardrail is installed per specifications and at proper height		N/A	Daily	Spot-check every 50lf for proper height	
Fencing	VDOT Section 507 & Table 105-5				
Verify fencing type, height and location		N/A	Daily	Weekly	
Maintenance of Traffic	VDOT Section 512 & Table 105-5				
Monitor installation and maintenance and use Work Zone Safety Checklist		N/A	Daily	Weekly	
Topsoil and Seeding	VDOT Section 602/603 & Table 105-5				
Verify proper material is utilized at application rates from plans		N/A	Daily	Weekly	
Traffic Signs	VDOT Section 512 & Table 105-5				
Verify that signs meeting current standards are utilized in locations per plans		N/A	Daily	Weekly	
Traffic Signals	VDOT Section 703 & Table 105-5				
Monitor installation for conformance with plans and specifications		N/A	Daily	Weekly	

Locality QC/QA/IA Frequency / Acceptance

Miscellaneous Roadway and Structure

Material Type	Spec Section	Test Reference	Contractor QC Frequency/ Acceptance Testing	QC / QA Frequency City / VDOT	IA Frequency VDOT
Water and Sewer Facilities	VDOT Section 520 & Table 105-5				
Monitor installation for conformance with plans and specifications		N/A	Daily	Weekly	

SPECIAL PROVISION
QUEUE DETECTION SYSTEM

The Queue Detection System shall include all items noted in the plans. The Queue Detection System shall detect a vehicle(s) stopped in the detection zone for 10 seconds or more. Upon detection, the system shall immediately preempt the master controller operations to begin minimum clearance phase time and change the Ramp D-1 phase to green. Simultaneously, the Queue Detection System shall actuate the flashing beacons on the advance warning sign located on the Expressway.

Upon clearance of all vehicles within 50 feet of the stop bar on Ramp D-1, the system will automatically deactivate the flashing beacons and allow the controller to resume normal coordinated operations.

The Contractor will field test the operation of the system and confirm proper operations in the presence of the City's representative and the manufacturer's representative prior to putting the system into service. This will include use of test vehicles provided by the Contractor, if deemed necessary by the City. Contractor shall also perform additional, similar tests, if requested by the City, until final acceptance of the project.

All labor, equipment, vehicles and incidentals to perform work required by this Special Provision shall be included in the lump sum price bid for the Queue Detection System. No separate payment will be considered for any associated services.

SPECIAL PROVISION
PRECAST CLAY PAVERS

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Clay paver units
- B. Sand setting bed and joint sand.

1.02. REFERENCES

- A. American Society of Testing Materials (ASTM):
 - 1. C902 Standard Specification for Pedestrian And Light Traffic Paving Brick
 - 2. C1272 Standard Specification for Heavy Vehicular Paving Brick
 - 3. C136 Method for Sieve Analysis for Fine and Coarse Aggregate.
 - 4. C67 Method of Sampling and Testing Brick and Structural Clay Tile.
 - 5. C33 Specification for Concrete Aggregates.
 - 6. C144-89 Standard Specification for Aggregate for Masonry Mortar.

1.03. QUALITY ASSURANCE

- A. Installation shall be by an installer with at least two years' experience and who has installed at least 200,000 sq. ft. of sand set pavers in commercial projects.

1.04. SUBMITTALS

- A. Submit shop or product drawings and product data.
- B. Submit samples of brick paving units. Clay pavers shall match type, size, color and brand as used on the adjacent sections of the Midtown Connector project.
- C. Submit sieve analysis for grading of bedding and joint sand.
- D. Submit test results for compliance of paving unit requirements to ASTM C 902 or ASTM C 1272 from an independent testing laboratory.
- E. Submit installer qualifications: provide satisfactory evidence that the installer complies with the qualifications set out in section 1.03.
- F. Schedule & Work Plan: submit a detailed schedule and work plan.

1.05. DELIVERY, STORAGE AND HANDLING

- A. Deliver brick pavers to the site in steel banded, plastic banded, or plastic wrapped cubes or on pallets capable of transfer by fork lift or clamp lift. Unload pavers at job site in such a manner that no damage occurs to the product.
- B. Sand shall be covered with waterproof covering to prevent exposure to rainfall or removal by wind. The covering shall be secured in place.

1.06. ENVIRONMENTAL CONDITIONS

- A. Do not install sand or pavers during heavy rain or snowfall.
- B. Do not install frozen sand.

PART 2 PRODUCTS

2.01. MANUFACTURED UNITS

Brick pavers may have spacer bars on each unit. These ensure a minimum joint width between each unit in which the sand is placed. Spacer bars help prevent contact of the edges with adjacent pavers and subsequent chipping. Manually installed pavers may be installed with or without spacer bars.

- A. Brick pavers shall be A Grade pavers manufactured/supplied by a member of the Brick Institute of America (BIA).
- B. Pavers shall meet the following requirements set forth in ASTM C 902, Specification for Pedestrian and Light Traffic Paving Brick or C 1272 Specification for Heavy Vehicular Paving Brick and shall conform to the PX standard.
 - 1. Minimum average compressive strength of 10,000 psi.
 - 2. The average cold water absorption shall not be greater than 6% with no individual unit testing greater than 7%. Absorption test results may not be achieved through the use of sealers or other products applied to the clay paver. (Sealer protection degrades over time requiring re-application after several years.)
 - 3. Resistance of 50 freeze-thaw cycles, when tested in accordance with ASTM C67. In addition the clay paver must pass CSA-A231.2 freeze thaw test in saline solution without the use of sealers or other products applied to the paver. A test report must be submitted by the manufacturer. (Salt is the most common

substance used for de-icing during the winter months.)

4. Dimensional tolerances should meet the PX standard. The dimensional tolerances around the mean values for length, width, and depth shall be 1/16". (Studies show that dimensional tolerances are directly linked to joint width size and proper interlock.)
5. The pavers should be solid units without core holes or other perforations.
6. The contractor shall ensure that the manufacturer conducts a test sampling of 24 pavers every 50,000 pavers manufactured to determine the pavers compliance with dimensional and water absorption characteristics. The 24 paver sample shall be representative of the color mix in the typical finished package and chosen on a consistent basis from one kiln car. (Proper control procedures and testing are standard operating procedure for high quality manufacturers.)

2.02. BEDDING AND JOINT SAND

The type of sand used for bedding is often called concrete sand. Sands vary regionally. Contact paver installers local to the project and confirm sand(s) successfully used in previous similar applications.

- A. Bedding and joint sand shall be clean, non-plastic, free from deleterious or foreign matter. The sand shall be natural or manufactured from crushed rock. Grading of samples shall be done according to ASTM C136. The particles shall be sharp and conform to the grading requirements of ASTM C33 as shown in Table 1.

Table 1
Grading Requirements for Bedding and Joint Sand

Sieve Size	Percent Passing
3/8 in.	100
No. 4	95 to 100
No. 8	80 to 100
No. 16	50 to 85
No. 30	25 to 60
No. 50	10 to 30
No. 100	2 to 10

2.03. EDGE RESTRAINTS

- A. Edge restraints are required on all installations. Edge restraints are to be pre-cast or cast-in-place concrete, plastic, or steel as specified in the drawings. Install as per manufacturer's specifications.

2.04. JOINT SAND STABILIZERS (IF APPLICABLE)

Joint sand stabilizers prevent sand loss and maintain interlock which is critical in situations where sand loss could be a problem. Some situations typically requiring joint sand stabilizers are at the bottom of a grade, areas where rain water runoff is not caught by gutters, and crosswalks. Please consult the allied products section on our web site for information on joint sand stabilizers. Always follow the manufacturer's recommendations for installation of these products.

2.05. FILTER GEOTEXTILE (IF APPLICABLE)

- A. The woven geotextile fabric shall be MIRAFLI 700X supplied by Mirafi, Inc., Charlotte, NC or equal.

PART 3 EXECUTION

For installations on a compacted gravel base the subgrade shall be compacted to a minimum of 95% modified proctor density. Compacted aggregate shall be applied in even lifts of 4" and also compacted to a minimum of 95% modified proctor density. The specifier should be aware that the top surface of the pavers may be 1/8 to 1/4 inch above the final elevations after compaction. This difference in initial and final elevations is to compensate for possible minor settling.

3.01 EXAMINATION

- A. Verify that base is dry, uniform, even and ready to support sand, pavers and imposed loads.
- B. Verify gradients and elevations of base are correct.
- C. Verify location, type, installation and elevations of edge restraints around the perimeter area to be paved.
- D. Beginning of installation means acceptance of base and edge restraints.

3.02 INSTALLATION

- A. Provide edge restraints as indicated - install edge restraints prior to placing unit pavers.
- B. Lay Filter Geotextile (if applicable) along edges where indicated in the drawings. Place geotextile over the compacted base course overlapping ends and edges at least 12 inches.
- C. Spread the sand evenly over the base course and screed to 1 - 1 ½ inches thickness. The screeded sand should not be disturbed. Sufficient sand shall be placed to ensure that no delay occurs in laying pavers. The screeded bedding sand shall not be subjected to any traffic by either mechanical or pedestrian use.
- D. Ensure that pavers are free of foreign material before installation. The installer shall take the pavers from the pallet by row consisting of 18 pavers. Each row shall be installed together to ensure proper color mix.
- E. Lay the pavers in the pattern(s) as shown on the drawings. Full pavers are to be laid first. The pavers should be laid hand tight. Maintain straight pattern lines and adjust as necessary.
- F. Joints between the pavers shall be between 1/16 inch wide.
- G. Fill gaps at the edges of the paved area with cut pavers or edge units. Cut pavers to be placed along the edge using a masonry saw and in such a manner that no segment is smaller than one quarter of a full paver.
- H. Use a low amplitude, high frequency plate vibrator capable of 3000 to 5000 lbs. centrifugal compaction force to vibrate the pavers into the sand. Vibrate the pavers, sweeping dry sand into the joints and vibrating until they are full. This will require at least two or three passes with the vibrator. Do not vibrate within three feet of the unrestrained edges of the paving units. (A plate vibrator is not recommended for straight edge pavers, instead use a hand tamp and board method for compaction)
- I. All work to within three feet of the laying face must be left fully compacted with sand-filled joints at the completion of each day.
- J. Sweep off excess sand when the job is complete. Contractor shall return to the site one month after installation is complete to inspect sand in joints. Contractor is responsible for adding additional sand to fill joints where necessary.
- K. The final surface elevations shall not deviate more than 3/8 inch under a 10 foot long straightedge.
- L. The surface elevation of pavers shall be 1/8 to 1/4 inch above adjacent drainage inlets, concrete collars or channels.

3.03 JOINT SAND STABILIZER APPLICATION (if applicable)

- A. The surface shall be made clean and free from oil, dust from cutting and any loose material prior to the application of an epoxy joint sand stabilizer. (Any sand or dirt left on the pavers during sealing WILL BE SEALED TO THE PAVER. It is extremely difficult to correct this mistake!) The surface and joint sand shall be dry for its full depth prior to commencing work.
- B. The treated area shall be protected from rain or moisture and shall not be trafficked for 24 hours after the completion of the stabilizer application.

3.04 FIELD QUALITY CONTROL

- A. After removal of excess sand, check final elevations for conformance to the drawings.

3.05 PROTECTION AND CLEAN UP

A. Protection:

- 1. Protect work from damage, discoloration and theft.
- 2. All vehicles and equipment operating on the completed pavers before and after application of the joint sand stabilizer shall be maintained in a clean condition, so that oil, tar, rubber or other matter is not deposited on the surface of the pavers or adjacent paving and features.

B. Clean up:

- 1. All materials generated by construction work in this section shall be removed at the end of each section of the work and the site shall be left in a clean and safe condition.
- 2. After completion of any repair work, clean all exposed surfaces with clean water and stiff brushes until all stains and dirt are removed. Use cleaning solutions only that are recommended by the paver and stabilizer manufacturers and do not use wire brushes.

3.06 MAINTENANCE

A. Repairs:

- 1. Repair or replace any damaged work to the original specified condition.

2. Where lateral displacement of the pavers has occurred adjacent to edge restraints the cut pavers shall be replaced with new pavers of the correct size to comply with the specified joint widths and the surface shall be re-established.

B. Maintenance:

1. The installer shall return to the site at the Owners request over a period of one year from handover to rectify any problems in the work caused by its failure to adequately align the pavers, compact the bedding sand or fill the joints.

3.07 MEASUREMENT AND PAYMENT

Precast clay pavers shall be paid for at the lump sum price bid, complete-in-place, including all labor, equipment and materials, excavation, compaction, disposal of excess material, all types of clay pavers required, spacers, bedding material, joint sand, edge restraints, filter geotextile, aggregate base material, repairing damaged pavers and any other items required for a complete installation.

Payment will be made under:

Pay Item	Pay Unit
Precast Clay Pavers	Lump Sum

END OF SECTION

SPECIAL PROVISION
PRECAST CONCRETE PAVERS

PART 1 GENERAL

1.01. SECTION INCLUDES

- A. Concrete paver units
- B. Sand setting bed and joint sand

1.02. REFERENCES

- A. American Society of Testing Materials (ASTM):
 - 1. C1272 Standard Specification for Heavy Vehicular Paving Brick
 - 2. C136 Method for Sieve Analysis for Fine and Coarse Aggregate.
 - 3. C67 Method of Sampling and Testing Brick and Structural Clay Tile.
 - 4. C33 Specification for Concrete Aggregates.
 - 5. C144-89 Standard Specification for Aggregate for Masonry Mortar.

1.03. QUALITY ASSURANCE

- A. Installation shall be by an installer with at least two years' experience and who has installed at least 200,000 sq. ft. of sand set pavers in commercial projects.

1.04. SUBMITTALS

- A. Submit shop or product drawings and product data.
- B. Submit samples of concrete paving units. Concrete pavers shall match type, size, color and brand as used on the adjacent sections of the Midtown Connector project.
- C. Submit sieve analysis for grading of bedding and joint sand.
- D. Submit test results for compliance of paving unit requirements to ASTM C 902 or ASTM C 1272 from an independent testing laboratory.
- E. Submit installer qualifications: provide satisfactory evidence that the installer complies with the qualifications set out in section 1.03.
- F. Schedule & Work Plan: submit a detailed schedule and work plan.

1.05. DELIVERY, STORAGE AND HANDLING

- A. Deliver concrete pavers to the site in steel banded, plastic banded, or plastic wrapped

cubes or on pallets capable of transfer by fork lift or clamp lift. Unload pavers at job site in such a manner that no damage occurs to the product.

- B. Sand shall be covered with waterproof covering to prevent exposure to rainfall or removal by wind. The covering shall be secured in place.

1.06. ENVIRONMENTAL CONDITIONS

- A. Do not install sand or pavers during heavy rain or snowfall.
- B. Do not install frozen sand.

PART 2 PRODUCTS

2.01. MANUFACTURED UNITS

- A. Concrete pavers may have spacer bars on each unit. These insure a minimum joint width between each unit in which the sand is placed. Spacer bars help prevent contact of the edges with adjacent pavers and subsequent chipping. Manually installed pavers may be installed with or without spacer bars.
- B. Concrete pavers shall be A Grade pavers manufactured/supplied by a member of the Brick Institute of America (BIA).
- C. Pavers shall meet the following requirements set forth in C 1272 Specification for Heavy Vehicular Paving Brick and shall conform to the PX standard.
 - 1. Minimum average compressive strength of 10,000 psi.
 - 2. The average cold water absorption shall not be greater than 6% with no individual unit testing greater than 7%. Absorption test results may not be achieved through the use of sealers or other products applied to the concrete paver. (Sealer protection degrades over time requiring re-application after several years.)
 - 3. Resistance of 50 freeze-thaw cycles, when tested in accordance with ASTM C67. In addition the clay paver must pass CSA-A231.2 freeze thaw test in saline solution without the use of sealers or other products applied to the paver. A test report must be submitted by the manufacturer. Salt is the most common substance used for de-icing during the winter months.
 - 4. Dimensional tolerances should meet the PX standard. The dimensional tolerances around the mean values for length, width, and depth shall be 1/16". (Studies show that dimensional tolerances are directly linked to joint width size and proper interlock.)

5. The pavers should be solid units without core holes or other perforations.
6. The contractor shall ensure that the manufacturer conducts a test sampling of 24 pavers every 50,000 pavers manufactured to determine the pavers compliance with dimensional and water absorption characteristics. The 24paver sample shall be representative of the color mix in the typical finished package and chosen on a consistent basis from one kiln car. (Proper control procedures and testing are standard operating procedure for high quality manufacturers.)

2.02. BEDDING AND JOINT SAND

The type of sand used for bedding is often called concrete sand. Sands vary regionally. Contact paver installers local to the project and confirm sand(s) successfully used in previous similar applications.

- A. Bedding and joint sand shall be clean, non-plastic, free from deleterious or foreign matter. The sand shall be natural or manufactured from crushed rock. Grading of samples shall be done according to ASTM C136. The particles shall be sharp and conform to the grading requirements of ASTM C33 as shown in Table 1.

Table 1
Grading Requirements for Bedding and Joint Sand

Sieve Size	Percent Passing
3/8 in.	100
No. 4	95 to 100
No. 8	80 to 100
No. 16	50 to 85
No. 30	25 to 60
No. 50	10 to 30
No. 100	2 to 10

2.03. EDGE RESTRAINTS

- A. Edge restraints are required on all installations. Edge restraints are to be pre-cast or cast-in-place concrete, plastic, or steel as specified in the drawings. Install as per manufacturer's specifications.

2.04. JOINT SAND STABILIZERS (IF APPLICABLE)

Joint sand stabilizers prevent sand loss and maintain interlock which is critical in situations where sand loss could be a problem. Some situations typically requiring joint sand stabilizers are at the bottom of a grade, areas where rain water runoff is not caught by gutters, and crosswalks. Please consult the allied products section on our web site for information on joint sand stabilizers. Always follow the manufacturer's recommendations for installation of these products.

2.05. FILTER GEOTEXTILE (IF APPLICABLE)

- A. The woven geotextile fabric shall be MIRAFI 700X supplied by Mirafi, Inc., Charlotte, NC or approved equal.

PART 3 EXECUTION

For installations on a compacted gravel base the sub-grade shall be compacted to a minimum of 95% modified proctor density. Compacted aggregate shall be applied in even lifts of 4" and also compacted to a minimum of 95% modified proctor density. The specifier should be aware that the top surface of the pavers may be 1/8 to 1/4 inch above the final elevations after compaction. This difference in initial and final elevations is to compensate for possible minor settling.

3.01. EXAMINATION

- A. Verify that base is dry, uniform, even and ready to support sand, pavers and imposed loads.
- B. Verify gradients and elevations of base are correct.
- C. Verify location, type, installation and elevations of edge restraints around the perimeter area to be paved.
- D. Beginning of installation means acceptance of base and edge restraints.

3.02. INSTALLATION

- A. Provide edge restraints as indicated - install edge restraints prior to placing unit pavers.
- B. Lay Filter Geotextile (if applicable) along edges where indicated in the drawings. Place geotextile over the compacted base course overlapping ends and edges at least 12 inches.
- C. Spread the sand evenly over the base course and screed to 1 - 1 1/2 inches thickness. The

screeded sand should not be disturbed. Sufficient sand shall be placed to ensure that no delay occurs in laying pavers. The screeded bedding sand shall not be subjected to any traffic by either mechanical or pedestrian use.

- D. Ensure that pavers are free of foreign material before installation. The installer shall take the pavers from the pallet by row consisting of 18 pavers. Each row shall be installed together to ensure proper color mix.
- E. Lay the pavers in the pattern(s) as shown on the drawings. Full pavers are to be laid first. The pavers should be laid hand tight. Maintain straight pattern lines and adjust as necessary.
- F. Joints between the pavers shall be between 1/16 inch and 1/8 inch (2 to 3 mm) wide.
- G. Fill gaps at the edges of the paved area with cut pavers or edge units. Cut pavers to be placed along the edge using a masonry saw and in such a manner that no segment is smaller than one quarter of a full paver.
- H. Use a low amplitude, high frequency plate vibrator capable of 3000 to 5000 lbs. centrifugal compaction force to vibrate the pavers into the sand. Vibrate the pavers, sweeping dry sand into the joints and vibrating until they are full. This will require at least two or three passes with the vibrator. Do not vibrate within three feet of the unrestrained edges of the paving units. (A plate vibrator is not recommended for straight edge pavers, instead use a hand-tamp and board method for compaction)
- I. All work to within three feet of the laying face must be left fully compacted with sand-filled joints at the completion of each day.
- J. Sweep off excess sand when the job is complete. Contractor shall return to the site one month after installation is complete to inspect sand in joints. Contractor is responsible for adding additional sand to fill joints where necessary.
- K. The final surface elevations shall not deviate more than 3/8 inch under a 10 foot long straightedge.
- L. The surface elevation of pavers shall be 1/8 to 1/4 inch above adjacent drainage inlets, concrete collars or channels.

3.03. JOINT SAND STABILIZER APPLICATION (if applicable)

- A. The surface shall be made clean and free from oil, dust from cutting and any loose material prior to the application of an epoxy joint sand stabilizer. (Any sand or dirt left on the pavers during sealing WILL BE SEALED TO THE PAVER. It is extremely difficult to correct this mistake!) The surface and joint sand shall be dry for its full depth prior to commencing work.

- B. The treated area shall be protected from rain or moisture and shall not be trafficked for 24 hours after the completion of the stabilizer application

3.04. FIELD QUALITY CONTROL

- A. After removal of excess sand, check final elevations for conformance to the drawings.

3.05. PROTECTION AND CLEAN UP

A. Protection:

1. Protect work from damage, discoloration and theft.
2. All vehicles and equipment operating on the completed pavers before and after application of the joint sand stabilizer shall be maintained in a clean condition, so that oil, tar, rubber or other matter is not deposited on the surface of the pavers or adjacent paving and features.

B. Clean up:

1. All materials generated by construction work in this section shall be removed at the end of each section of the work and the site shall be left in a clean and safe condition.
2. After completion of any repair work, clean all exposed surfaces with clean water and stiff brushes until all stains and dirt are removed. Use cleaning solutions only that are recommended by the paver and stabilizer manufacturers and do not use wire brushes.

3.06. MAINTENANCE

A. Repairs:

1. Repair or replace any damaged work to the original specified condition.
2. Where lateral displacement of the pavers has occurred adjacent to edge restraints the cut pavers shall be replaced with new pavers of the correct size to comply with the specified joint widths and the surface shall be re-established.

B. Maintenance:

1. The installer shall return to the site at the Owners request over a period of one year from handover to rectify any problems in the work caused by its failure to adequately align the pavers, compact the bedding sand or fill the joints.

3.07. MEASUREMENT AND PAYMENT

Precast concrete pavers shall be paid for at the lump sum price bid, complete-in-place, including all labor, equipment and materials, excavation, compaction, disposal of excess material, all types of concrete pavers required, spacers, bedding material, joint sand, edge restraints, filter geotextile, aggregate base material, repairing damaged pavers and any other items required for a complete installation.

Payment will be made under:

Pay Item	Pay Unit
Precast Concrete Pavers	Lump Sum

END OF SECTION

**SPECIAL PROVISION FOR
MECHANICALLY STABILIZED EARTH (MSE)
RETAINING STRUCTURE (CONCRETE PANEL FACING)**

1.0 DESCRIPTION

This work shall consist of furnishing and constructing Mechanically Stabilized Earth (MSE) retaining structure in accordance with these specifications and in reasonably close conformity with the lines, grades, dimensions, and design shown on the plans or established by the Engineer. This specification is intended to cover MSE retaining structures utilizing discrete concrete panel facing as approved by VDOT Structure and Bridge Division.

2.1 SUBMITTALS

The Contractor shall submit working drawings, shop plans, and design calculations, signed and sealed by a Virginia Registered Professional Engineer, to the Engineer for review by the Department. The Contractor shall allow 30 days from the day the submittals are received by the Department for review and approval. Fabrication or any wall construction shall not begin prior to the approval of the design, working drawings and shop plans. Approval of the Contractor's working drawings and shop plans shall not relieve the Contractor of any of his responsibility under the contract for the successful completion of the work.

2.2 Working Drawings and Shop Plans

The working drawings and shop plans shall reflect all information needed to fabricate and erect the walls including:

- a. Elevations at the top of wall at all the horizontal and vertical break points and at interval not exceeding 50 feet along the wall;
- b. Elevations at the top of leveling pad step breaks;
- c. Elevation of the finished grade in front of the wall;
- d. The number, size, type, length, and details of the soil reinforcing elements in each design section;
- e. The locations and sizes of all pipes and utilities that will be penetrating the wall face or within the soil reinforced mass;
- f. Typical cross-section or cross-sections showing the elevation relationship between ground conditions and proposed grades;
- g. Details for construction of wall around obstructions (i.e. drainage facilities, utilities, overhead sign footing, piles, drilled shafts) within the reinforced backfill;
- h. Details pertaining to coping, parapets, railing, as required by the contract plans;
- i. Shape, dimension, and designation of wall panel;

j. Details of the architectural or finish treatment supplied.

2.2 Design Calculations

The proposed design shall satisfy the design parameters and requirements in the plans and in the special provisions. Complete design calculations shall include the most critical geometry and loading combination for each design section that exist during construction and at the end of construction.

3.1 MATERIALS

The Contractor shall make arrangements to purchase or manufacture the facing elements, metallic reinforcing mesh or strips, geosynthetic geogrids, connection devices, joint materials, and all other necessary components. Material not conforming to this section of the specifications shall not be used without the written consent from the Engineer.

3.2 Reinforced Concrete Face Panels

Concrete for face panel units shall be Class A4 conforming to the requirements of Section 217 of the Specifications except that the maximum water/cement ratio shall be 0.47. Panel steel reinforcement shall meet the requirements of Section 223 of the Specifications.

Panel steel reinforcement, connection devices, and lifting devices shall be set in place to the dimensions and tolerances shown on the plans prior to casting.

3.2.1. Testing and Inspection

The Contractor or his supplier shall furnish facilities and shall perform all necessary sampling and testing in an expeditious and satisfactory manner. Panels will be considered acceptable for placement in the wall when control cylinder tests exceed 85% of 28 day design strength requirements.

3.2.2. Casting

Concrete panels shall be cast on a flat area; the front face of the form at the bottom and the back face at the upper part. Galvanized connection devices shall be set on the rear face. The concrete in each unit shall be placed without interruption and shall be consolidated by the use of an approved vibrator, supplemented by such hand-tamping as may be necessary to force the concrete into the corners of the forms and prevent the formation of stone pockets or cleavage planes. Clear form oil of the same manufacture shall be used throughout the casting operation.

3.2.3. Curing

Panel units shall be cured in accordance with the requirements of Section 404.03 (k) of the Specifications. Any panel concrete placement that does not reach specified design strength within 28 days will be rejected as determined by concrete control cylinders.

3.1.4. Removal of Forms

The forms shall remain in place for a minimum of 20 hours or when control cylinder tests indicate that the concrete has attained at least 20% of the 28-day design requirement in accordance with the requirements of Section 404.03 (j) of the Specifications.

3.1.5. Concrete Finish and Tolerances

Unless otherwise shown on the plans, concrete surface for the front face shall be a Class 1 finish conforming to the requirements of Section 404 of the Specifications or as detailed on the plans and a uniform surface finish on the rear face. Rear face of the panel shall be screeded to eliminate open pockets of aggregate and surface distortions in excess of 1/4 inch.

3.1.6. Tolerances

- All panel units shall be manufactured within the following tolerances:
- Lateral position of connection devices within 1 inch.
- All other panel dimensions within 3/16 inch.
- Squareness, as determined by the difference between the two diagonals, shall not exceed ½ inch.
- Surface irregularities on smooth formed surfaces measured on a length of 5 feet shall not exceed 1/8 inch. Surface irregularities on textured-finish surfaces measured on a length of 5 feet shall not exceed 5/16 inch.

3.1.7. Rejection

Panel units will be subject to rejection because of failure to meet any of the requirements specified above. In addition, any of the following defects will be sufficient cause for rejection:

- Defects that indicate imperfect molding.
- Defects such as chipped or broken concrete.
- Defects indicating honeycombed or open texture concrete.
- Color variations on the front face of panel due to excess form oil or other reason.

3.1.8. Marking

The date of manufacture, production lot number, and piece mark shall be clearly scribed on the rear face of each panel unit.

3.1.9. Handling, Storage and Shipping

All panel units shall be handled, stored and shipped in such manner as to eliminate the danger of chipping, cracks, fractures and excessive bending stresses. Panel units shall be removed from

casting beds by an approved four-point pick up method. Panel units in storage shall be supported on firm blocking to protect the panel connection devices and the exposed exterior finish.

3.2 Steel Soil Reinforcing and Connection Devices

3.2.1 Metallic Reinforcing Strips

Reinforcing strips shall be hot rolled or cold formed from bars or coil to the required shape and dimensions. Their physical and mechanical properties shall conform to ASTM A-36, ASTM A-572 Grade 65, or ASTM A-1011 Grade 65. Galvanization for reinforcing strips shall conform to the requirements of ASTM A-123 and the minimum coating thickness shall be 2 oz/sf (or 3.4mils).

3.2.2 Metallic Reinforcing Mesh and Bar Mats

Reinforcing mesh shall be shop fabricated of cold drawn steel wire conforming to the requirements of ASTM A-82 and shall be welded into the finished mesh fabric in accordance with the requirements of ASTM A-185, except that, the minimum average shear stress of the weld shall be at least 35,750 psi. The reinforcing mesh manufacturer shall provide certification that the minimum average weld shear strength is adequate for the proposed design and provides a reasonable safety factor.

Galvanization shall be applied after the mesh is fabricated and conform to the requirements of ASTM A-123 and the minimum coating thickness shall be 2 oz/sf (or 3.4mils).. Any damage to the galvanizing shall be repaired in accordance with the requirements of Section 233 of the Specifications.

3.2.3 Tie Strips/Lug

Tie strips/lug shall be shop fabricated of hot rolled or cold formed steel conforming to the requirements of ASTM A-570, Grade 50 or ASTM A-1011 Grade 50. Galvanization shall conform to ASTM A-123 and the minimum coating thickness shall be 2 oz/sf (or 3.4 mils).

3.2.4 Fasteners

Bolts and nuts shall conform to the requirements of ASTM A-325, ASTM A-449, or ASTM A-563 and shall be galvanized in accordance with ASTM A-153 and minimum coating thickness of 2 oz/sf (or 3.4 mils).

3.2.5 Connection Devices

Connection loop shall be fabricated of cold drawn steel wire conforming to the requirements of ASTM A-82 and welded in accordance with the requirements of ASTM A185. Connector bars shall be fabricated of cold drawn steel wire conforming to the requirements of ASTM A-82 and galvanized in accordance with ASTM A-123.

All connection devices shall be galvanized in accordance with the requirements of ASTM A-123 or approved equal and minimum coating thickness shall be 2 oz/sf (or 3.4 mils).

3.3 Geosynthetic Soil Reinforcing and Connection Devices

3.3.1 Geogrids

Geogrids shall be structural geogrids formed by uniaxially drawing a continuous sheet of high density polyethylene material. Geogrids shall be a regular network of integrally connected polymer tensile elements with aperture geometry sufficient to permit significant mechanical interlock with the surrounding soil or rock. Structure of geogrid reinforcement shall be dimensionally stable and able to retain its geometry under manufacture, transport and installation.

3.3.2 Delivery, Storage, and Handling

The Contractor shall check the geogrid reinforcement upon delivery to assure that the proper grade and type of material has been received. Rolled geogrid shall be stored in accordance with the manufacturer's recommendations. During all period of shipment and storage, geogrid reinforcement shall prevent wet cement, epoxy and like materials from coming in contact with and affixing to the geogrids.

3.3.3 Connection Devices

Connection devices, such as bars, pins, plates etc, shall consist of non-degrading polymer and be made for the express use with the geogrids supplied.

3.4 Joint Materials

3.4.1. Joint Cover

If required, cover all joints between panels on the back side of the wall with a geotextile meeting the requirements for drainage fabric as specified in Section 245. Use adhesive approved by the manufacturer to attach the geotextile to the panel. The minimum width and lap shall be 12 inches.

3.4.2. Bearing Pads

Provide in horizontal joints between panels preformed EPDM rubber pads conforming to ASTM D-2000 for 4AA, 812 rubbers, neoprene elastometric pads having a Durometer Hardness of 55±5, or high density polyethylene pads with a minimum density of 59.06 lb/ft³ in accordance with ASTM 1505.

3.4.3 Joint Filler

If required, provide flexible foam strips as recommended by wall manufacturer for filler for vertical and inclined joints between panels, and in horizontal joints where pads are used, where indicated on the plans.

3.5 Select Backfill Material

Select backfill material used in the structure volume shall be reasonably free from organic material, shale or other poor durability particles and otherwise deleterious materials. The backfill shall conform to the following grading as determined by AASHTO T-27:

Sieve Size	Percent Passing
4"	100
No. 40	0 - 60
No. 200	0 - 15

The Plasticity Index (P.I.) of the backfill material as determined by AASHTO T-90 shall not exceed 6. Backfill material shall exhibit an angle of internal friction of not less than 34 degrees, as determined by the standard Direct Shear Test, AASHTO T236, on the portion finer than the #10 sieve, using a sample of the material compacted to 95 percent of AASHTO T99, Methods C or D, with oversized correction as outlined in Note 7, at optimum moisture content. No testing is required for material where 80 percent of sizes are greater than 3/4 inch.

Backfill material shall have a magnesium sulfate soundness loss of less than 30 percent after four cycles.

Additionally, the backfill material shall conform to the following electrochemical requirements:

- For metallic soil reinforcements:

Requirements	AASHTO Test Methods
a) pH range between 5.0 and 10.0	T289
b) Resistivity greater than 3,000 ohm-cm	T288
c) Chlorides less than 100 ppm	T291
d) Sulfates less than 200 ppm	T290
e) Organic Content less than 1%	T267

If resistivity is greater or equal to 5000 ohm-cm, the chlorides and sulfates requirements may be waived.

- For geosynthetic soil reinforcements:

Polyolefin Polymer (Polypropylene and High Density Polyethylene):

Requirement	AASHTO Test Methods
a) pH range between 3.0 and 11.0	T289

The Contractor shall perform analysis tests for each source of material and shall perform such additional tests to assure conformance whenever the character of the select backfill material changes. All tests shall be performed by laboratories that are AASHTO Materials Reference Laboratory (AMRL) accredited.

The Contractor shall furnish the Engineer a Certificate of Compliance certifying the furnished select backfill materials comply with the aforementioned requirements. Test results performed by the Contractor necessary to assure contract compliance shall also be furnished the Engineer.

3.6 Cast-In-Place Concrete

Concrete for leveling pads and wall top coping shall be Class A3 conforming to the requirements of

Section 217 of the Specifications.

3.7 Moment Slab Reinforcing Steel

Corrosion resistant reinforcing (CRR) steel shall be used in moment slab and shall be the same type of

CRR steel specified for parapet as shown on plans.

4.1 CONSTRUCTION REQUIREMENTS

4.2 Wall Excavation

Wall excavation shall be unclassified in accordance with the requirements of Sections 506 and 401 of the Specifications and shall be performed in reasonably close conformity to the limits and construction stages shown on the plans.

4.2 Foundation Preparation

The foundation for the structure shall be graded level for a width equal to or exceeding the length of reinforcement or as shown on the Plans. Prior to wall construction, the foundation shall be compacted in accordance with the embankment requirements of Section 303.04 (h) of the Specifications and graded to a relatively smooth and uniform surface. Any foundation soils found to be unsuitable shall be removed and replaced with select backfill as per Materials of these specifications.

At each panel foundation level, an unreinforced concrete leveling pad shall be provided as shown on the plans. Leveling pads shall be level within 1/8 inch per pad or per 100 feet, whichever is greater. The pad shall be cured a minimum of 12 hours before placement of wall panels.

4.3 Wall Erection

Precast concrete panels shall be placed vertically with the aid of a crane or other suitable equipment.

For erection, panels shall be handled by means of a lifting device set into the upper edge of the panels. Panels shall be placed in successive horizontal lifts in the sequence shown on the plans as backfill placement proceeds. As fill material is placed behind a panel, the panels shall be maintained in vertical position by means of temporary wooden wedges placed in the joint at the junction of the two adjacent panels on the external side of the wall. External bracing may also be required for the initial lift. Vertical tolerances (plumbness) and horizontal alignment tolerance

shall not exceed 3/4 inch when measured along a 10-foot straight edge. The maximum allowable lateral offset at any panel joint shall be 3/4 inch. The overall vertical tolerance of the wall (plumbness from top to bottom) shall not exceed 1/2 inch per 10 feet of wall height.

4.4 Select Backfill Placement

The placement of the select backfill material shall closely follow the erection of each lift of panels. At each reinforcing element level, backfill shall be roughly leveled before placing and attaching reinforcement to the panel. Unless otherwise shown on the plans, reinforcement shall be placed normal to the face of the wall. The maximum lift thickness shall not exceed 8 inches loose and shall closely follow panel erection. The Contractor shall decrease this lift thickness if necessary to obtain the specified density.

Backfill shall be compacted to 95% of the maximum density as determined by AASHTO T-99,

Method C or D with oversize correction as outlined in Note 7. For backfills containing more than 80 percent material retained on the 3/4 inch sieve, a method of compaction consisting of at least four passes with a heavy roller shall be used. For applications where spread footings are used to support bridge or other structural loads, the top 5 feet below the footing elevation shall be compacted to 100 percent AASHTO T-99. The moisture content of the backfill material prior to and during compaction shall be uniformly distributed throughout each layer. Backfill material shall have a placement moisture content equal to the optimum moisture content. Moisture content may be up to 2 percentage points less than optimum moisture content.

Prior to placement of any backfill, geogrid shall be pulled taut to remove slack. The backfill shall be placed in a manner that geogrid remains taut. Tracked construction equipment shall not operate directly on geogrid. A minimum fill thickness of 6 inches over the geogrid is required prior to operation of tracked vehicles. Rubber tired equipment may pass over the geogrid at speeds less than 10 mph. Sudden braking and sharp turning shall be avoided.

At the end of each day's operations, the Contractor shall shape the last level of backfill as to permit runoff of rainwater away from the wall face. Backfill compaction shall be accomplished without disturbance or distortion of reinforcing elements and panels. Compaction adjacent to the backside of the wall in a strip 3 feet wide shall be achieved using mechanical hand tampers. No compaction density tests are required within 3 feet from the back face of wall.

4.5 Cast-In-Place Concrete

Concrete work for leveling pads and wall top coping shall be performed in accordance with the requirements of Section 404 of the Specifications.

5.0 MEASUREMENT AND PAYMENT

The Mechanically Stabilized Earth (MSE) retaining structure shall be paid for as a lump sum item.

Unless otherwise defined on the plans, payment shall be full compensation for all design; excavation; temporary shoring when not specified on the wall plans or in the proposal as a separate pay item; concrete footing; leveling pads; face panels; copings; moment slabs; concrete

railing and metal railing on MSE wall; masonry; reinforcing steel; steel or geosynthetic soil reinforcements, select backfill material; backfilling; compaction; joint materials; riprap to fill temporary excavation, including all work necessary outside the retainage area shown on the plans; disposal offsite or onsite, where permitted by the Engineer, of unsuitable or surplus material; and all materials, labor, tools, equipment, and incidentals necessary to complete the work.

Payment will be made under:

Pay Item	Pay Unit
MSE Retaining Structure	Lump Sum

Miscellaneous