2016 ROAD AND BRIDGE SPECIFICATIONS

DIVISION IV—BRIDGES AND STRUCTURES

SPECIAL PROVISION COPIED NOTES (SPCNs), SPECIAL PROVISION (SPs) and SUPPLEMENTAL SPECIFICATIONS (SSs)

Specifications may also be found at the following locations:

- VDOT Web (Global Web Access)
- OutsideVDOT_ (Accessible by permission only)
- http://www.virginiadot.org/business/resources/const/2016Rev.zip ("zip" file [compressed WORD®])

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GUIDELINES — For projects requiring exposed aggregate finish for soundwalls, curb cut ramps, curbs and/or parapets. {2007-c504c00}

cn404-000100-00

EXPOSED AGGREGATE FINISH shall be performed by wirebrushing, blasting or surface retarder unless another method is approved by the Engineer.

Concrete for exposed aggregate finish shall conform to Section 217 of the Specifications for the class specified, except gravel shall be tan or light brown in color.

The Contractor shall provide a sample of the exposed aggregate finish for approval by the Engineer prior to beginning work. The sample shall be at least 12 inches by 12 inches and approximately 2 inches in depth. The approved sample shall be kept at the work site for comparison to completed work.

7-12-16 (SPCN)

GUIDELINES — For use in contracts involving construction of new bridge substructures.

SP401-000100-01

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
CLEARING AND GRUBBING AT BRIDGE APPROACHES

February 28, 2018

I. DESCRIPTION:

This work shall consist of clearing and grubbing at the future sites of bridge approaches in accordance with Section 301 of the Specifications, except as modified by this Special Provision. Clearing and Grubbing shall be performed prior to embankment construction in the vicinity of all bridge abutments, regardless of the height of the embankment fill and the height of the select backfill that will be placed behind the abutment.

II. **PROCEDURES:**

The Contractor shall remove stumps, vegetation, trees, brush, roots, perishable material and nonperishable, manmade objects (e.g., fences) in the vicinity of all proposed bridge abutments. Complete clearing and grubbing shall be conducted in advance of embankment fill placement in all areas where embankment fill will underlie the select backfill behind abutments.

All wet, loose, soft or disturbed soils that are present after clearing and grubbing operations are performed shall be removed or otherwise improved in accordance with Section 303 of the Specifications prior to embankment construction.

Clearing and grubbing shall be performed from the front toe of the embankment to the point behind the select backfill (see Longitudinal Limits in Figure 1). The lateral (transverse) limits of the clearing and grubbing shall extend from right toe-of-slope to left toe-of-slope.

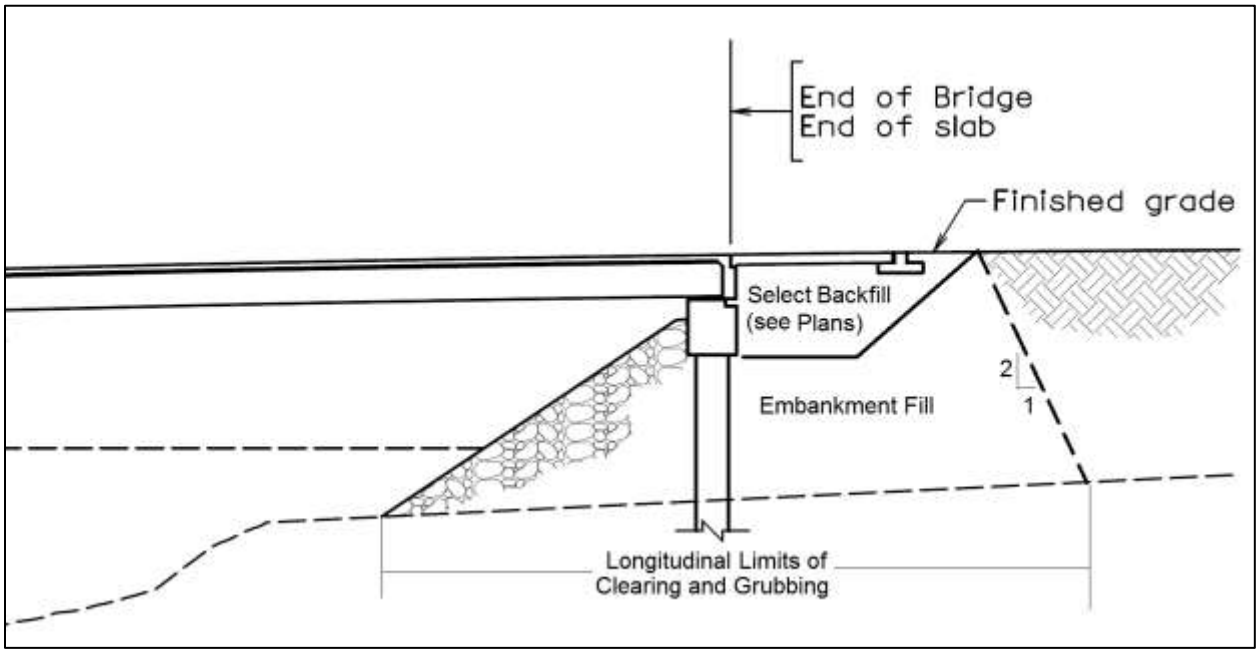

Figure 1
Limits of Clearing and Grubbing in the Vicinity of Bridge Abutments
Not to scale

III. **MEASUREMENT AND PAYMENT:**

Measurement and Payment for this work will be included as part of the project's overall Clearing and Grubbing pay item in accordance with Section 301 of the Specifications. No separate payment will be made.

GUIDELINES — For projects requiring dynamic pile testing for end bearing piles. {2007-S403C01}

SP403-000100-00

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

February 7, 2014; Reissued October 27, 2016

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 restrike 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 court before reaching the approved tip elevation. Pile driving criteria shall be approved by the Engineer.

VI. 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

GUIDELINES — For projects requiring expansion joints cleaned and resealed only. {2007-S404D01}

SP404-000100-00

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
SEALING EXPANSION JOINTS

June 15, 2015; Reissued July 12, 2016

I. DESCRIPTION

This work shall consist of cleaning and resealing expansion joints according to the Contract and as directed by the Engineer.

II. MATERIALS

Expansion joint filler and sealer materials shall conform to Section 212 of the Specifications.

III. PROCEDURES

Expansion joints shall be cleaned and shall be free of oil, grease, existing joint material or any other foreign material. Loose material shall be removed from the joint with oil-free compressed air delivered with not less than 120 cubic feet of air per minute and a nozzle pressure of not less than 90 pounds per square inch and not more than 200 pounds per square inch.

The Contractor shall protect the edges of pavement adjacent to the joints to be cleaned.

The Contractor shall install joint filler and sealer materials according to the manufacturer's written instructions.

Expansion joints shall be filled and sealed according to Section 404.05 of the Specifications. Joints to be filled shall be completely dry and the ambient air temperature shall be at least 45 degrees F. The applied sealer and finished joint shall be free of entrapped air. Finished sealer shall conform to the lines and grades of existing pavement surfaces.

IV. MEASUREMENT AND PAYMENT

Clean and reseal expansion joints will be measured in linear feet and will be paid for at the contract unit price per linear foot. This price shall be full compensation for cleaning joints, furnishing and installing joint filler, joint sealer, removal and disposal of debris, and for all material, labor, tools, equipment and incidentals necessary to complete the work.

Payment will be made under:

Pay Item	Pay Unit
Clean and reseal expansion joint	Linear foot

GUIDELINES — Use when requested by the Designer. {2007-S404G01}

SP404-000110-00

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
FILLING AND SEALING PATTERN CRACKS IN CONCRETE DECKS AND OVERLAYS

May 17, 2010c; Reissued July 12, 2016

I. DESCRIPTION

This Special Provision specifies the requirements for filling and sealing pattern cracks in hydraulic cement concrete bridge decks and overlays with a polymer as directed by the Engineer. Examples of pattern cracking that are defined and pictured in ACI 201.1R-08 *Guide for Conducting a Visual Inspection of Concrete in Service*, include checking, craze cracks, map cracking, pattern cracking, plastic cracking, shrinkage cracking and temperature cracking.

Pattern cracks may originate as plastic shrinkage cracks that are caused by the surface of the concrete drying before the curing material is applied. The cracks typically get wider with age as the concrete under goes drying shrinkage. Pattern cracking that is not identified for filling and sealing prior to the final acceptance of the project or prior to placing traffic on the surface is not covered by this special provision. This special provision does not apply to decks constructed with solid stainless reinforcing steel.

II. MATERIALS

Gravity fill polymer crack sealers shall be a high molecular weight methacrylate, epoxy or urethane conforming to the following:

PROPERTY @ 75 ± 5° F	TEST METHOD	REQUIREMENT
Gel Time, 50 ml sample	ASTM C881	6 hrs. max.
Tensile Strength	ASTM D638	1,500 psi. min.
Sand Penetration, MX-45 sand	VTM 101	80% min.

III. CONCRETE AGE AT TIME OF CRACK FILLING AND SEALING

Cracks shall be located, filled and sealed at the oldest age that is practical as determined by the Engineer and prior to the final acceptance of the project and prior to opening the surface to traffic.

IV. LOCATING CRACKS THAT SHALL BE FILLED and SEALED

Crack width shall be measured using a transparent crack comparator placed on the surface of the concrete. The width shall be at the oldest age that is practical as determined by the Engineer and prior to the final acceptance of the project and prior to opening the surface to traffic. The width shall be measured and recorded prior to 3 hours past sun rise. Cracks with a width equal to or greater than 0.2 millimeter shall be marked for filling and sealing.

V. SURFACE PREPARATION AND APPLICATION

Prior to filling and sealing, the cracks shall be protected from materials that can interfere with the filling of the crack and the curing of the polymer crack filling material.

Cracks to be filled shall be dry and free of dust, dirt and other debris prior to filling, and shall be air blasted with oil free compressed air prior to application of the polymer. The concrete surface temperature shall not be less than 55 degrees F when the polymer is applied. The polymer to be applied shall be suitable for use at the concrete temperature at the time of the application. The polymer shall be applied during the lowest temperature period of the day, usually between 1 a.m. and 9 a.m., when the cracks are open to the greatest extent. Cracks wider than 1.5 millimeters shall be filled with dry Grade E sand as prescribed in Table II-22 of the Road and Bridge Specifications prior to placement of the polymer. The mixed polymer shall be applied directly to the areas of the deck that are cracked allowing time for the polymer to seep down into the cracks, making additional applications until cracks are filled. The polymer shall be worked into the cracks with a broom or squeegee. Excess polymer shall be brushed off the surface prior to the polymer hardening. Mixed polymer shall be applied as soon as practical and polymer that exhibits an increase in viscosity and temperature shall not be placed on the concrete surface. Grade D sand as prescribed in Table II-22 of the Road and Bridge Specifications shall be broadcast over the applied polymer at the minimum rate of 0.5 pound per square yard. The sand shall be broadcast as soon as practical and before the viscosity of the polymer begins to increase. Regardless of the application method used, the polymer shall be applied in sufficient quantity and applications to fill cracks level. An application rate of one gallon per 100 square feet of deck is usually adequate. When practical, application of the polymer crack sealer shall be completed prior to grooving of the deck surface and grooving shall not be performed until the polymer has cured a minimum of 48 hours.

The Contractor shall plan and prosecute the work in such a manner to protect persons, vehicles and the bridge structure from injury or damage. Armored joints shall be covered, scuppers plugged and cracks sealed from underneath or other protective measures necessary to protect traffic, waterways and bridge components shall be implemented. In the event polymer materials or solvents harm the appearance of bridge components, removal of such materials will be required as directed by the Engineer. Traffic will not be permitted on the treated surface until tracking will not occur as determined by the Engineer.

VI. MEASUREMENT AND PAYMENT

When a pay item, gravity fill polymer crack sealing will be measured and paid for at the contract unit price per square yard as specified. The price bid for such work shall be full compensation for furnishing and applying the silica sand and polymer crack sealer, for vehicular and pedestrian protection, for crack preparation, for protection of waterways and bridge surfaces and for all labor, tools and incidentals necessary to complete the work.

Payment will be made under:

Pay Item	Pay Unit
Gravity fill polymer crack sealing	Square yard

GUIDELINES — Use when requested by the Designer. {2007-S404H01}

SP404-000120-00

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
SEALING LINEAR CRACKS IN CONCRETE DECKS AND OVERLAYS USING EPOXY AND CARBON FIBER MESH

September 16, 2009c; Reissued July 12, 2016

I. DESCRIPTION

This Special Provision specifies the requirements for sealing linear cracks and construction joints in hydraulic cement concrete bridge decks and overlays with epoxy and open grid carbon fiber mesh as directed by the Engineer.

Linear cracks, particularly transverse cracks, can be caused by thermal contraction, drying shrinkage, construction loads, continuous span deck construction sequence and live load induced tensile stress. The width of the cracks may be a function of thermal contraction, drying shrinkage, crack spacing, concrete age, and loads applied to the deck.

The cracks get wider with age as the concrete under goes drying shrinkage. This special provision does not apply to decks constructed with solid stainless reinforcing steel.

II. MATERIALS

Epoxy and aggregate materials shall meet the requirements in Section 431 of the Specifications. Carbon Fiber Mesh Materials shall conform to the following:

4-inch Carbon Fiber Strip Specs:

The carbon fiber mesh is comprised of a high tensile strength carbon fiber. The mesh is not impregnated and is wet out and cured in place in epoxy resin overlay.

General Information:	
Constituent Materials:	6K Carbon Fiber unidirectional tows
Primary Fiber Directions	Closed knit 0° X 90°
Color	Black
Packaging	4” X 200 linear ft rolls

Carbon Material Properties		
Nominal Thickness	0.030 inches	
Nominal Tensile Strength per unit width	400,000 psi	ASTM D3039-08
Nominal Tensile Modulus	33,000,000 psi	ASTM D3379-75(R-89)
Failure Strain	1.3%	ASTM D3379-75(R-89)
Grid Spacing	1/4” x 1/4” (inch) (longitudinal x transverse)	

III. CONCRETE AGE AT TIME OF CRACK FILLING AND SEALING

Cracks shall be located and sealed at the oldest age that is practical as determined by the Engineer and prior to the final acceptance of the project and prior to opening the surface to traffic.

IV. LOCATING CRACKS THAT SHALL BE FILLED AND SEALED

Crack width shall be measured using a transparent crack comparator placed on the surface of the concrete. The width shall be at the oldest age that is practical as determined by the Engineer and prior to the final acceptance of the project and prior to opening the surface to traffic. The width shall be measured and recorded prior to 3 hours past sun rise. Cracks with a width equal to or greater than 0.2 millimeter shall be marked for sealing.

V. SURFACE PREPARATION AND APPLICATION

The surface of the concrete on which the carbon fiber mesh will be placed shall be cleaned according to Section 431 of the Specifications. The epoxy and aggregate shall be placed according to the requirements for the first layer in Section 431 of the Specifications. Dump and spread the mixed epoxy resin on the designated area for the placement of the 4-inch Carbon Fiber strip. Apply the epoxy at a minimum rate of 2 ½ gallons per 100 square feet. Immediately place the 4-inch Carbon Fiber strip precut to the required length into the placed epoxy allowing the epoxy to wet into the carbon strip and to penetrate through the openings in the carbon strip to thoroughly encapsulate the strip. A roller or squeegee may be used to assist penetration and to ensure the strip is pressed to the substrate and the epoxy is evenly spread. Use a squeegee to move adjacent epoxy over the strip for complete encapsulation. Broad cast aggregate to excess over all surfaces covered with epoxy.

The Contractor shall plan and prosecute the work in such a manner to protect persons, vehicles and the bridge structure from injury or damage. In the event epoxy materials or solvents harm the appearance of bridge components, removal of such materials will be required as directed by the Engineer. Traffic will not be permitted on the treated surface during the curing period which is specified in Section 431 of the Specifications.

VI. MEASUREMENT AND PAYMENT

Crack sealing will be measured and paid for at the contract unit price per linear foot as specified. The price bid for such work shall be full compensation for surface and crack preparation, for furnishing and applying the epoxy, carbon fiber mesh and aggregate, for vehicular and pedestrian protection, for protection of waterways and bridge surfaces and for all labor, tools and incidentals necessary to complete the work.

Payment will be made under:

Pay Item	Pay Unit
Crack sealing using epoxy and carbon fiber mesh	Linear foot

GUIDELINES - For use on projects where the Plans call for use of Carbon Fiber Reinforcement Strands in Prestressed Concrete Piles.

SP405-000100-00

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
CARBON FIBER REINFORCED PRESTRESSED CONCRETE PILES

December 8, 2016

SECTION 105 – CONTROL OF WORK of the Specifications is amended as follows:

Section 105.10(c)3 – Concrete Structures and Prestressed Concrete Members is amended to insert the following:

Working Drawings for concrete structures and prestressed concrete members which are reinforced with Carbon Fiber Reinforced Polymer (CFRP) tendons and other CFRP reinforcement shall provide the following, as required for the successful prosecution of the Work and which are not included in the Plans furnished by the Department: additional details related to tendon coupler locations, stressing sequence accounting for coupler locations and differing moduli of elasticity, and spacing and ties for reinforcing. All additional information shall be included in the sealed package submitted for approval.

SECTION 223 – STEEL REINFORCEMENT of the Specifications is renamed **TENSILE REINFORCEMENT OF CONCRETE** and amended as follows:

Section 223.02(a)8 – Carbon Fiber Reinforced Polymer (CFRP) reinforcement is inserted as follows:

Carbon Fiber Reinforced Polymer (CFRP) reinforcement shall have an ultimate tensile strength of at least 338 ksi based on the nominal area and a minimum ultimate strain of 1.30% when tested in accordance with ASTM D7205.

Section 223.02(b) – Prestressing Tendons is replaced with the following:

Prestressing Tendons, as designated on the Plans, shall be one of the following**:**

1. **Seven-wire, whether stress-relieved strands, stress-relieved wire**, **or low-relaxation strands,** shall conform to ASTM A416, Grade 270; ASTM A421; and ASTM A416, Supplement I, respectively, with the following modifications:

   a. Strands or wires used in units of any one-bed layout shall be manufactured by the same plant.

   b. A manufacturer's certification and load-elongation curve in accordance with ASTM A416 or ASTM A421 shall be obtained by the prestressed concrete fabricator for each lot of strand planned for use in fabrication. The strand or wire manufacturer shall submit the data in permanent record form to the Engineer for approval prior to fabrication.

2. **CFRP tendons** shall be from the VDOT Materials Division's Special Products Evaluation List (SPEL).

The CFRP tendons shall have a nominal diameter as indicated on the Plans or Standard Drawings. CFRP tendons shall be free of scoring. “Nicks” or “gouges” will not be acceptable. Materials shall be shipped in coil form and shall be stored in such a way that kinks do not develop when the coil is unwound. Any CFRP tendon found to be damaged on the surface, bent, subjected to temperatures above 122°F at any time, or stored out of doors shall be discarded. A special handling guidelines manual shall be provided for CFRP tendons by the manufacturer.

SECTION 403 – BEARING PILES of the Specifications is amended as follows:

Section 403.03(b) – Precast Concrete Piles is amended by replacing the first paragraph with the following:

Precast Concrete Piles: Precast concrete piles with conventional or Carbon Fiber Reinforced Polymer (CFRP) reinforcement or tendons shall be furnished in accordance with these Specifications. Prestressed concrete piles shall be furnished in accordance with the requirements of Section 405. Piles shall be manufactured to conform to Section 404. The Class of Concrete shall be as specified on the Plans or the Specifications. If not specified, then Class A3 concrete shall be used for piles which are not prestressed.

Section 403.03(b)1 – Casting is replaced with the following:

Casting

a. **All Piles:** Forms shall conform to Section 404 and shall be accessible for vibrating, tamping, and consolidating concrete. Care shall be taken to place concrete to produce a satisfactory bond with the reinforcement and avoid segregation of components, honeycombs, or other defects.

Concrete shall be continuously placed in each pile form and consolidated by vibrating. Forms shall be overfilled, the surplus concrete screeded off, and the top surface finished to a uniform, even texture similar to that produced by forms.

b. **Piles using CRFP Reinforcement:**

The Contractor shall use self-consolidating concrete (SCC) conforming to Section 217.11 when using CRFP. During concrete placement, internal vibrators shall be encased with a protective polyurethane sheath. External vibrators will be acceptable. Extreme care shall be taken to avoid damage to CFRP tendons and reinforcement from internal vibrators. SCC will not require any vibration; however, limited vibration that will not cause segregation may be applied to ensure flow of material in congested areas, and to provide a smooth surface.

Materials, including anchorages, couplers, and other miscellaneous hardware, shall be carefully handled to prevent any damage or deformation along the reinforcement surface, and will be stored in their original containers until required for use. Materials, including anchorages, couplers, and other miscellaneous hardware, shall not be placed directly on the ground and shall be kept free from grease, dirt, and dust. Any damaged material shall be removed from the final product prior to stressing. Workers shall not walk on or step on CFRP prestressing tendons during the placement of the tendons.

CFRP reinforcement shall be suitably covered to eliminate any environmental factors such as temperatures above 122°F, ultraviolet rays, and chemical substances; and shall be protected from sudden shocks or heavy hard objects and welding sparks. The CFRP reinforcement shall not be mishandled, handled in a rough manner, nor damaged (e.g. shall not be stepped

on, walked on, or dragged over rough or dirty surfaces nor through rough or jagged holes in steel or wood).

CFRP reinforcement shall be properly cut to the lengths as specified on the Plans. Cutting of carbon reinforcement shall be performed by use of a high-speed rotary grinder approved by the Engineer, which will not damage the material. Heat oriented cutting tools, such as gas welding torches, shall not be used. Heating CFRP in any manner is dangerous and shall not be used. CFRP reinforcement shall not be field bent. Draping (harping) of tendons shall only be allowed as provided for in the Plans.

All supports, such as chairs, and tie wires shall be non-metallic material and shall not be in contact with metal reinforcement such as stainless steel. The Contractor shall use an inert, non-metallic, insulating material to prevent direct contact. All CFRP reinforcement shall be sufficiently tied down prior to placing of concrete to eliminate “floating” of reinforcement.

The Contractor shall be responsible for installing the special anchoring system on the CFRP tendons for pretensioning according to the guidelines provided by the CFRP tendon manufacturing company. The jacking operation shall be the same as for conventional steel, except that steel transfer couplers shall be used to transfer prestressing force to the CFRP tendons. The end preparation material and steel transfer coupler shall be provided by, or approved for use with the CFRP tendon by, the CFRP tendon manufacturer.

At least 5 days prior to jacking, the Contractor shall provide the Department with PE approved shop drawings showing the CFRP tendon layout, to include coupler placement locations and offset requirements necessary to prevent collision of couplers during pretensioning due to elongation of the tendon. The Contractor shall perform sequenced tendon jacking operations as noted on the approved Working Drawings. The Engineer shall approve each strand force and strand elongation prior to “lock off” and jack removal. Jacking operations shall proceed to the next strand as sequenced on the approved Working Drawings. Steel transfer coupler shall temporarily be supported for vertical loads and prevented from any rotation movement during prestressing as noted on the approved Working Drawings. Release of the prestressing force for anchoring shall be uniform and gradual and shall not expose any part of the pile cross section to sudden eccentric stresses. A sudden release of pretensioning force shall not be permitted except as part of the approved detensioning process. Release of force shall also be simultaneous at each end of the pile. The jacking force for CFRP tendons shall be 10% greater than desired or effective prestressing force.

Section 403.03(b)2 – Curing is replaced with the following:

Curing: Steam curing will be permitted if the concrete temperature is kept below 165°F. If CFRP is specified, the environment outside the pile where the coupler is located shall be kept below 122°F, as high temperatures will have detrimental effects on carbon reinforcement and slippage in the coupling or the anchoring.

As soon as piles have set sufficiently, side forms shall be removed and the piles moist-cured for at least 7 days. However, if CFRP is used or the concrete piles are to be used in brackish water, tidal water, or alkali soils, the piles shall be moist-cured for at least 30 days before use. Piles shall not be driven until the concrete has reached the minimum 28-day compressive strength specified in Section 217.

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

Section 405.02(a) – Concrete is amended by inserting the following:

Calcium nitrite will not be required for corrosion protection in piles when Carbon Fiber Reinforced Polymer (CFRP) tendons are specified.

The Contractor shall use self-consolidating concrete (SCC) conforming to Section 217.11 when using CFRP. Vibration of SCC shall conform to Section 403.03(b)1.

Section 405.05(b) – Placing Strands and Wires and Applying and Transferring Pretension is amended to replace the sixth paragraph with the following:

The final stressing of strands shall be performed by applying tension to each strand individually or to all CFRP tendons as a group. The strands shall be tensioned to the total pre-tensioning force as indicated on the plans, with a maximum applied stress indicated below.

Strand Type	Percent of guaranteed ultimate strength
CFRP Strand	65%
Stress-Relieved Strands	70%
Low-Relaxation Strands	75%

The nominal area of the strand and reinforcing shall be confirmed between the precast concrete producer and the strand supplier. Care shall be exercised when cutting the strand to prevent damage to the region adjacent to the cut end.

SECTION 406 – REINFORCING STEEL of the Specifications is amended as follows:

Section 406.02(e) – Carbon Fiber Reinforced Polymer (CFRP) pile confinement reinforcement is inserted as follows:

Carbon Fiber Reinforced Polymer (CFRP) pile confinement reinforcement shall be made from a product listed on VDOT Materials Division's Special Products Evaluation List (SPEL). Ties for pile confinement shall be corrosion free. CFRP confinement reinforcement shall have a reinforcing strength per foot which meets or exceeds the force indicated on the plans.

SQ404-000100-00

GUIDELINES — Use when requested by the Designer.{2007-SU421000A}

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
ELASTIC INCLUSION
Expanded Polystyrene (EPS)

June 24, 2003; Reissued July 12, 2016_

I. DESCRIPTION

Elastic Inclusion work shall consist of installation of an elasticized Expanded Polystyrene (EPS) and geotextile separation fabric between the back of concrete surfaces and backfill material, according to these specifications and in conformity with manufacturer's recommendations, the lines shown on the plans or as established by the Engineer.

II. MATERIALS

(a) **Elasticized Expanded Polystyrene (EPS)**: EPS shall have a size tolerance of 1/8 inch for each dimension and conform to the following:

Physical Property	Test Method	Requirements
Compressive strength	D-1621	720 psf +/-60 psf @10% strain
Water absorption	C-272	Max. 3% by volume
Insect Resistance	D-3345-74	Resistance to ants, termites, etc.

The EPS shall be elasticized, with a linear-elastic stress-strain behavior up to 10 percent strain and linear proportional stress-strain behavior up to 30 percent strain.

The EPS shall contain no chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (**HFCs**) or formaldehyde. It shall be chemically and biologically inert when in contact with acidic and alkaline soils. It shall be treated to prevent insect attack.

Materials shall withstand temperature variations from 0ºF to 140ºF without deforming 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 alkalis and acids, or other ice control materials.

The EPS shall contain a flame retardant additive.

(b) **Geotextile Separation Fabric**: A non-woven geotextile separation fabric shall be placed between the EPS and the backfill material. Fabric joints shall have a minimum overlap of twelve inches. Fabric shall extend a minimum of twelve inches beyond the EPS surface and overlap with adjacent concrete surface.

The separation fabric shall have the following properties:

Physical Property	Test Method	Requirements
Grab Strength	D-4632	Min. 250 lb

Puncture Strength	D-4833	Min. 112 lb
Tear Strength	D-4533	Min. 90 lb
Permittivity	D-4491	Min. 0.5 sec^{-1}
Apparent Opening Size	D-4751	Max. No. 50 sieve

Geotextile separation fabric shall be protected from mud, dirt, dust, sunlight, and debris during transport and storage. Material shall be inert to commonly encountered chemicals; resistant to mildew, rot, insects, and rodents; and biologically and thermally stable. Geotextile separation fabric for subsurface installation shall not be exposed to direct sunlight for more than 24 hours during installation.

Tensile strength requirements are in the machine and cross-machine directions.

(c) **Adhesive**: Adhesive shall be used to bond the EPS to concrete surfaces and the separation fabric to the EPS. It shall be applied according to the EPS manufacturer's recommendations.

(d) **Backfill Material:** Backfill material adjacent to the separation fabric shall be as specified in the Contract.

III. PROCEDURES

(a) **Preparation of Concrete Surface:** Before placement of EPS, concrete surfaces shall be abrasive blast cleaned with a positive contact sandblaster or adhesives manufacturer's recommendation and approved by the Engineer to remove all non-adherent laitance, oil, grease or other foreign or deleterious matter.

(b) **Installation of Material:**

The EPS shall be attached to the back of the concrete surfaces with an adhesive compatible with the material.

The concrete surface must be thoroughly dry and clean for adhesive for the application of the EPS. Adhesive shall be applied according to the adhesive manufacturer's recommendation or approval.

The separation fabric may be installed after the EPS has been installed or it may be pre-attached to the EPS. The separation fabric shall cover all exposed surfaces of the EPS.

EPS and separation fabric shall be installed according to the manufacturer's recommendations.

IV. TESTING

Elasticized EPS shall be tested by an independent commercial laboratory, to verify the material requirements specified herein. The Contractor shall provide written documentation of all tests specified. Documentation shall include style, lot, roll numbers, and actual results of each test. In addition, the name, address, phone number of the testing laboratory, and date of testing shall be provided.

Geotextile separation fabric shall be tested by an independent commercial laboratory, to verify the material requirements specified herein. The Contractor shall provide written documentation of all tests specified. Documentation shall include style, lot, roll numbers, and actual results of each test. In addition, the name, address, phone number of the testing laboratory, and date of testing shall be provided.

After the EPS has been installed and before the work has been accepted, the Contractor and Inspector shall perform a visual inspection of EPS coverage and adhesion to the concrete surface. Any area deemed unacceptable and questionable as to remaining in position during the placement of the backfill material shall be replaced or repaired, as required.

REPAIR OF FAILED AREA OF EPS: Unacceptable portion of the EPS shall be removed and the concrete surface shall be prepared and the EPS installed according to this special provision. New EPS in the repair areas shall be visually inspected after curing. The cost of all additional work for repairing or replacing of the defective joint material shall be borne by the Contractor.

IV. MEASUREMENT AND PAYMENT

Elastic inclusion, when a pay item, will be measured in square yards along the back of backwall surface area, complete-in-place, and will be paid for at the contract unit price per square yard. Such price shall be full compensation for cleaning surface, for furnishing and installing the EPS material according to these Specifications and the manufacturer's recommendations, separation fabric, testing, and for all material, labor, tools, equipment and incidentals necessary to complete the work. When not a pay item, the cost thereof shall be included in the price for other appropriate pay items.

Payment will be made under:

Pay Item	Pay Unit
Elastic Inclusion (Thickness)	Square Yard

Included in the 2019_Supplement_to_the_2016_Specifications page 47

SS401-002016-01 April 5, 2017

VIRGINIA DEPARTMENT OF TRANSPORTATION
2016 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS
SECTION 401—STRUCTURE EXCAVATION

SECTION 401 – STRUCTURE EXCAVATION of the Specifications is amended as follows:

Section 401.03(i) – Backfilling is amended by replacing the second paragraph with the following:

The Contractor shall use select backfill material behind all abutments. The Department will include a detail indicating the limits (zone) of the select backfill in the Plans. The Contractor shall compact the material in accordance with Sections 305 and 303 respectively. The top surface of the backfill material shall be neatly graded.

Section 401.04 – Measurement and Payment is amended by replacing the thirteenth paragraph with the following:

Select backfill (Abutment zone) will be measured in tons and paid for at the contract ton price. This price shall include furnishing, placing, compacting, and grading select backfill material.

Included in the 2019_Supplement_to_the_2016_Specifications page 47

SS403-002016-01 June 7, 2016; Issued July 12, 2016

VIRGINIA DEPARTMENT OF TRANSPORTATION
2016 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SECTION 403—BEARING PILES

SECTION 403—BEARING PILES of the Specifications is amended as follows:

Section 403.07(d) **Dynamic Formula** is amended by replacing the equation with the following:

$R_{ndr} = 1.75(E_d)^{0.5} \log_{10}(10N_b) - 100$

where:

R_{ndr} = nominal pile resistance measured during pile driving (kips)

E_d = developed hammer energy. This is the kinetic energy in the ram at impact for a given blow. If ram velocity is not measured, it may be assumed equal to the potential energy of the ram at the height of the stroke, taken as the ram weight times the actual stroke (ft-lbs)

N_b = number of hammer blows for 1.0 in. of pile permanent set (blows/in.)

Included in the 2019 Supplement to the 2016 Specifications page 47

SS404-002016-01 July 12, 2016

VIRGINIA DEPARTMENT OF TRANSPORTATION
2016 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS
SECTION 404—HYDRAULIC CEMENT CONCRETE OPERATIONS

SECTION 404—HYDRAULIC CEMENT CONCRETE OPERATIONS of the Specifications is replaced with the following:

Section 404.02(a)**—Concrete** is amended by replacing the first paragraph with the following:

Concrete shall conform to Section 217 of the Specifications. Aggregate used in concrete for bridge decks shall be nonpolishing. All concrete shall be tested for permeability in accordance with Section 217 of the Specifications.

Included in the 2019_Supplement_to_the_2016_Specifications page 48

SS405-002016-01 June 21, 2018

VIRGINIA DEPARTMENT OF TRANSPORTATION
2016 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS
SECTION 405—PRESTRESSED CONCRETE

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

Section 405.05(b) Placing Strands and Wires and Applying and Transferring Pretension is amended by replacing the last paragraph (including it's subparagraphs) with the following:

The schedule for single-strand detensioning of units having deflected strands shall incorporate the following:

- Straight strands located in the upper flange of the unit shall be released first.
- Tension in the deflected strands at the ends of bed and uplift points shall be released in sequence.
- Hold-down devices for deflected strands shall be disengaged, and hold-down bolts shall be removed from units.
- The remaining straight strands of the pattern to be detensioned individually shall be released in sequence.

If it is desired to release hold-down devices prior to releasing tension in deflected strands, this may be permitted if the weight of the prestressed unit is more than twice the total of the forces required to hold strands in the low position, or if weights or other approved vertical restraints are applied directly over the hold-down points to counteract uplifting forces at least until the release of deflected strands has proceeded to such a point that the residual uplifting forces are less than 1/2 the weight of the unit.

Failure to follow these procedures may result in rejection of the units.

Section 405.05(h) Handling, Storing, and Erecting is replaced with the following:

Handling, Storing, and Erecting: Units shall be adequately separated in storage immediately following removal from beds to make inspection of finished surfaces possible and to facilitate repair of surface blemishes.

Care shall be taken in handling and storing units to avoid damage to concrete. Concrete must have attained the minimum 28-day design compressive strength before structural units are shipped to the project site.

Piles shall not be driven until at least 7 days after the date concrete is cast and has attained the minimum design compressive strength.

Lifting and support points for all units shall be as shown on the Plans. If the Plans do not indicate lifting and support points, the Contractor shall lift and support units at locations not less than 6 inches or more than the depth of the unit from the end of the unit. The Contractor shall be

responsible for the design and safety of the lifting device used. Piles shall be supported at lift points as shown on the Plans.

Requests by the Contractor to use lifting or support points other than those indicated must be accompanied by computations showing that stresses are within the allowable range using 50 percent of the dead load as an impact factor.

Units that have been damaged in handling shall be repaired to the satisfaction of the Engineer. Units that have been damaged to such an extent that they are not repairable shall be replaced at no expense to the Department.

Recesses at ends of transverse ties, holes for anchor bars, and other recesses shown on the plans shall be filled with mortar conforming to Section 218. Mortar shall be applied in one continuous operation for each span. Where waterproofing material is to be applied to tops of units in the field, longitudinal joints shall be sufficiently smoothed to prevent damage to the material. Shear keys required between adjacent units shall be constructed using the material shown on the Plans.

Struts and diaphragms between spread units may be cast separately or monolithically with the deck slab. If the Contractor casts struts and diaphragms separately from the slab, deck slab concrete shall not be placed until concrete in the struts or diaphragms has attained 80 percent concrete strength (f'c). If the Contractor casts struts and diaphragms monolithically with the slab, each prestressed concrete beam shall be placed and restrained in such a manner that the beam will not be canted during construction of the struts, diaphragms, and slab. The Contractor's method for maintaining acceptable vertical alignment of beams shall be subject to the approval of the Engineer.

Bearing surfaces of units shall be parallel to the bottom surface of the unit or as specified on the plans. Attached bearing assemblies shall be fabricated so that their bottom bearing surfaces shall lie in truly horizontal planes in their erected position. Metal bearing plates or bottoms of precast beams that are to bear on elastomeric pads shall be coated with epoxy, Type EP-2, EP-4, or EP-5, and then surfaced with a No. 36 to No. 46 silicon carbide or aluminum oxide grit.

Ends of beams, at ends of spans, and diaphragms shall be vertical.

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

Units shall be stored on dunnage placed at the support points shown on the Plans and at least 4 inches above the ground. If supports points are not provided on the Plans, the Contractor may locate the dunnage at the lifting points or bearings. If units are stacked, they shall be so arranged that the weight of upper members does not introduce shear or bending effects onto members below. The Contractor shall make all units accessible for inspection by the Engineer upon request.

Once beams, girders, or slabs have been placed on temporary supports for storage, camber measurements shall be taken at midspan, at release and at 2 week intervals thereafter up to 120 days after detensioning. These measurements shall be recorded in the morning to reduce the effects of solar radiation for each unit and shall include the date, time, weather conditions, and measurements taken.

Piles or other elements supported at more than two points shall have their camber measured at the midpoint of each supported span.

Camber shall be measured and recorded in a bound log book and made available to the Inspector.

Camber measurements that fall outside the tolerances below shall be reported in writing to the Engineer and will be cause for rejection if not corrected to the satisfaction of the Engineer. Each measurement shall include the date of casting, the date of the measurement, the time of day, the temperature and other weather conditions (as directed by the Engineer) along with the measurement.

The Contractor shall submit a camber management plan to the Engineer prior to fabrication indicating the method for controlling camber. Units shall not be loaded before the 28-day compressive strength is achieved and no earlier than 7 days. The Engineer will review the plan, and once found to be acceptable, the Contractor shall implement the plan if any of the thresholds below are exceeded:

- 75 percent of the design camber at erection on the Plans
- 75 percent of the allowable limit between adjacent beams, girders or slabs
- 3/4 inch difference between the high and low units in the same span (for slabs or box beams)

The Contractor shall implement the camber management plan for any beams, girders or slabs that will be erected 120 days or more after detensioning. Where a change in construction schedule occurs which will result in erection 120 days or more after detensioning, the Contractor shall implement the camber management plan.

When a camber management plan is implemented, camber measurements shall be taken after loading the units. Subsequent camber measurements can be taken in the loaded state. Camber shall be measured within 3 days prior to shipping in an unloaded state.

The Contractor may submit a request to delay the implementation of the camber management plan to the next scheduled camber measurement if documentation is submitted showing the camber growth is following an established camber development path that will not exceed the camber tolerance at erection under the current construction schedule. If accepted by the Engineer, the Contractor shall implement the camber management plan at the next scheduled camber measurement unless a subsequent request is made and approved by the Engineer.

No beam, girder or slab exceeding the camber tolerance at erection shall be shipped to the jobsite unless approved by the Engineer.

All field welding, such as field welding of sole plates or other metallic components, shall be performed in accordance with Section 407. Coatings shall be repaired in accordance with Sections 233 and 411 as applicable. Payment for field welding, inspection, and coating shall be included in the price bid for other items.

Section 405.06(a) Precast Prestressed Concrete I-Beams and T-Beams is replaced by the following:

Precast Prestressed Concrete I-Beams and T-Beams:

Characteristic	Values
Depth (overall)	±1/4 inch
Width (flanges and fillets)	±1/4 inch
Width (web)	±1/4 inch
Length of beam	±1/8 inch/10 ft or 1/2 inch, whichever is greater
Exposed beam ends (deviation from square or designated skew)	Horizontal ±1/4 inch, vetical ±1/8 inch/ft of beam height

Side inserts (spacing between centers of inserts and from centers of inserts to ends of beams)	±1/2 inch
Bearing plate (spacing from centers of bearing plates to ends of beams)	±1/2 inch
Stirrup bars (projection above top of beam)	±3/4 inch
Stirrup bars (longitudinal spacing)	±1 inch
Horizontal alignment (deviation from straight line parallel to centerline of beam)	Max. 1/8 inch/10 ft
Camber differential between adjacent beams of same type and strand pattern	1/8 inch/10 ft or max. 1/2 inch(at time of erection)
Camber differential from design camber at erection on plans	+30% to -50% (at time of erection)
Center of gravity of strand group	±1/4 inch
Center of gravity of depressed strand group at end of beam	±1/4 inch
Position of hold-down points for depressed strands	±6 inches
Position of handling devices	±6 inches

Section 405.06(b) Precast Prestressed Concrete Box Beams and Flat Slabs is replaced with the following**:**

Precast Prestressed Concrete Box Beams and Flat Slabs

Characteristic	**Values**
Depth (top slab)	+1/2 to –1/4 inch
Depth (bottom slab)	0 to +1/2 inch
Depth (overall)	±1/4 inch
Width of web or thickness of sidewalls	±3/8 inch
Width (overall)	+1/8 to –1/4 inch
Length	±1/8 inch/10 ft or 1/2 inch, whichever is greater
Void position (longitudinal) from Plan locations	±1/2 inch ±1 inch adjacent to end block
Square ends (deviation from square)	±1/4 inch
Skew ends (deviation from designated skew)	
Skew angle equal to or less than 30°	±1/4 inch
Skew angle greater than 30°	±1/2 inch
Horizontal alignment (deviation from straight line parallel to centerline of unit)	Max. 1/8 inch/10 ft
Gap between adjacent units	Max. 1/2 inch
Tie rod tubes (spacing between centers of tubes and from centers of tubes to ends of units)	±1/4 inch
Tie rod tubes (spacing from centers of tubes to bottom of beam)	±1/4 inch
Longitudinal begin/end position of Virginia Adjacent Member Connection blockouts	±3 inches
Camber differential between adjacent units	Max. 1/4 inch (at time of erection)
Camber differential between adjacent units with Virginia Adjacent Member Connections	Max. 1/2 inch (at time of erection)
Camber differential between high and low units in same span	Max. 3/4 inch (at time of erection)
Camber differential from design camber at erection on plans	+30% to -50 percent (at time of erection)

Side inserts (spacing between centers of inserts and from centers of inserts to ends of beams)	±1/2 inch
Stirrup bars (projection above top of beam)	±3/4 inch
Stirrup bars (longitudinal spacing)	±1 inch
Center of gravity of strand group	±1/4 inch
Center of gravity of depressed strand group at end of beam	±1/4 inch
Position of hold-down points for depressed strands	±6 inches
Position of handling devices	±6 inches

Section 405.07 – Measurement and Payment is amended by replacing the first paragraph with the following:

Prestressed concrete piles will be paid for in accordance with Section 403.10.

Included in the 2019 Supplement to the 2016 Specifications page 53

SS406-002016-02 July 7, 2016; Issued October 5, 2016

VIRGINIA DEPARTMENT OF TRANSPORTATION
2016 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SECTION 406—REINFORCING STEEL

SECTION 406—REINFORCING STEEL of the Specifications is amended as follows:

Section 406.03(c) **Fabrication** is amended by replacing the first paragraph with the following:

Fabrication: Bent bar reinforcement shall be cold bent to the shape shown on the plans. Fabrication shall be in accordance with the ACI *Detailing Manual* – 2004 (SP-66-04).

Section 406.03(d) **Placing and Fastening** is replaced with the following:

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 will accurately maintain the position of steel reinforcement during the placing and setting of concrete. Placing reinforcing steel in concrete after concrete has been freshly placed is not permitted.

Unless otherwise specified by the Engineer, tie wires used with corrosion resistant reinforcing steel can be: plastic; solid stainless; epoxy-coated carbon (black) steel wire; or plastic-coated carbon (black) steel wire.

The minimum clear distance from the face of the concrete to any reinforcing bar shall be maintained as specified in the table below.

Location	Minimum Cover (in)		
	Normal Condition	Corrosive Environment[1]	Marine[2]
Pier caps, bridge seats and backwalls:			
Principal reinforcement	2-3/4	3-3/4	4
Stirrups and ties	2-1/4	3-1/4	3-1/2
Pier caps, bridge seats and backwalls (at open joint locations):			
Principal reinforcement	3-3/4	3-3/4	4
Stirrups and ties	3-1/4	3-1/4	3-1/2
Footings and pier columns:			
Principal reinforcement	3	4	4
Stirrups and ties	2-1/2	3-1/2	3-1/2
Cast-in-place deck slabs:			
Top reinforcement[3]	2-1/2	2-1/2	2-1/2
Bottom reinforcement	1-1/4	1-1/4	2
Precast and cast-in-place slab spans:			
Top reinforcement[3]	2-1/2	2-1/2	2-1/2
Bottom reinforcement	2	2	3

Location	Minimum Cover (in)		
	Normal Condition	Corrosive Environment[1]	Marine[2]
Prestressed slabs and box beams:			
Top steel	1-3/4	1-3/4	1-3/4
Stirrups and ties	1-1/8	1-1/8	1-1/8
Reinforcement concrete box culverts and rigid frames with more than 2 ft. fill over top of slab:			
Top slab – top reinforcement	1-1/2	2-1/2	3
Top slab – bottom reinforcement	1-1/2	2-1/2	3
Inside walls and bottom slab top mat	1-1/2	2-1/2	3
Outside walls and bottom slab bottom mat	1-1/2	2-1/2	3
Reinforcement concrete box culverts and rigid frames with less than 2 ft fill over top of slab:			
Top slab – top reinforcement	2-1/2	2-1/2	3
Top slab – bottom reinforcement	2	2-1/2	3
Inside walls and bottom slab top mat	1-1/2	2-1/2	3
Outside walls and bottom slab bottom mat	1-1/2	2-1/2	3
Rails, rail posts, curbs and parapets:			
Principal reinforcement	1-1/2	1-1/2	1-1/2
Stirrups, ties and spirals	1	1	1
Concrete piles cast against or permanently exposed to earth (not applicable for prestressed concrete):	3	3	3
Drilled shafts:			
Principal reinforcement	4	5	5
Ties and spirals	3-1/2	4-1/2	4-1/2
All other components not indicated above:			
Principal reinforcement	2-1/2	3-1/2	3-1/2
Stirrups and ties	2	3	3

[1]Corrosive environment affects cover where concrete surface is in permanent contact with corrosive soil.
[2]Marine includes all locations with direct exposure to brackish and salt water.
[3]Includes 1/2 inch monolithic (integral) wearing surface.

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.

Plastic (composite) chairs may be used to support Corrosion Resistant Reinforcement (CRR) in precast concrete elements; otherwise, CRR in structures shall be supported by steel bar supports as follows, unless otherwise specified by the Engineer:

1. For Class I CRR, steel bar supports shall be: plastic-protected wire bar supports (per CRSI Class 1 – Maximum Protection) when stay-in-place forms are not used and the steel bar support will be exposed; and epoxy-coated bright basic wire bar supports (per CRSI Class 1A – Maximum Protection) when either stay-in-place forms are used or the steel bar support will not be exposed.

2. For Class II and Class III CRR, steel bar supports shall be: either stainless steel wire bar supports or plastic-protected wire bar supports (per CRSI Class 1 – Maximum Protection) when stay-in-place forms are not used and the steel bar support will be exposed; and epoxy-coated

bright basic wire bar supports (per CRSI Class 1A – Maximum Protection) when either stay-in-place forms are used or the steel bar support will not be exposed.

3. Steel bar supports for CRR shall be fabricated from cold-drawn carbon steel wire conforming to the CRSI corrosion protection class listed above for their specific use, except for plastic-protected wire bar supports, which shall be epoxy-coated with plastic protection applied by dipping legs (i.e., capping legs with premolded plastic tips is prohibited).

Carbon (black) steel in structures shall be supported by bright basic wire bar supports (per CRSI Class 3 – No Protection), except when cast-in-place members are cast directly on soil or rock, such as footings and approach slabs. In these cases, precast concrete supports and plastic (composite) chairs may be used. Steel bar supports for carbon (black) steel shall be fabricated from cold-drawn carbon steel wire. Precast concrete bar supports shall have a 28-day design compressive strength of at least 4,500 pounds per square inch and shall be furnished with plastic ties or shaped to prevent slippage from beneath the reinforcing bar.

Side form spacers shall meet the same corrosion protection level as the bar supports.

Bar supports for CRR in bridge decks and slab spans shall be spaced as recommended by CRSI but not more than 4 feet apart transversely or longitudinally. The mat of steel reinforcement closest to the surface shall be supported by bolster supports or individual chair bar supports and intermediate and upper mats can be supported by individual high chair bar supports or continuous bar supports placed between mats. When the upper mat is supported by the bottom mat (e.g., using continuous bar supports placed between mats), all the bar supports shall be spaced as recommended by CRSI but not more than 3 feet apart transversely or longitudinally. Bar supports shall be firmly stabilized so as not to displace under construction activities. Standees (a bar bent to a U-shape with 90 degree bent legs extending in opposite directions at right angles to the U-bend acting as a high chair resting on a lower mat of reinforcing bars to support an upper mat) may be used on 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.

In reinforced concrete sections or elements other than bridge decks and slab spans, 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 adhering to the CRSI corrosion protection classes and specific uses listed above. 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 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, the Engineer will inspect reinforcing steel and determine approval for proper position and the adequacy of the method for maintaining position.

Section 406.03(e) **Splicing and Lapping** is amended by replacing the fourth paragraph with the following:

For corrosion resistant reinforcing bars, mechanical butt splicers shall be of the same material as the bars being spliced.

GUIDELINES — For projects with steel and other metal structures.

SS407-002016-02 August 29, 2019

VIRGINIA DEPARTMENT OF TRANSPORTATION
2016 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS
SECTION 407—STEEL AND OTHER METAL STRUCTURES

SECTION 407—STEEL AND OTHER METAL STRUCTURES of the Specifications is amended as follows:

Section 407.04—Fabrication Procedures is amended by replacing the seventh, eighth, and ninth paragraphs with the following:

The Contractor shall furnish a complete mill analysis showing chemical and physical results from each heat of steel for all units prior to fabrication. Before cutting, pieces of steel other than steel conforming to ASTM A709, Grade 36, that are to be cut to smaller-sized pieces shall be legibly marked with the ASTM A6 specification identification color code or the material specification designation. The identification color code of the latest system adopted under ASTM A6 shall be used to identify material. Any markings that indicate direction of roll shall be transferred to each new piece before cutting the new piece from the larger plate.

If requested by the Engineer, the Contractor shall furnish an affidavit from the fabricator certifying that the fabricator has marked and maintained the identification of steel in accordance with these specifications throughout the fabrication operation.

Section 407.04(a) – Welds is replaced with the following:

Welds: Only welding or tack welding noted on the Plans shall be performed on structural steel, reinforcing steel, or aluminum units.

Partial penetration welding shall not be allowed without the written permission of the Engineer.

Preheat shall be applied in accordance with the applicable AWS code for the thickness and grade of material, but in no case shall be less than 70°F.

Structural units shall not be used as a worktable. Welding on other work shall be completed before parts are installed on units.

Groove welds in flange plates, cover plates, and longitudinal stiffeners shall be ground flush. Groove welds in legs of rigid frames, webs of exterior girders, and beams shall be ground flush on the exposed side. Cope holes shall not be filled. The perimeter of cope holes shall be ground smooth. Temporary erection bolt holes shall be filled with high-strength bolts and tightened in accordance with the specifications herein.

Electroslag welding (ESW-NG) will not be allowed on Fracture Critical members. ESW-NG will only be allowed in other cases with written approval of the Engineer and in accordance with AWS D1.5. All ESW-NG shall be inspected in accordance with VTM 29 and VTM 30. Electrogas welding will not be allowed.

Welds that do not conform to the specifications as determined by visual inspection or nondestructive testing shall be repaired, or if not repairable, removed and replaced by the Contractor by methods permitted in the specifications or the Engineer will reject the entire piece.

The Engineer will re-inspect repaired or replaced welds in accordance with the applicable nondestructive testing method.

The Contractor shall submit or shall have the fabricator submit to the Engineer a copy of the certificate of qualifications for each welder, welding operator, or tacker employed in the work. The Contractor shall also submit to the Engineer a certificate stating that the welder, welding operator, or tacker has not exceeded any period of 3 months since the date of qualification without performing satisfactory welding in the required process. The qualification certification shall state the name of the welder, operator, or tacker; name and title of the person who conducted the examination; type of specimens; position of welds; results of tests; and date of the examination. The qualification certification shall be made by a Department approved agency.

Welds for reinforcing steel, including tack welds, shall conform to AWS D1.4.

Welding of aluminum shall conform to AWS D1.2.

Welds for tubular structures shall conform to AWS D1.1 for cyclically loaded tubular structures, unless using ESW-NG.

Section 407.06(c) – Assembly of Structural Connections Using High-Strength Bolts is amended by replacing the first paragraph with the following:

Assembly of Structural Connections Using High-Strength Bolts: Field connections shall be made with high-strength bolts 7/8-inch in diameter fabricated in accordance with ASTM F3125, Grade A325 unless otherwise specified. The Engineer will give consideration to the substitution of adequately designed welded connections if requested in writing by the Contractor.

Section 407.06(c)1 – Bolts, nuts, and washers is replaced with the following:

Bolts, nuts, and washers: Bolts, nuts, and washers shall conform to Section 226 and shall each be from one manufacturer on any one structure unless otherwise approved by the Engineer. In addition, each bolt, nut, and washer combination, when installed, shall be from the same rotational-capacity lot. Prior to installation, the Contractor shall perform a field rotational-capacity test on two nut, bolt, and washer assemblies for each diameter and length in accordance with VTM 135. Bolts fabricated in accordance with ASTM F3125, Grade A490 and galvanized bolts fabricated in accordance with ASTM F3125, Grade A325 shall not be reused. Retightening previously tightened bolts, which may have been loosened by the tightening of adjacent bolts, shall not be considered a reuse. Other bolts may be reused only if approved by the Engineer. Threads of plain (uncoated) bolts shall be oily to the touch when installed. Galvanized nuts shall be lubricated by lubricant containing a visible dye. Threads of weathered or rusted bolts shall be cleaned of loose rust, scale, and debris and relubricated. Lubricant shall be as recommended by the fastener manufacturer.

Section 407.06(c)3 – Installation is amended by replacing the second paragraph with the following:

When bolts fabricated in accordance with ASTM F3125, Grade A490 are used with steel having yield points less than 40 kips per square inch, hardened washers shall be installed under the nut and bolt head.

Section 407.06(c)3 – Installation is amended by replacing the eighth paragraph with the following:

The required minimum bolt tension is equal to 70% of specified minimum tensile strengths of bolts rounded to the nearest kip as specified in ASTM F3125 for Grades A325 and A490. *Snug tight* is defined as the tightness attained when a power wrench begins to impact solidly or when the bolts are firmly hand tightened with a spud wrench such that the complete area of the connecting surfaces are brought into firm contact with each other. Snug tightening shall progress systematically from the most rigid part of the connection to the free edges, and then the bolts of

the connection shall be retightened in a similar systematic manner as necessary until all bolts are simultaneously snug tight and the connection is fully compacted.

Section 407.06(c)3b – Direct Tension Indicators (DTI) is amended by replacing the first paragraph with the following:

Direct Tension Indicators (DTI): Direct tension indicator washers shall be used for all high strength bolts, and installation shall be in accordance with Section 407.06(c)3; however, the indicator washer shall not be considered a substitute for the required hardened washer under the turned element. The indicator washer may be considered a substitute for the hardened washer required under the unturned element when bolts conforming to ASTM F3125, Grade A490 are used with steel conforming to ASTM A709, Grade 36. Direct tension-indicator washers shall not be painted or coated with any epoxy or similar material prior to installation. The normal installation shall consist of the load indicator washer being placed under the unturned bolt head or unturned nut. However, if conditions require installation under the turned bolt portion, a hardened flat washer or nut face washer shall be fitted against the tension-indicating protrusions. Tension-indicating washers shall not be substituted for the hardened washers required with short-slotted or oversized holes but may be used in conjunction with them.

Table IV-3 – Bolt Tension is replaced with the following:

TABLE IV-3
Bolt Tension

	Required Min. Bolt Tension (lb.)	
Bolt Size	**Grade A325 Bolts**	**Grade A490 Bolts**
1/2	12,000	15,000
5/8	19,000	24,000
3/4	28,000	35,000
7/8	39,000	49,000
1	51,000	64,000
1 1/8	56,000	80,000
1 1/4	71,000	102,000
1 3/8	85,000	121,000
1 1/2	103,000	148,000

GUIDELINES — For use in projects requiring protective coatings of metal in structures.

SS411-002016-01 February 21, 2019

VIRGINIA DPARTMENT OF TRANSPORTATION
2016 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS
SECTION 411 – PROTECTIVE COATING OF METAL IN STRUCTURES

SECTION 411—PROTECTIVE COATING OF METAL IN STRUCTURES of the Specifications is amended as follows:

Section 411.03(a) **SSPC QP-1 Requirement** is replaced with the following:

SSPC QP-1 Requirement: The Contractor shall be certified to perform coating applications according to *SSPC QP-1, Standard Procedure for Evaluating Qualifications of Industrial/Marine Painting Contractors, Field Applications in Complex Structures* in order to perform coating operations on all new and existing steel structures except as noted below. The Contractor shall submit proof of such current certification to the Engineer before starting the Work. For existing steel structures, the requirement is not applicable for repairs or replacement of structural components where the area of applied coating is less than 100 square feet.

Section 411.03(b) **SSPC QP-2 Requirement** is amended by replacing the first paragraph with the following:

When contract work involves the removal of greater than 100 square feet of coating from a Type B structure, the Contractor shall be certified to perform coating removal operations according to *SSPC QP-2, Standard for Evaluating Painting Contractors, Removal of Hazardous Coatings from Industrial/Marine Steel Structures* in order to perform coating removal operations. The Contractor shall submit proof of this certification to the Engineer before starting the Work.The SSPC QP-2 certified contractor shall assign a SSPC QP-2 qualified Competent Person to oversee removal activities to protect the environment and workers safety and health while performing removal activities under the contract. For the purposes herein a Competent Person is an individual who meets the qualifications defined in the document SSPC-QP2 – Qualifications, Section 2. The Environmental Protection Plan and worker safety and health plan described in Sections 411.09 and 411.10 shall be prepared by the SSPC QP-2 certified organization. The SSPC QP-2 Competent Person shall be present during startup, surface preparations, removal operations, and waste removal/disposal activities to ensure and verify environmental protection and worker safety and health practices and procedures comply with the prepared plans.

Section 411.05(a) **Bare Steel** is replaced with the following:

Bare Steel: The Contractor shall coat all weathering steel either indicated in the Contract or within 5 feet of a deck joint, including but not limited to cross frames, diaphragms, stiffeners, connector plates, girders, and beams with System B. All areas to be coated shall be thoroughly cleaned using Method 5 to no less than 6 inches outside the area to be coated before any coating is applied.

Section 411.06(a) **Shop Coating** is amended by deleting the fifth and sixth paragraphs, to include their subparagraphs.

Section 411.07—Galvanized Surfaces is renamed to **Metal-Based Coatings**.

Section 411.07(a) **Existing Uncoated** is renamed to **Galvanizing Existing Uncoated Structures**.

Section 411.07(b) **New Surfaces** is renamed to **Galvanizing New Surfaces**.

Section 411.07(c) **Thermal Spray Coating** is inserted as follows:

Thermal spray coating of structural steel members shall conform to AISC S8.2.

GUIDELINES — For use on projects with Widening, repairing, and reconstructing existing structures.

SS412-002016-02 July 5, 2018

VIRGINIA DEPARTMENT OF TRANSPORTATION
2016 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS
SECTION 412—WIDENING, REPAIRING, AND RECONSTRUCTING EXISTING STRUCTURES

SECTION 412—WIDENING, REPAIRING, AND RECONSTRUCTING EXISTING STRUCTURES of the Specifications is amended as follows:

412.03(a) **Preparation of Concrete Patches** is replaced with the following:

When reinforcing bars are exposed, including epoxy coated or galvanized bars, the exposed length shall be cleaned by abrasive blast cleaning. Any epoxy coating that is well-bonded to the bars after abrasive blast cleaning (i.e., unable to be pried off when being cut pried with stout knife blade at several locations) does not have to be removed and bare areas do not have to be repaired. Care shall be taken to prevent striking reinforcing bars with hammer points. Reinforcing steel that has lost 1/4 or more of its original cross-sectional area shall be lapped with new bars of the same material type, size, and shape, or as specified on the Plans. New bars shall lap existing bars a length of 30 diameters on each side of the damaged portion if a sufficient length of the existing bar is exposed. Otherwise, new bars shall be mechanically connected in accordance with Section 406 except when the new bars specified on the Plans are a different material type, then the splice sleeves shall be the same material as the new bars and not coated when spliced to existing epoxy coated reinforcing bars. New bars may be welded with a 6-inch arc-welded lap on each side of the damaged portion with a single-flare V-groove weld in accordance with Section 407 if specified on the Plans or authorized by the Engineer in writing.

The Contractor shall support unsupported areas with forms or falsework.

The Contractor shall remove and dispose of excess material and debris resulting from repairs in an approved disposal area in accordance with Section 106.04.

Wherever new concrete is scheduled to be placed against existing concrete, the two concrete masses shall be connected as indicated in the Plans. Where no plan details are provided, dowels at least 3/4 inch in diameter shall be placed at no more than 2 feet 6 inches center to center over the entire joining surface and 6 to 12 inches from the edge. Dowels shall be placed perpendicular to the surface of existing concrete by drilling and grouting and shall project into both new concrete and existing concrete to a depth as great as the thickness of the concrete will allow but need not project more than 9 inches into either surface. The Contractor will not be required to install dowels if other acceptable means for connecting new concrete to existing are available. Acceptable alternative methods include lapping of reinforcing steel protruding from the existing concrete surface or use of approved mechanical splices to provide continuity between new and existing reinforcing steel.

For footings and neat work of substructures where joining planes are vertical, 3/4-inch headed expansion bolts shall be used instead of dowels. Bolts shall project at least 9 inches into new concrete and shall extend sufficiently far into existing concrete to develop their rated pullout strength but not less than 6 inches. The Contractor shall exercise care so that existing reinforcing steel is not damaged when drilling holes for expansion bolts.

Where necessary to prevent featheredges, existing concrete shall be removed to ensure a thickness for new concrete of at least 6 inches.

All of the concrete within a span lane that is to be removed shall be removed before recasting any concrete within that span lane, unless otherwise approved by the Engineer.

No concrete repairs, including removal and recasting of superstructure and substructure concrete, shall be performed within a span lane that is under traffic unless approved by the Engineer.

For full depth deck repair or expansion joint elimination or reconstruction that is not protected by concrete traffic barrier, the work shall be limited to that amount which can be performed within the duration of the scheduled lane closure unless alternate means of temporarily protecting the opening are provided. Any method for allowing traffic to ride over a temporary construction opening shall be designed to sustain traffic loading by the Contractor, and Working Drawings conforming to Section 105.10 shall be submitted to the Engineer for approval prior to use.

Where steel plates are provided to protect damaged or patched areas from traffic, the steel plate shall be of sufficient size, thickness, and strength to temporarily support traffic. Additionally, temporary anchorages between the steel plate and deck shall be adequate to prevent movement of the plate under traffic.

The Contractor shall provide appropriate work platforms, scaffolds, under bridge access vehicles, and other equipment that is required to obtain access to areas of work. The Engineer shall be provided access to work areas to determine the extent of repairs and to inspect the work. The cost of access equipment and materials shall be included in the price bid for the appropriate items.

1. **Remove Existing Concrete and Replace with New**

   The Contractor shall sound the surface of the concrete element to be repaired in accordance with ASTM D4580 in the presence of the Engineer. The Contractor shall then outline areas to be repaired with paint or other marker in rectangular patterns. Prior to performing repairs, obtain verification from the Engineer that marked areas are the appropriate areas requiring repair.

   Sawcut edges of area to be repaired to a depth of at least 1 inch or to a depth that shall clear the top of the reinforcing steel.

   Remove loose and unsound materials by the use of hand tools or pneumatic hammers weighing a nominal 35 pounds or less. Hammer weight applies to the weight of the pneumatic hammer alone. Pneumatic hammers shall be worked at an angle of 45 to 60 degrees to the plane of the concrete surface being removed.

   Whenever existing reinforcing bars are exposed, concrete shall be removed to a depth of no less than one inch beyond the reinforcing bars. Existing concrete shall be removed as shown on the plan details or as directed by the Engineer, to horizontal and vertical planes only, and to sound concrete, taking care not to damage any existing reinforcing steel.

   Within 24 hours prior to the placement of new concrete, exposed reinforcing steel and the faces of existing concrete shall be cleaned by abrasive blast cleaning.

   The Contractor shall repair and replace damaged or corroded reinforcement as required by this section.

   The Contractor shall place at least one zinc anode in the opening of each area to be patched or repaired, in accordance with Section 412.03(c) for Embedded Galvanic Anodes

   Immediately prior to placing new concrete, exposed reinforcing steel and faces of existing concrete shall be cleaned of all dust and debris by blowing with oil-free compressed air or hosing with water. A fine spray of moisture shall be applied to the exposed concrete surfaces. Faces of existing concrete shall be in a saturated surface dry condition prior to placing new concrete.

   Prior to placement of repair material the Contractor shall capture clear digital images or photographs of all repair areas. Images shall clearly demonstrate that the area to be repaired was prepared to the proper depth and with appropriate surface preparation. Images shall

include measuring devices that clearly demonstrate the length, width, and depth of the repair area. Images shall be submitted to Engineer for inclusion in project records and will be a condition for payment.

2. **Deteriorated Concrete Removal Plan**

The Contractor shall notify the Engineer a minimum of 3 working days before the beginning of any concrete repairs so that the areas to be repaired can be sounded in the presence of the Engineer. To preserve structural integrity and prevent unsafe structural conditions, the Contractor shall develop a plan for the removal of deteriorated concrete in superstructure and substructure elements. The plan shall be submitted to the Engineer for review after the elements are sounded and prior to beginning the work. The plan shall specify the order and size limits of areas of deteriorated concrete that may be removed at any one time. Concrete in the newly repaired areas shall attain a minimum design compressive strength of 3000 psi before adjacent concrete is removed. The cost of preparing the plan shall be included in the price bid for the appropriate items. Unless otherwise approved by the Engineer, the plan shall include the following limitations on concrete removal:

- **Reinforced Concrete Beams** - the removal of concrete in the tension zone of a beam shall be less than 30% of the span length at any one time.

- **Prestressed Concrete Beams** - the removal of concrete in the tension zone of a beam shall be less than 30% of the span length at any one time.

- **Caps for Column Piers** - the removal of concrete in the tension zone of a cap shall be less than 30% of the span between adjacent columns at any one time.

- **Cap Cantilevers for Column and Hammerhead Piers** - the removal of concrete in the tension zone of a cap cantilever shall be less than 30% of the length of the cantilever at any one time.

- **Pier Columns** - the removal of concrete in a pier column shall be less than 30% of the height of the column at any one time.

- **Columns in Multi-Column Piers** - no more than 50% of the columns may be under repair at any given time.

3. **Self-consolidating concrete** (SCC), used in lieu of Class A4 concrete for superstructure repairs or Class A3 concrete for substructure repairs, shall adhere to these procedures.

The Contractor shall demonstrate that he can produce satisfactory SCC that meets the Contract requirements by submitting documentation indicating the Contractor's successful experience in furnishing and placing SCC on similar size projects or structural elements, or by successfully trial batching at least 3 weeks prior to beginning placement operations. Such documentation shall list projects by date of completion, name or project reference number, client or owner, structural elements or type of unit placed, quantity of SCC furnished, names and experience of personnel, and current contact (owner or client) information for verification. The Contractor shall also demonstrate that SCC can be placed without segregation of the mix by a mock-up simulating the actual elements. The cost of the mock-up shall be included in the price bid for the appropriate items.

Formwork shall be in accordance with Section 404 and designed for the full static head of concrete.

A Concrete Technologist (such as the admixture supplier) experienced in the production of SCC or a representative of the SCC producer shall be present during placement. Concrete

shall stay plastic and within the slump flow specified during placement operations. Concrete placement shall be conducted in such a manner that air is not encapsulated, segregation does not occur, and the SCC flows freely to thoroughly occupy the formwork throughout the duration of the placement.

The Contractor shall field-test SCC in accordance with Section 217.11.

Record all concrete test data and submit the test data to the Engineer.

Consolidation is typically not necessary for SCC. However, the Contractor shall have internal vibrators on site in case internal vibration is needed due to delays in placement or if the concrete has lower than expected slump flow and has to be placed to prevent the formation of a cold joint.

The Contractor shall obtain prior approval by the Engineer if it is anticipated minimal vibration (external or internal) is required for proper consolidation due to congested reinforcement or space restrictions.

Equipment for job site mixing of hydraulic cement concrete and HES concrete shall be approved by the Engineer prior to the start of the work. Concrete mixed at the job site shall be mixed in a High Performance Volumetric Mixer (HPVM) in accordance with Section 217.05(d) when the quantity of repair material is greater than 6 cubic feet.

Concrete shall be constructed in accordance with Section 404 except that surfaces shall be finished and shaped to match existing adjacent surfaces. Concrete shall be Class A4 when used for superstructure work except prestressed concrete beams, and Class A3 when used for substructure work.

Section 412.03(e) **Concrete Substructure Surface Repairs** is replaced with the following:

Concrete Substructure Surface Repairs shall include repairing piers, wing blocks, abutments and other areas as designated on the Plans, removing and disposing of existing concrete, repairing or replacing existing reinforcing steel where required by the work described in this Section, preparing the contact surfaces, furnishing and placing a bond breaker when required, and furnishing and placing new reinforcing steel and concrete in accordance with the requirements herein. Exposed undamaged existing reinforcing steel shall be abrasive blast-cleaned and reused.

Limits of repair and removal of damaged concrete shall be determined in accordance with Section 412.03(a) herein. Removal of concrete shall be to a depth as required by Section 412.03(a) herein or as specified on the plans or as directed by the Engineer. Welded wire fabric shall be installed in accordance with Section 412.03(b)6 herein.

Concrete for substructure surface repair shall be Class A3 concrete or self-consolidating concrete cast within forms placed to match the original geometry of the substructure element. Finished and repaired concrete shall be flush with pre-existing concrete and no blisters or protrusions will be accepted. Shotcrete shall not be permitted unless approved by Engineer in writing. Repair materials shall conform to Section 217 and this specification.

Section 412.03(g) **Shotcrete** is amended by replacing the first paragraph with the following:

Shotcrete will be permitted only when specified for repairs or approved in writing for use in lieu of conventional hydraulic cement concrete or self-consolidating concrete. Shotcrete repairs shall be performed in accordance with Sections 412.02(e), 412.03(a), 412.03(b)6, 412.03(b)7d and 412.03(e) herein.

Included in the 2019 Supplement to the 2016 Specifications page 63

SS413-002016-01

August 30, 2017

VIRGINIA DEPARTMENT OF TRANSPORTATION
2016 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS
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(c) **Environmental and Worker Protection** is replaced with the following:

Environmental and Worker Protection: Heating, welding, flame cutting, grinding, chipping, needle gun cleaning, manual scraping, heat gun cleaning, drilling, straightening, and other construction operations, or demolition of Type B structures, as defined in Section 411.01, that disturbs areas coated with a hazardous material shall require environmental and worker protection.

1. **Environmental protection** shall be in accordance with Section 411.09 except the Department will allow a Certified Industrial Hygienist to perform the required duties of the SSPC QP-2 Certified Competent Person for work involving the removal of protective coating from a Type B structure where no coating operations will be conducted in the disturbed coating areas. The Department will not require the Contractor to submit and implement an environmental protection plan as specified in Sections 411.09(a) and 411.09(b) for work involving the removal of 100 square feet or less of protective coating from a Type B structure. However, the Contractor shall comply with applicable local, state, and federal codes and regulations and shall employ appropriate measures to prevent the release of hazardous materials into the environment. Determination of the total square footage of removal area shall not include the cumulative area of coating disturbance from removal of bolts. The Contractor shall dispose of hazardous materials generated from his demolition according to Sections 411.09(c) and 411.09(d).

2. **Worker health and safety protection** shall be accomplished according to Section 411.10 except the Department will allow a Certified Industrial Hygienist to perform the required duties of the SSPC QP-2 Certified Competent Person for work involving the removal of protective coating from a Type B structure where no coating operations will be conducted in the disturbed coating areas. The Department will not require the Contractor to submit and implement a worker health and safety protection plan as specified in Sections 411.10(a) and 411.10(b) for work involving the removal of 100 square feet or less of protective coating from a Type B structure. However Contractor shall comply with other applicable codes and regulations regarding public and worker health and safety.

Except when not required by size of removal areas, the Contractor shall submit a written statement to the Engineer, complete with all revisions including notations of any areas of noncompliance and corrective actions taken, that certifies both the Environmental Protection Plan and the Worker Health and Safety Plan were fully implemented as detailed during the performance of the work covered by this specification upon completion of the project.

Included in the 2019_Supplement_to_the_2016_Specifications page 64

SS431-002016-01 May 22, 2017

VIRGINIA DEPARTMENT OF TRANSPORTATION
2016 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS
SECTION 431—EPOXY BRIDGE DECK OVERLAYS

SECTION 431—EPOXY BRIDGE DECK OVERLAYS of the Specifications is amended as follows:

Section 431.02(a) **Fine aggregate** is replaced with the following:

Fine aggregate shall conform to Section 243.