



PAT McCRORY
Governor

NICHOLAS J. TENNYSON
Secretary

December 13, 2016

Addendum No. 3

RE: Contract # C203875

WBS # 46478.3.1

STATE FUNDED

Tyrrell-Dare Counties (B-5936)

Bridge #7 Over Alligator River On US-64

December 20, 2016 Letting

To Whom It May Concern:

Reference is made to the proposal form furnished to you on this project.

The following revisions have been made to the proposal:

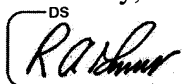
Page No.	Revisions
Proposal Cover	Note added that reads "Includes Addendum No. 3 Dated 12-13-16"
BPS-24	Removed paragraph (6) under (N) Coating Material under "Submittals" within the project special provision entitled "Cleaning and Painting Existing Bearings with HRCSA". The subsequent pages were renumbered
BPS-36	Removed the warranty language within the project special provision entitled "Cleaning and Painting Existing Bearings with HRCSA". The subsequent pages were renumbered

Please void the proposal cover and staple the new proposal cover thereto. We are hereby providing you with a complete new "BPS Section" with the above noted changes included.



The contract will be prepared accordingly.

Sincerely,

^{DS}


R. A. Garris, PE
Contract Officer

RAG/jag

cc: Mr. Lamar Sylvester, PE
Mr. Jerry Jennings PE
Mr. Rodger Rochelle, PE
Mr. R.E. Davenport, PE
Mr. Ken Kennedy, PE
Ms. Jaci Kincaid
Project File (2)

Mr. Ray Arnold, PE
Ms. Theresa Canales, PE
Ms. Marsha Sample
Mr. Mike Gwyn
Mr. Mitchell Dixon
Ms. Penny Higgins
Ms. Lori Strickland

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH, N.C.

PROPOSAL

INCLUDES ADDENDUM No. 3 DATED 12-13-16
INCLUDES ADDENDUM No. 2 DATED 11-29-16
INCLUDES ADDENDUM No. 1 DATED 10-13-16

DATE AND TIME OF BID OPENING: **DECEMBER 20, 2016 AT 2:00 PM**

CONTRACT ID C203875
WBS 46478.3.1

FEDERAL-AID NO. STATE FUNDED
COUNTY TYRRELL, DARE
T.I.P. NO. B-5936
MILES 2.828
ROUTE NO. US 64
LOCATION BRIDGE #7 OVER ALLIGATOR RIVER ON US-64.

TYPE OF WORK BRIDGE REHABILITATION

NOTICE:

ALL BIDDERS SHALL COMPLY WITH ALL APPLICABLE LAWS REGULATING THE PRACTICE OF GENERAL CONTRACTING AS CONTAINED IN CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA WHICH REQUIRES THE BIDDER TO BE LICENSED BY THE N.C. LICENSING BOARD FOR CONTRACTORS WHEN BIDDING ON ANY NON-FEDERAL AID PROJECT WHERE THE BID IS \$30,000 OR MORE, EXCEPT FOR CERTAIN SPECIALTY WORK AS DETERMINED BY THE LICENSING BOARD. BIDDERS SHALL ALSO COMPLY WITH ALL OTHER APPLICABLE LAWS REGULATING THE PRACTICES OF ELECTRICAL, PLUMBING, HEATING AND AIR CONDITIONING AND REFRIGERATION CONTRACTING AS CONTAINED IN CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA. NOTWITHSTANDING THESE LIMITATIONS ON BIDDING, THE BIDDER WHO IS AWARDED ANY FEDERAL - AID FUNDED PROJECT SHALL COMPLY WITH CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA FOR LICENSING REQUIREMENTS WITHIN 60 CALENDAR DAYS OF BID OPENING.

BIDS WILL BE RECEIVED AS SHOWN BELOW:

THIS IS A STRUCTURE PROPOSAL

5% BID BOND OR BID DEPOSIT REQUIRED

**Project Special Provisions
Structures
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DocuSigned by:
Robbie Weisz 12/2/2016
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STRUCTURE PROJECT SPECIAL PROVISIONS**SCOPE OF WORK**

This work shall consist of furnishing all labor, equipment, and materials to overlay the existing bridge deck with epoxy overlay system, bridge deck joint replacement, shotcrete repairs on superstructure and substructure, epoxy resin injection on substructure, and pile repairs. Work includes: existing bridge deck surface preparation, concrete deck repairs, overlaying the prepared bridge deck with an epoxy overlay system, existing joint demolition and reconstruction; installation of silicone joint seals, pile jacketing and rejacketing, milling of roadway approaches, asphalt paving approaches, pavement markings, temporary work platforms, seeding and mulching all grassed areas disturbed, disposal of waste material and all incidental items necessary to complete the project as specified and shown on the plans. No separate payment will be made for portable lighting as the cost of such is incidental to the work being performed.

Work will be performed on the existing bridges at the following locations in Tyrrell County:

- 1.) Bridge #7 – US 64 over Alligator River

Contractor shall provide all necessary access; provide all traffic control; understructure platforms, scaffolding, ladders, etc.; provide all staging areas, material storage, waste disposal, provide environmental controls to limit loss of materials from sawing equipment, and chipping equipment; and all else necessary to complete the work.

The contractor shall be responsible for fulfilling all requirements of the NCDOT Standard Specifications for Roads and Structures dated January 2012, except as otherwise specified herein.

SECURING OF VESSELS**(10-12-01)**

Secure vessels in accordance with Section 107 of the Standard Specifications and the following provision.

When utilizing barges, tugboats or other vessels, take all necessary precautions to ensure that such vessels are securely anchored or moored when not in active operation. Take all necessary measures to ensure that the vessels are operated in a manner that avoids damage to or unnecessary contact with bridges and other highway structures and attachments. If severe weather conditions are anticipated, or should be anticipated through reasonable monitoring of weather forecasts, take additional measures to protect bridges and other highway structures and attachments from extreme conditions. The Contractor is strictly liable for damages to any bridge or other highway structure or attachment caused by a vessel owned or controlled by the Contractor. The Contractor is also liable to third parties for property damages and loss of revenue caused by vessels under the Contractor's control.

MAINTENANCE OF WATER TRAFFIC**(12-5-12)**

The Contractor will be required to maintain water traffic in a manner satisfactory to both the Engineer and the U.S. Coast Guard and in conformance with the conditions of the Bridge Permit issued by the U.S. Coast Guard. The Contractor shall provide and maintain navigational lights in conformance with the requirements of the U.S. Coast Guard on both temporary and permanent work and shall carry on all operations in connection with the construction of the project in such a manner as to avoid damage or delay to water traffic.

WORK IN, OVER OR ADJACENT TO NAVIGABLE WATERS**(12-5-12)**

All work in, over, or adjacent to navigable waters shall be in accordance with the special provisions and conditions contained in the permits obtained by the Department from the U.S. Coast Guard, U.S. Army Corps of Engineers, or other authority having jurisdiction. The work shall have no adverse effect on navigation of the waterway including traffic flow, navigational depths, and horizontal and vertical clearances without approval from the authorities granting the permits.

The Contractor shall prepare drawings necessary to obtain any permits which may be required for his operations which are not included in the Department's permit including but not limited to excavation and dumping, constructing wharves, piers, ramps, and other structures connecting to bank or shore, and drawings for constructing falsework, cofferdams, sheeting, temporary bridges, and any other construction within the waterway. Submittals shall show locations of such work with respect to the navigational opening. The Contractor shall coordinate the submittal of drawings with the Engineer.

All construction shall progress and be maintained in a safe and timely manner. Temporary construction facilities shall be removed completely and promptly upon discontinuation of their useful purpose. Navigational lights, signals, or facilities shall be provided and maintained by the Contractor on temporary or permanent construction or vessels until such facilities are no longer needed as determined by the Engineer or permitting agency.

The Contractor shall immediately notify the appropriate authorities and take corrective measures as needed when any situation occurs that imposes a threat to the public. He shall also immediately correct any acts or occurrences that contradict or violate any requirements in the plans, special provisions, or permits when corrective measures can be performed in a safe manner. The Contractor shall notify the appropriate authorities when such corrective measures cannot be performed in a safe manner.

All costs incurred by the Contractor in complying with the above requirements shall be included in the prices bid for the various pay items and no additional payment will be made.

BRIDGE JOINT REMOVAL**(SPECIAL)****DESCRIPTION**

This provision addresses the removal of existing joint material to facilitate the installation of new silicone joint seals at the locations noted in the contract plans.

REMOVAL AND PREPARATION

Prior to any construction, take the necessary precautions to ensure debris from joint construction is not allowed to fall below the bridge deck.

Remove existing joint material by methods approved by the Engineer.

MEASUREMENT AND PAYMENT

Bridge Joint Removal will be measured and paid for at the contract unit price bid per linear foot and will be full compensation for removal, containment and disposal of existing joint material and shall include the cost of labor, tools, equipment and incidentals necessary to complete the work.

Pay Item**Pay Unit**

Bridge Joint Removal

Linear Feet

EPOXY OVERLAY SYSTEM-MECHANICALLY DISTRIBUTED**(SPECIAL)****GENERAL**

This work shall consist of furnishing and mechanically distributing an epoxy overlay system, over the concrete bridge deck in accordance with the contract documents and consists of a minimum of two (2) layers of hybrid polymer resins with a special blend of extremely hard aggregate designed to provide a 3/8 inch thick overlay for the purpose of crack treatment, complete waterproofing, and providing a non-skid surface. The overlay system shall be formulated and applied to withstand continuous heavy traffic, extreme changes in weather conditions, and deformations due to structure loading and temperature changes.

PERFORMANCE GUARANTEE

The Contractor shall provide a warranty bond to the Department, guaranteeing the wearing surface for a period of 36 months against the following defects: delamination of the epoxy overlay from the deck surface, and skid resistance less than 40 as measured by AASHTO T242. The performance bond will be invoked if 25 square feet of the deck surface meets the defect criteria prior to the end of the warranty. The guarantee period will start on the date of Department final acceptance of the project. At the end of the guarantee period, the warranty bond will be invoked if any part of deck surface meets the defect criteria, regardless of quantity.

The Contractor shall replace defective materials and workmanship at no cost to the Department. The Contractor will not be responsible for damage due to normal wear and tear, negligence on the part of the Department, or use in excess of the design.

The warranty bond amount shall be the bid quantity of epoxy overlay multiplied by the statewide average unit bid price for the epoxy overlay. The guarantee period of 36 months and bond value shall be specified in the warranty bond provided to the Department prior to final acceptance of the project.

MATERIALS

This two-part epoxy polymer overlay system shall be on the NCDOT Approved Products List (APL) and be free of any fillers or volatile solvents and shall be formulated to provide a simple volumetric mixing ratio of two components such as one to one or two to one by volume. The epoxy overlay system shall be formulated to provide flexibility in the system without any sacrifice of the hardness, chemical resistance or strength of the system. Use of external/conventional flexibilizers will not be accepted. Flexibility shall be by interaction of elastomers which chemically link during the process of curing so the flexibility of the molecule is least affected during the low temperature conditions that are confronted in actual use.

Epoxy

When the two component system is mixed at the appropriate ratio, the cured resin shall conform to the following requirements:

EPOXY PROPERTIES		
Property	Requirement	Test Method
Viscosity-Poises at 77°F ± 2°F	7-25	ASTM D2393 (Spindle No.3 at 20 rpm)
Pot Life	15-45 minutes @ 75° F	ASTM C881
Min. Tensile Strength at 7 days	2000 psi	ASTM D638
Tensile Elongation at 7 days	30-70%	ASTM D638
Min. Compressive Strength @ 3 hrs.	1,000 psi	ASTM C109
Min. Compressive Strength @ 24 hrs.	5000 psi	ASTM C109
Min. adhesion strength @ 24 hrs.	250 psi @ 75° F	ASTM C1583
Max. Water Absorption	1%	ASTM D570

Aggregate

Aggregate used for all layers shall be non-friable, non-polishing, clean and free from surface moisture. The aggregate shall be flint rock, 100% fractured, thoroughly washed and kiln dried to a maximum moisture content of 0.2% by weight, measured in accordance with ASTM C566.

The fracture requirements shall be at least one mechanically fractured face and will apply to materials retained on a U.S. No. 10 sieve. Aggregate shall conform to the following requirements:

AGGREGATE PROPERTIES		
Property	Value	Test Method
Moisture Content, max.	0.2% by weight	AASHTO T255
Mohs Hardness, min.	7	
Soundness Loss, 5 cycles in Sodium Sulfate, max.	5.4%	AASHTO T104
Micro-Deval, max.	10%	AASHTO TP58

AGGREGATE GRADATION	
Sieve	Percent Passing
No. 4	100
No. 8	30-75
No. 16	Max. 5
No. 30	Max. 1

SURFACE PREPARATION

Remove all existing overlays if applicable, and all loose, disintegrated, unsound or contaminated concrete from the bridge deck. Prepare the bridge deck prior to applying the overlay system, in accordance with the manufacturer's recommendations, the special provision *Concrete Deck Repair for Epoxy Overlay*, and this provision.

Prior to overlay placement and upon completion of the deck repairs, clean the entire deck surface by steel shotblasting and other means to remove asphaltic material, oils, dirt, rubber, curing compounds, pavement markings, paint carbonation, laitance, weak surface mortar and other materials that may interfere with the bonding or curing of the overlay. Do not begin shotblasting until all grinding or milling operations are completed. Use sandblasting equipment on areas that cannot be reached by the shotblasting operation. If expansion joints are not being replaced or have been replaced prior to shotblasting they shall be protected from damage from the shotblasting operation. Pavement markings shall be considered clean when the concrete has exposed aggregate showing through the paint stripe. Deck drains and areas of curb or railing above the proposed surface shall be protected from the shotblasting operation. Mortar that is soundly bonded to the coarse aggregate shall have open pores to be considered adequate for bond.

Prior to placement of epoxy, remove and capture all shotblasting media, unsound concrete, dust, dirt, and other loose material from the shotblasting operation, and dry all moisture from the bridge deck.

Prior to overlay placement and upon completion of surface preparation, perform bond testing of the epoxy overlay material in accordance with ASTM C1583 on two pre-selected 3' x 3' test patches. Test locations will be determined by the Engineer. The tensile rupture strength shall be at least 250 psi, or the depth of failure into the concrete deck shall be ¼" or greater over a minimum of 50% of the location area. Install test sections with the same materials, equipment, personnel, timing and sequence of operations and curing time that will be used for the installation of the overlay.

If the cleaning method, materials and installation procedure do not produce acceptable test results, the contractor must remove failed test patches, make the necessary adjustments, and retest all patches at no additional cost to the Department until satisfactory test results are obtained.

Test locations shall be removed to the original concrete substrate prior to placement of the deck overlay.

Epoxy based overlays shall not be placed on hydraulic cement concrete that is less than 28 days old. Patching and cleaning operations shall be inspected and approved prior to placing each layer of the overlay. Any contamination of the deck or intermediate courses, after initial cleaning, shall be removed.

The deck shall be completely dry at the time of application of the epoxy concrete overlay. Deck drains shall be closed off during application of epoxy overlay.

EQUIPMENT

Equipment shall consist of no less than an epoxy distribution system, an aggregate spreader, application squeegees, a vacuum truck, and a source of lighting if work is to be performed at night. Provide a vacuum capable of picking up dust and other loose material from the shotblasting operation. Provide air compressors equipped with oil/water separator capable of drying all moisture from the bridge deck. Care shall be taken and methods used to fully capture and collect shotblasting media, unsound concrete, dust, dirt, and other loose material. The distribution system, which may be comprised of multiple components, shall accurately measure and mix the epoxy resin and hardening agent, and shall uniformly and accurately apply the epoxy materials at the specified rate to the bridge deck in such a manner as to cover 100% of the work area. The use of hand held machine mixing equipment or hand mixing equipment is prohibited. Squeegees may be used for additional spreading and adjustments after the epoxy material is placed. The aggregate spreader shall be propelled in such a manner as to uniformly and accurately apply the aggregate to cover 100% of the epoxy material. Aggregate shall be sprinkled or dropped vertically in a manner such that the level of the epoxy mixture is not disturbed.

APPLICATION

Handling and mixing of the epoxy resin and hardening agent shall be performed in a safe manner to achieve the desired result in accordance with the manufacturer's recommendations as approved and as directed by the Engineer. Epoxy overlay materials shall not be placed when

weather or surface conditions are such that the material cannot be properly handled, placed, spread and cured within the specified requirements of traffic control.

The application rates of the liquid and stone in the 2 layers shall be as recommended by the manufacturer, but not less than the following rate of application.

TABLE 4		
APPLICATION RATES		
Course	Min. Epoxy Rate (Gal./100 SF)	Min. Aggregate Rate (Lbs./Sq.Yd)
1	2.5	10
2	5	14

The final overlay thickness shall be a minimum of 3/8". Once the epoxy mixture has been prepared, immediately and uniformly apply it to the surface of the bridge deck. There shall be no longitudinal joints of the epoxy overlay in the wheel path. The temperature of the bridge deck surface and all epoxy and aggregate components shall be 60°F or above at the time of application. Epoxy shall not be applied if the air temperature is expected to drop below 55°F within 8 hours after application or if air temperatures would cause the gel time to be less than 10 minutes. Consult with the manufacturer when placing overlay at temperatures above 90°F. The dry aggregate shall be applied in such a manner as to completely cover the epoxy mixture so that no wet spots appear and before it begins to gel. First course applications that do not receive enough aggregate prior to gel shall be removed and replaced. A second course insufficiently covered with aggregate may be left in place, but will require additional applications before opening to traffic. After each course is fully cured, all loose aggregate shall be removed by vacuuming or brooming. Traffic shall not be allowed on the first course of the overlay. Traffic and equipment shall not be permitted on the overlay surface during the curing period. The minimum curing periods shall be as follows:

Course: Average temperature of deck, epoxy and aggregate components in °F

	60-64	65-69	70-74	75-79	80-84	85+
Course 1	4 hrs.	3 hrs.	2.5 hrs.	2 hrs.	1.5 hrs.	1 hr.
Course 2	6.5 hrs.*	5 hrs.	4 hrs.	3 hrs.	3 hrs.	3 hrs.

*Course 2 shall be cured for 8 hrs. if the air temperature drops below 60°F during the curing period.

The Contractor shall plan and execute the work to provide the curing periods as specified herein, or manufacturer proposed curing periods may be submitted to the Engineer for review and approval.

Do not apply epoxy overlay courses over modular joints, metal expansion joints, or foam joint seals. A bond breaker shall be placed on all expansion joints.

In the event the Contractor's operation damages the epoxy overlay, the Contractor shall remove the damaged areas by saw-cutting in rectangular sections perpendicular to the top of

the concrete deck surface and replacing the various courses in accordance with this Specification at no additional cost to the Department.

Prior to acceptance, perform one bond test on each span or every 300 square yards, whichever is smaller, in accordance with ASTM C1583 on 3' x 3' test patches. Test locations will be determined by the Engineer. The tensile rupture strength test results shall be at least 250 psi, or the depth of failure into the concrete deck shall be ¼" or greater over a minimum of 50% of the test location area. Unacceptable test results will require removal and replacement of overlay as directed by the Engineer at no cost to the Department. Test locations shall be repaired with approved repair materials.

MEASUREMENT & PAYMENT

Epoxy Overlay System – Mechanically Distributed will be measured and paid for at the contract unit price per square feet. The price shall include surface preparation, furnishing and placing the overlay system by means of mechanical distribution, providing a 36 month warranty bond, all tools, labor, materials, bond strength testing and any incidentals necessary to complete the work.

Payment will be made under:

Pay Item	Pay Unit
Generic Structure Item (Epoxy Overlay System-Mechanically Distributed)	Square Feet

CONCRETE DECK REPAIR FOR EPOXY OVERLAY

(SPECIAL)

GENERAL

This provision addresses concrete deck repairs prior to placing an epoxy overlay. Work shall begin within 60 days of notification. After surface preparation, the Engineer sounds the deck using a chain drag or other acceptable means and marks areas to be repaired.

MATERIALS

Concrete deck repair material shall be epoxy based material with a minimum modulus of elasticity of 2500 ksi. The repair material must be on the NCDOT Approved Product List (APL) and recommended by the manufacturer for use with an epoxy overlay system. Materials containing cement mortar are acceptable; however, a 28 day curing period will be required before placing the epoxy overlay. The curing period may be adjusted if approved by the epoxy overlay manufacturer and the Engineer. Submit the proposed repair material and schedule of repairs to the Engineer for approval prior to beginning the work.

CLASS II SURFACE PREPARATION (PARTIAL DEPTH)

Saw cut a perimeter surrounding the repair to a depth not less than 1 inch and remove all loose, unsound and contaminated material by chipping with hand tools to an average depth of approximately one-half the deck thickness, but no less than 3/4 inch below the top mat of steel.

At joint locations remove by chipping with hand tools all loose, unsound concrete or elastomeric headers adjacent to the joint. Use a small chipping hammer (15 lb. class) to prepare the edges of the repair area to limit micro fractures.

In overhangs, removing concrete areas greater than 0.60 ft²/ft length of bridge will require overhang support. Submit the overhang support method to the Engineer for approval.

If the condition of the concrete at joint edges is such that deep spalls or sheer faces result, notify the Engineer prior to completing repair.

Clean, repair or replace rusted or loose reinforcing steel. Care shall be taken not to cut, stretch, or damage any exposed reinforcing steel. Thoroughly clean the newly exposed surface. Use a bonding agent in accordance with the manufacturer's recommendations.

APPLICATION

Refill areas where concrete is removed with repair material up to the finished deck surface and cure in accordance with the material manufacturer's recommendations. Provide a raked finish.

MEASUREMENT & PAYMENT

Concrete Deck Repair for Epoxy Overlay will be measured and paid for at the contract unit price per square feet for the appropriate areas repaired. The price shall include materials, labor, equipment, tools and any incidentals necessary to complete the work.

Reinforcing Steel added to supplement or replace deteriorated steel will be measured and paid for at the contract unit price bid per pound of steel used in the completed and accepted work. Reinforcing steel needed to repair cut or otherwise damaged bars during concrete removal shall be supplied and installed at the Contractors expense.

Payment will be made under:

Pay Item	Pay Unit
Concrete Deck Repair for Epoxy Overlay	Square Feet
Reinforcing Steel	Pound

EPOXY RESIN INJECTION

(12-5-12)

1.0 GENERAL

For repairing cracks, an approved applicator is required to perform the epoxy resin injection. Make certain the supervisor and the workmen have completed an instruction program in the methods of restoring concrete structures utilizing the epoxy injection process and have a record of satisfactory performance on similar projects.

The applicator furnishes all materials, tools, equipment, appliances, labor and supervision required when repairing cracks with the injection of an epoxy resin adhesive.

2.0 SCOPE OF WORK

Using Epoxy Resin Injection, repair all cracks 30 mils wide or greater in the end bent caps, interior bent columns and caps, and in the superstructure deck.

Repair the column cracks to the top of the footings. Make the underwater repairs when water surface elevation is low and the water is still. For underwater repairs, use manufacturer recommended materials.

Repair any crack, void, honeycomb or spall area unsuitable for repair by injection with epoxy mortar.

3.0 COOPERATION

Cooperate and coordinate with the Technical Representative of the epoxy resin manufacturer for satisfactory performance of the work.

Have the Technical Representative present when the job begins and until the Engineer is assured that his service is no longer needed.

The expense of having this representative on the job is the Contractor's responsibility and no direct payment will be made for this expense.

4.0 TESTING

The North Carolina Department of Transportation Materials and Tests Unit will obtain cores from the repaired concrete for testing. If the failure plane is located at the repaired crack, a minimum compressive strength of 3000 psi is required of these cores.

5.0 MATERIAL PROPERTIES

Provide a two-component structural epoxy adhesive for injection into cracks or other voids. Provide modified epoxy resin (Component "A") that conforms to the following requirements:

	Test Method	Specification Requirements
Viscosity @ 40 ± 3°F, cps	Brookfield RVT Spindle No. 4 @ 20 rpm	6000 - 8000
Viscosity @ 77 ± 3°F, cps	Brookfield RVT Spindle No. 2 @ 20 rpm	400 - 700
Epoxide Equivalent Weight	ASTM D1652	152 - 168
Ash Content, %	ASTM D482	1 max.

Provide the amine curing agent (Component "B") used with the epoxy resin that meets the following requirements:

	Test Method	Specification Requirements
Viscosity @ 40 ± 3°F, cps	Brookfield RVT Spindle No. 2 @ 20 rpm	700 - 1400
Viscosity @ 77 ± 3°F, cps	Brookfield RVT Spindle No. 2 @ 20 rpm	105 - 240
Amine Value, mg KOH/g	ASTM D664*	490 - 560
Ash Content, %	ASTM D482	1 max.
* Method modified to use perchloric acid in acetic acid.		

Certify that the Uncured Adhesive, when mixed in the mix ratio that the material supplier specifies, has the following properties:

Pot Life (60 gram mass)

@ 77 ± 3°F - 15 minutes minimum

@ 100 ± 3°F - 5 minutes minimum

Certify that the Adhesive, when cured for 7 days at 77 ± 3°F unless otherwise specified, has the following properties:

	Test Method	Specification Requirements
Ultimate Tensile Strength	ASTM D638	7000 psi (min.)
Tensile Elongation at Break	ASTM D638	4% max.
Flexural Strength	ASTM D790	10,000 psi (min.)
Flexural Modulus	ASTM D790	3.5 x 10 ⁵ psi

Compressive Yield Strength	ASTM D695	11,000 psi (min.)
Compressive Modulus	ASTM D695	2.0 - 3.5 x 10 ⁵ psi
Heat Deflection Temperature Cured 28 days @ 77 ± 3°F	ASTM D648*	125°F min. 135°F min.
Slant Shear Strength, 5000 psi (34.5 MPa) compressive strength concrete Cured 3 days @ 40°F wet concrete Cured 7 days @ 40°F wet concrete Cured 1 day @ 77°F dry concrete	AASHTO T237	 3500 psi (min.) 4000 psi (min.) 5000 psi (min.)
* Cure test specimens so that the peak exothermic temperature of the adhesive does not exceed 77°F.		

Use an epoxy bonding agent, as specified for epoxy mortar, as the surface seal (used to confine the epoxy resin during injection).

6.0 EQUIPMENT FOR INJECTION

Use portable positive displacement type pumps with interlock to provide positive ratio control of exact proportions of the two components at the nozzle to meter and mix the two injection adhesive components and inject the mixed adhesive into the crack. Use electric or air powered pumps that provide in-line metering and mixing.

Use injection equipment with automatic pressure control capable of discharging the mixed adhesive at any pre-set pressure up to 200 ± 5 psi and equipped with a manual pressure control override.

Use equipment capable of maintaining the volume ratio for the injection adhesive as prescribed by the manufacturer. A tolerance of ± 5% by volume at any discharge pressure up to 200 psi is permitted.

Provide injection equipment with sensors on both the Component A and B reservoirs that automatically stop the machine when only one component is being pumped to the mixing head.

7.0 PREPARATION

Follow these steps prior to injecting the epoxy resin:

Remove all dirt, dust, grease, oil, efflorescence and other foreign matter detrimental to the bond of the epoxy injection surface seal system from the surfaces adjacent to the cracks or other areas of application. Acids and corrosives are not permitted.

Provide entry ports along the crack at intervals not less than the thickness of the concrete at that location.

Apply surface seal material to the face of the crack between the entry ports. For through cracks, apply surface seal to both faces.

Allow enough time for the surface seal material to gain adequate strength before proceeding with the injection.

8.0 EPOXY INJECTION

Begin epoxy adhesive injection in vertical cracks at the lower entry port and continue until the epoxy adhesive appears at the next higher entry port adjacent to the entry port being pumped.

Begin epoxy adhesive injection in horizontal cracks at one end of the crack and continue as long as the injection equipment meter indicates adhesive is being dispensed or until adhesive shows at the next entry port.

When epoxy adhesive appears at the next adjacent port, stop the current injection and transfer the epoxy injection to the next adjacent port where epoxy adhesive appeared.

Perform epoxy adhesive injection continuously until cracks are completely filled.

If port to port travel of epoxy adhesive is not indicated, immediately stop the work and notify the Engineer.

9.0 FINISHING

When cracks are completely filled, allow the epoxy adhesive to cure for sufficient time to allow the removal of the surface seal without any draining or runback of epoxy material from the cracks.

Remove the surface seal material and injection adhesive runs or spills from concrete surfaces.

Finish the face of the crack flush to the adjacent concrete, removing any indentations or protrusions caused by the placement of entry ports.

10.0 BASIS OF PAYMENT

Payment for epoxy resin injection will be at the contract unit price per linear foot for "Epoxy Resin Injection". Such payment will be full compensation for all materials, tools, equipment, labor, and for all incidentals necessary to complete the work.

SHOTCRETE REPAIRS**(SPECIAL)****GENERAL**

The work covered by this Special Provision consists of removing deteriorated concrete from the structure in accordance with the limits, depth and details shown on the plans, described herein and as established by the Engineer. This work also includes removing and disposing all loose debris, cleaning and repairing reinforcing steel and applying shotcrete.

The location and extent of repairs shown on the plans are general in nature. The Engineer shall determine the extent of removal in the field based on an evaluation of the condition of the exposed surfaces.

Any portion of the structure that is damaged from construction operations shall be repaired to the Engineer's satisfaction, at no extra cost to the Department.

MATERIAL REQUIREMENTS

Use prepackaged shotcrete conforming to the requirements of ASTM C1480, the applicable sections of the Standard Specifications and the following:

Test Description	Test Method	Age (Days)	Specified Requirements
Silica Fume (%)	ASTM C1240	-	10 (Max.)
Water/Cementitious Materials Ratio	-	-	0.40 (Max.)
Air Content - As Shot (%)	ASTM C231	-	4 ± 1
Slump - As Shot (Range in inches)	ASTM C143	-	2 - 3
Minimum Compressive Strength (psi)	ASTM C39	7 28	3,000 5,000
Minimum Bond Pull-off Strength (psi)	ASTM C1583	28	145
Rapid Chloride Permeability Tests (range in coulombs)	ASTM C1202	-	100 - 1000

Admixtures are not allowed unless approved by the Engineer. Store shotcrete in an environment where temperatures remain above 40°F and less than 95°F

All equipment must operate in accordance with the manufacturer's specifications and material must be placed within the recommended time.

QUALITY CONTROL

A. Qualification of Shotcrete Contractor

The shotcrete Contractor shall provide proof of experience by submitting a description of jobs similar in size and character that have been completed within the last 5 years. The name, address and telephone number of references for the submitted projects shall also be furnished. Failure to provide appropriate documentation will result in the rejection of the proposed shotcrete contractor.

B. Qualification of Nozzleman

The shotcrete Contractor's nozzleman shall be certified by the American Concrete Institute (ACI). Submit proof of certification to the Engineer prior to beginning repair work. The nozzleman shall maintain certification at all times while work is being performed for the Department. Failure to provide and maintain certification will result in the rejection of the proposed nozzleman.

TEMPORARY WORK PLATFORM

Prior to beginning any repair work, provide details for a sufficiently sized temporary work platform at each repair location. Design steel members to meet the requirements of the American Institute of Steel Construction Manual. Design timber members in accordance with the "National Design Specification for Stress-Grade Lumber and Its Fastenings" of the National Forest Products Association. Submit the platform design and plans for review and approval. The design and plans shall be sealed and signed by a North Carolina registered Professional Engineer. Do not install the platform until the design and plans are approved. Drilling holes in the superstructure for the purpose of attaching the platform is prohibited. Upon completion of work, remove all anchorages in the substructure and repair the substructure at no additional cost to the Department.

SURFACE PREPARATION

Prior to starting the repair operation, delineate all surfaces and areas assumed to be deteriorated by visually examining and sounding the concrete surface with a hammer or other approved method. The Engineer is the sole judge in determining the limits of deterioration.

Prior to removal, introduce a shallow saw cut approximately 1/2" in depth around the repair area at right angles to the concrete surface. Remove all deteriorated concrete 1 inch below the reinforcing steel with a 17 lb (maximum) pneumatic hammer with points that do not exceed the width of the shank or with hand picks or chisels as directed by the Engineer. Do

not cut or remove the existing reinforcing steel. Unless specifically directed by the Engineer, do not remove concrete deeper than 1 inch below the reinforcing steel.

Abrasive blast all exposed concrete surfaces and existing reinforcing steel in repair areas to remove all debris, loose concrete, loose mortar, rust, scale, etc. Use a wire brush to clean all exposed reinforcing steel and prestressed strands. After sandblasting examine the reinforcing steel to ensure at least 90% of the original diameter remains. If there is more than 10% reduction in the rebar diameter, splice in and securely tie supplemental reinforcing bars as directed by the Engineer. Note and provide detailed documentation, including location, and severity, of all damage to prestressed strands that exceeds 10% section loss. If five or more strands are damaged, notify the Engineer prior to placement of repair material.

Provide welded stainless wire fabric at each repair area larger than one square foot if the depth of the repair exceeds 2 inches from the "As Built" outside face. Provide a minimum 4" x 4" - 12 gage stainless welded wire fabric unless otherwise shown on the plans. Rigidly secure the welded wire fabric to existing steel or to 3/16" diameter stainless hook fasteners adequately spaced to prevent sagging. Encase the welded wire fabric in shotcrete a minimum depth of 1½ inches.

The contractor has the option to use synthetic fiber reinforcement as an alternate to welded wire fabric if attaching welded wire fabric is impractical or if approved by the Engineer. Welded wire fabric and synthetic fiber reinforcement shall not be used in the same repair area.

Thoroughly clean the repair area of all dirt, grease, oil or foreign matter, and remove all loose or weakened material before applying shotcrete. Saturate the repair area with clean water the day before applying shotcrete. Bring the wetted surface to a saturated surface dry (SSD) condition prior to applying shotcrete and maintain this condition until the application begins. Use a blowpipe to facilitate removal of free surface water. Only oil-free compressed air is to be used in the blowpipe.

The time between removal of deteriorated concrete and applying shotcrete shall not exceed 5 days. If the time allowance exceeds 5 days, prepare the surface at the direction of the Engineer before applying shotcrete.

APPLICATION AND SURFACE FINISH

Apply shotcrete only when the surface temperature of the repair area is greater than 40°F and less than 95°F. Do not apply shotcrete to frosted surfaces. Maintain shotcrete at a minimum temperature of 40°F for 3 days after placement.

Apply shotcrete in layers. The properties of the applied shotcrete determine the proper thickness of each layer or lift.

The nozzleman should hold the nozzle 3 to 4 feet from the surface being covered in a position that ensures the shotcrete strikes at right angles to the surface being covered without excessive impact. The nozzleman shall maintain the water amount at a practicable minimum, so the mix properly adheres to the repair area. Water content should not become high enough

to cause the mix to sag or fall from vertical or inclined surfaces, or to separate in horizontal layers.

Use shooting wires or guide strips that do not entrap rebound sand. Use guide wires to provide a positive means of checking the total thickness of the shotcrete applied. Remove the guide wires prior to the final finish coat.

To avoid leaving sand pockets in the shotcrete, blow or rake off sand that rebounds and does not fall clear of the work, or which collects in pockets in the work. Do not reuse rebound material in the work.

If a work stoppage longer than 2 hours takes place on any shotcrete layer prior to the time it has been built up to required thickness, saturate the area with clean water and use a blowpipe as outlined previously, prior to continuing with the remaining shotcrete course. Do not apply shotcrete to a dry surface.

Finish all repaired areas, including chamfered edges, as close as practicable to their original "As Built" dimensions and configuration. Provide a minimum 2" of cover for reinforcing steel exposed during repair. Slightly build up and trim shotcrete to the final surface by cutting with the leading edge of a sharp trowel. Use a rubber float to correct any imperfections. Limit work on the finished surface to correcting imperfections caused by trowel cutting.

Immediately after bringing shotcrete surfaces to final thickness, thoroughly check for sags, bridging, and other deficiencies. Repair any imperfections at the direction of the Engineer.

Prevent finished shotcrete from drying out by maintaining 95% relative humidity at the repair and surrounding areas by fogging, moist curing or other approved means for seven days.

MATERIAL TESTING & ACCEPTANCE

Each day shotcreting takes place, the nozzleman shall shoot one 18" x 18" x 3" test panel in the same position as the repair work that is being done to demonstrate the shotcrete is being applied properly. Store, handle and cure the test panel in the same manner as the repaired substructure.

Approximately 72 hours after completing the final shotcrete placement, thoroughly test the surface with a hammer. At this time, the repair area should have sufficient strength for all sound sections to ring sharply. Remove and replace any unsound portions prior to the final inspection of the work. No additional compensation will be provided for removal and replacement of unsound shotcrete.

After 7 days, core three 3" diameter samples from each test panel and from the repaired structure as directed by the Engineer. Any cores taken from the structure shall penetrate into the existing structure concrete at least 2 inches. Cores shall be inspected for delamination, sand pockets, tested for bond strength and compressive strength. If a core taken from a repaired structure unit indicates unsatisfactory application or performance of the shotcrete, take additional cores from the applicable structure unit(s) for additional evaluation and testing as directed by the Engineer. Any repair work failing to meet the requirements of this

provision will be rejected and the Contractor shall implement a remediation plan to correct the deficiency at no additional cost to the Department. No extra payment will be provided for drilling extra cores. Patch all core holes in repaired structure units to the satisfaction of the Engineer. All material testing, core testing and sampling will be done by the Materials and Tests Unit of North Carolina Department of Transportation.

MEASUREMENT AND PAYMENT

Shotcrete Repairs will be measured and paid for at the contract unit price bid per cubic foot and will be full compensation for removal, containment and disposal off-site of unsound concrete including the cost of materials, labor, tools, equipment and incidentals necessary to complete the repair work. Depth will be measured from the original outside concrete face. The Contractor and Engineer will measure quantities after removal of unsound concrete and before application of repair material. Payment will also include the cost of sandblasting, surface cleaning and preparation, cleaning of reinforcing steel, placement of new steel, cost of temporary work platform, testing for soundness, curing of shotcrete and taking core samples from the test panels and substructure units.

Payment will be made under:

Pay Item	Pay Unit
Shotcrete Repairs	Cubic Feet

EPOXY MORTAR REPAIRS

(SPECIAL)

1.0 MATERIAL PROPERTIES

Use a two-component paste epoxy bonding agent for the epoxy mortar conforming to the following requirements:

Density, lbs/gal	10.5
Specific Gravity	1.3
Minimum Application Temperature, °F	50
Application Temperature Range, °F	60 to 105
Shelf Life	1 year (min.)

	@ 60°F	@ 85°F	@ 105°F
Potlife, hr., 1 gallon	2½	1	½
Open Time ¹ , minimum: hr.	4	1¾	¾
Non-sag Thickness, inches (ASTM D2730)	1	¾	½
Initial Cure ² , days (AASHTO T237)	10	6	3

Cure Time ³ , days (ASTM D695)	20	10	7
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Typical Mechanical Properties ⁴	
Tensile Strength, psi Elongation at Break (ASTM D638)	1,500 4%
Compressive Yield Strength, psi Compressive Modulus, psi (ASTM D695)	8,000 4.0 x 10 ⁵
Heat Deflection Temperature ⁵ , °F (ASTM D648)	105
Slant Shear Strength, psi Damp to Damp Concrete (AASHTO T237)	5,000 100% Concrete Failure

1. From start of mixing to completion of repair
2. 5,000 psi minimum
3. Isothermal cure to eliminate effect of exotherm
4. Cure schedule 7 days @ 77°F, test temperature 77°F
5. 128°F after 28 day cure

2.0 SURFACE PREPARATION

Prior to the application of epoxy mortar, thoroughly clean surfaces to be repaired and remove all loose materials. Remove grease, wax, and oil contaminants by scrubbing with an industrial grade detergent or degreasing compound followed by a mechanical cleaning. Remove weak or deteriorated concrete to sound concrete by bush hammering, gritblasting, scarifying, waterblasting, or other approved methods. Remove dirt, dust, laitance and curing compounds by gritblasting, sanding, or etching with 15% hydrochloric acid.

Acid etch only if approved by the Engineer. Follow acid etching by scrubbing and flushing with copious amounts of clean water. Check the cleaning using moist pH paper. Water cleaning is complete when the paper reads 10 or higher.

Follow all mechanical cleaning with vacuum cleaning.

3.0 APPLICATION

When surface preparation is completed, apply epoxy mortar to the areas specified in the contract plans and established by the Engineer. Repair deep surface irregularities such as severe spalling with a 1:1 sand-epoxy mix. Use graded silica sand that is washed, kiln-dried, and bagged. Repair shallow surface irregularities with the epoxy bonding agent. The finishing of those areas receiving the sand-epoxy mix with the epoxy bonding agent is permitted.

Apply epoxy mortar to damp surfaces only when approved. In such instances, remove all free water by air-blasting.

After applying the epoxy mortar, remove excessive material and provide a smooth, flush surface. Remove the epoxy material in accordance with the supplier's instructions.

TEMPORARY WORK PLATFORM

Prior to beginning any repair work, provide details for a sufficiently sized temporary work platform at each repair location. Design steel members to meet the requirements of the American Institute of Steel Construction Manual. Design timber members in accordance with the "National Design Specification for Stress-Grade Lumber and Its Fastenings" of the National Forest Products Association. Submit the platform design and plans for review and approval. The design and plans shall be sealed and signed by a North Carolina registered Professional Engineer. Do not install the platform until the design and plans are approved. Drilling holes in the superstructure for the purpose of attaching the platform is prohibited. Upon completion of work, remove all anchorages in the substructure and repair the substructure at no additional cost to the Department.

4.0 MEASUREMENT AND PAYMENT

Payment for Epoxy Mortar Repairs will be at the contract unit price per cubic foot for "Epoxy Mortar Repairs". Such payment will be full compensation for furnishing all material, labor, the cost of surface cleaning and preparation, cleaning of reinforcing steel, cost of temporary work platform and tools and equipment necessary for performing this work complete in place and accepted. Depth will be measured from the original outside concrete face. The Contractor and Engineer will measure quantities after removal of unsound concrete and before application of repair material.

Payment will be made under:

Pay Item	Pay Unit
Epoxy Mortar Repairs	Cubic Feet

CLEANING AND PAINTING EXISTING BEARINGS WITH HRCSA

DESCRIPTION

These items of work shall consist of cleaning, preparation, and field application of the specified paint system to existing steel bridge bearings and for all labor, materials, tools and equipment necessary, to complete the work to the limits shown on the plans, described in these special provisions, or as directed by the Engineer.

On bridge 880007, the bearings (including bearing plates, fill plates, anchor rods and nuts, embedded plates on girder, and any other associated metal components that support each girder at each bent) shall be cleaned as required in this special provision, using hand tools, power tools, and high pressure water equipment. Using dry compressed air, connections and crevices will be dried completely. Rust penetrant will be applied to all open connections, crevices, pack rust and scale rust areas. A paint system with a co-polymerized high ratio of 'active' calcium sulfonate (HRCSA) will be used as a stripe coat at all connections/crevices and as a topcoat over the bearings.

CERTIFICATION

The existing paint systems include toxic substances such as red lead oxide, which are considered hazardous if improperly removed. The contractor shall be currently SSPC QP 2, Category A certified, and have successfully completed lead paint removal and field painting on similar structures within 18 months prior to this bid.

The apparent low bidder shall submit a list of projects for which QP 2 work was performed within the last 18 months including owner contact information and submit to the Assistant State Structures Engineer (Operations) a "Lead Abatement Affidavit" by 12:00 noon of the third day following the opening of bids. This form may be downloaded from: <http://www.ncdot.gov/projects/nbridges/#stats>.

The Engineer will evaluate the work history to verify all lead abatement work was completed in accordance with contract specifications, free of citation from safety or environmental agencies. Lead abatement work shall include, but not be limited to: abrasive blasting; waste handling, storage and disposal; worker safety during lead abatement activities (fall protection, PPE, etc.); and containment. This requirement is in addition to the contractor pre-qualification requirements covered by Article 102-2 of the *2012 Standard Specifications*.

TWELVE-MONTH OBSERVATION PERIOD

The Contractor maintains responsibility for the coating system for a 12 month observation period beginning upon the satisfactory completion of all the work required in the plans or as directed by the Engineer. The Contractor shall guarantee the coating system under the payment and performance bond (refer to Article 109-10 of the *2012 Standard Specifications*). To successfully complete the observation period, the coating system shall meet the following requirements after 12 months service:

- (A) No visible rust, contamination or application defect is observed in any coated area.
- (B) Painted surfaces have a uniform color and gloss.
- (C) Painted surfaces have an adhesion that meets an ASTM D3359, 3A rating.

Final acceptance is made only after the paint system meets the above requirements.

SUBMITTALS

Submit all of the following to the Engineer for review and approval before scheduling the pre-construction meeting. Allow 40 calendar days for review and approval, or acceptance, of working drawings, from the date they are received, until they are returned by the Engineer.

- (A) Work schedule which shall be kept up to date, with a copy of the revised schedule being provided to the Engineer in a timely manner,
- (B) Containment Drawings in accordance with SSPC Guide 6, Class 2W sealed by a Professional Engineer licensed by the State of North Carolina,
- (C) Bridge wash water sampling and disposal plan,
- (D) Subcontractor identification,
- (E) Lighting plan for night work in accordance with Section 1413 of the *2012 Standard Specifications*. Lighting shall be equipped with explosion-proof fixtures,
- (F) Traffic control plan with NCDOT certified supervisors, flaggers and traffic control devices,
- (G) Health and safety plan addressing at least the required topics as specified by the SSPC QP 1 and QP 2 program and including hazard communication, respiratory health, emergency procedures, and local hospital and treatment facilities with directions and phone numbers, disciplinary criteria for workers who violate the plan and accident investigation. The plan shall address the following: hazardous materials, personal protective equipment, general health and safety, occupational health and environmental controls, fire protection and prevention, signs signals, and barricades, materials handling, storage, use, and disposal, hand and power tools, welding and cutting, electrical, scaffolds, fall protection, cranes, derricks, hoists, elevators, and conveyors, ladders, toxic and hazardous substances, airless injection and HPWJ.
- (H) Provide the Engineer a letter of certification that all employees performing work on the project have blood lead levels that are below the OSHA action level.
- (I) Provide the Engineer with Competent Person qualifications and summary of work experience.
- (J) Environmental Compliance Plan
- (K) Quality Control Plan (Project Specific) with quality control qualifications and summary of work experience.
- (L) Bridge and Public Protection Plan (Overspray, Utilities, etc. - Project/Task Specific)
- (M) Soluble salt removing chemical for use during high pressure water cleaning
 - (1) Product Data Sheet
- (N) Coating Material
 - (1) NCDOT HICAMS Test Reports (testing performed by NCDOT Materials and Tests Unit),
 - (2) Product Data Sheets,
 - (3) Material Safety Data Sheets,
 - (4) Product Specific Repair Procedures, and
 - (5) Acceptance letters from paint manufacturers for work practices that conflict with Project Special Provisions and/or paint manufactures product data sheets.

PRE-CONSTRUCTION MEETING

Submittals shall be reviewed and approved by the Engineer prior to scheduling the pre-construction meeting. Allow no less than 2 weeks for a review process. When requesting a pre-construction meeting, contact the Engineer at least 7 working days in advance of the desired pre-construction date. The contractor's project supervisor, Competent person, quality control personnel, coating manufacturer's representative, and certified traffic control supervisor shall be in attendance at the pre-construction meeting in order for the Contractor and NCDOT team to establish responsibilities for various personnel during project duration and to establish realistic timeframes for problem escalation.

CONTAINMENT PLAN

If a containment plan for Painting of Existing Structure is submitted for a bridge that will have its bearings cleaned and painted with HRCSA, the containment plan for that structural steel painting operation will suffice for cleaning and painting existing bearings with HRCSA. If the structural steel of a bridge is not to be cleaned and painted, and no containment plan has been submitted for that bridge, if that bridge will have its bearings cleaned and painted with HRCSA, a containment plan for cleaning and painting existing bearings with HRCSA shall be submitted for review and approval.

No work shall begin until the Contractor furnishes the Engineer with a containment plan for surface preparation and coating operations and the Engineer reviews and approves, in writing, the acceptability of said plan. Allow a minimum of two weeks for review of the plan. Such plan shall meet or exceed the requirements of Class 2W containment in accordance with SSPC Guide 6. Enclosure drawings and loads supported by the containment structure shall be prepared, signed and sealed by a Professional Engineer licensed by the State of North Carolina.

In the containment plan describe how debris is contained and collected. Describe the type of tarpaulin, bracing materials and the maximum designed wind load. Describe the paint and debris collection system and how a negative pressure of 0.03 inches of water column is maintained inside the enclosure while cleaning and painting operations are being conducted. Describe how the airflow inside the containment structure is designed to meet all applicable OSHA Standards. Describe how wash water will be contained and paint chips separated. Describe how water run-off from rain will be routed by or through the enclosure. Describe what physical containment will be provided during painting application to protect the public and areas not to be painted.

WASH WATER SAMPLING AND DISPOSAL PLAN

No work shall begin until the Contractor furnishes the Engineer with a containment plan for surface preparation and coating operations and the Engineer reviews and approves in writing said plan. All wash water shall be collected and sampled prior to disposal. Representative sampling and testing methodology shall conform to 15A NCAC 02B.0103, "Analytical Procedures". Wash water shall be tested for pollutants listed in 15A NCAC 02B.0211(3), 15A NCAC 02T.0505(b)(1) and 15A NCAC 2T.0905(h). Depending on the test results,

wash water disposal methods shall be described in the disposal plan. Wash water shall be disposed of in accordance with all current Federal and State regulations. See link for NCDOT Guidelines for Managing Bridge Wash Water: <http://www.ncdot.gov/projects/ncbridges/#stats>.

WASTE HANDLING OF PAINT AND DEBRIS

Comply with all Federal, State and local regulations. Failure to comply with the regulations could result in fines and loss of qualified status with NCDOT.

Comply with the Resource Conservation and Recovery Act (RCRA - 40 CFR 261 - 265) and the Occupational Safety and Health Act (OSHA - 29 CFR 1910 - 1926) regulations for employee training, and for the handling, storage, labeling, recordkeeping, reporting, inspections and disposal of all hazardous waste generated during paint removal.

A summary of Generator Requirements is available at the above NCDOT web link which cites the specific regulations for each Generator category. Quantities of waste by weight and dates of waste generation shall be recorded. Waste stored at the project site shall be properly labeled. All waste, hazardous or non-hazardous, requires numbered shipping manifests.

The North Carolina Department of Environmental Quality (NCDEQ) have adopted RCRA as the North Carolina Hazardous Waste Management Rules and are responsible for enforcement. The "Hazardous Waste Compliance Manual for Generators of Hazardous Waste" is published by the Compliance Branch of the Division of Waste Management of NCDEQ, and can be found at:

<https://deq.nc.gov/about/divisions/waste-management/waste-management-rules/hazardous-waste-rules>

Use a company from the below list of approved waste management companies. Immediately after award of the contract, arrange for waste containers, sampling, testing, transportation and disposal of all waste. No work shall begin until the Contractor furnishes the Engineer with a written waste disposal plan. Any alternative method for handling waste shall be pre-approved by the Engineer.

Southern Logistics, Inc.

312 Orville Wright Dr., Greensboro, NC 27409

(Phone 336-662-0292)

A&D Environmental

PO Box 484, High Point, NC 27261

(Phone 336-434-7750)

Poseidon Environmental Services, Inc.

837 Boardman-Canfield Rd #209, Youngstown, OH

(Phone 330-726-1560)

Clean Harbors Reidsville, LLC

208 Watlington Industrial Drive, Reidsville, NC 27320
(Phone 336-342-6106)

All removed paint and debris shall be tested for lead following the SW-846 TCLP Method 1311 Extraction, as required in 40 CFR 261, Appendix 11, to determine whether it shall be disposed of as hazardous waste. Furnish the Engineer certified test reports showing TCLP results and Iron analysis of the paint chips stored on site, with disposal in accordance with "Flowchart on Lead Waste Identification and Disposal" at:

<https://ncdenr.s3.amazonaws.com/s3fs-public/document-library/Lead%20Disposal.pdf>

All sampling shall be done in presence of the Engineer's representative.

The Competent Person shall obtain composite samples from each barrel of the wash water and waste generated by collecting two or more portions taken at regularly spaced intervals during accumulation. Combine the portions into one sample for testing purposes. Acquire samples after 10% or before 90% of the barrel has accumulated. The intent is to provide samples that are representative of widely separated portions, but not the beginning and end of wash water or waste accumulation.

Perform sampling by passing a receptacle completely through the discharge stream or by completely diverting the discharge into a sample container. If discharge of the wash water or waste is too rapid to divert the complete discharge stream, discharge into a container or transportation unit sufficiently large to accommodate the flow and then accomplish the sampling in the same manner as described above.

Comply with the NCDEQ Hazardous Waste Compliance Manual for Generators of Hazardous Waste. Record quantities of waste by weight and dates of waste generation. Until test results are received, store all waste, and label as "NCDOT Bridge Paint Removal Waste - Pending Analysis" and include the date generated and contact information for the Division HazMat Manager or Project Engineer. Store waste containers in an enclosed, sealed and secured storage container protected from traffic from all directions. Obtain approval for the protection plan for these containers from the Engineer. If adequate protection cannot be obtained by use of existing guardrail, provide the necessary supplies and equipment to maintain adequate protection. Once test results are received and characterized, label waste as either "Hazardous Waste - Pending Disposal" or "Paint Waste - Pending Disposal".

Once the waste has been collected, and the quantities determined, prepare the appropriate shipping documents and manifests and present them to the Engineer. The Engineer will verify the type and quantity of waste and obtain a Provisional EPA ID number from the:

NC Hazardous Waste Section
North Carolina Department of Environment & Natural Resources
1646 Mail Service Center
Raleigh, NC 27699
Phone (919) 508-8400, Fax (919) 715-4061

At the time of shipping, the Engineer will sign, date and add the ID number in the appropriate section on the manifest. The maximum on-site storage time for collected waste shall be 90 days. All waste whether hazardous or non-hazardous will require numbered shipping manifests. The cost for waste disposal (including lab and Provisional EPA ID number) is included in the bid price for this contract. Note NC Hazardous Waste Management Rules (15A NCAC 13A) for more information. Provisional EPA ID numbers may be obtained at this link:

<http://deq.nc.gov/about/divisions/waste-management/waste-management-permits/hazardous-waste-section-permits/provisional-hazardous-waste-notification>

Testing labs shall be certified in accordance with North Carolina State Laboratory Public Health Environmental Sciences. List of certified laboratories may be obtained at this link:

<https://slphreporting.ncpublichealth.com/EnvironmentalSciences/Certification/CertifiedLaboratory.asp>

All test results shall be documented on the lab analysis as follows:

1. For leachable lead:
 - a. Soils/Solid/Liquid- EPA 1311/200.7/6010

Area sampling will be performed for the first 2 days at each bridge location. The area sample will be located within five feet of the containment and where the highest probability of leakage will occur (access door, etc.). Results from the area sampling will be given to the Engineer within 72 hours of sampling (excluding weekends). If the results of the samples exceed $20 \mu\text{g}/\text{m}^3$ corrective measures shall be taken and monitoring shall be continued until 2 consecutive sample results are less than $20 \mu\text{g}/\text{m}^3$.

TWA may suspend the work if there are visible emissions outside the containment enclosure or pump monitoring results exceeding the level of $30 \mu\text{g}/\text{m}^3$.

Where schools, housing and/or buildings are within 500 feet of the containment, the Contractor shall perform initial TSP-Lead monitoring for the first 10 days of the project during water cleaning and containment removal. Additional monitoring will be required during water cleaning 2 days per month thereafter. Results of the TSP monitoring at any location shall not exceed $1.5 \mu\text{g}/\text{m}^3$.

EQUIPMENT MOBILIZATION

The equipment used in any travel lanes and paved shoulder shall be mobile equipment on wheels that has the ability to move on/off the roadway in less than 30 minutes. All work conducted in travel lanes shall be from truck or trailer supported platforms and all equipment shall be self-propelled or attached to a tow vehicle at all times.

SUBLETTING OF CONTRACT

Only contractors certified to meet SSPC QP 2, Category A, and have successfully completed lead paint removal and field painting on all similar structures within 18 months prior to this bid are qualified for this work. Work is only sublet by approval of the Engineer.

MATERIAL**PENETRANT AND PAINT SYSTEM**

The paint system to be used shall be a High Ratio Co-Polymerized Calcium Sulfonate (HRCSA) coating system. Characteristics of submitted products shall meet or exceed those of the requirements listed within this specification.

The structure is to be coated with a High Ratio, Co-Polymerized Calcium Sulfonate (HRCSA) corrosion mitigation system. Any Contractor-proposed coating system shall meet the following requirements:

- a. The proposed coating system shall be an HRCSA coating as defined by these specifications and shall be submitted for approval.
 1. Primer/Topcoat (Minimum 9.5% active sulfonate) must maintain a 9-11 to 1 ratio Total Base Number to Active Sulfonate, i.e., total base number of 85 to 104 to 9.5% Active Sulfonate, as determined by Percent Active Sulfonate Content by Cationic Titration (Hyamine) testing, Procedure No. 817/4.9/T1409A.
 2. Formulations with greater than 27% Alkyd or co-polymer are not valid HRCSA.
 3. Zero VOC, 100% Solids Penetrant/Sealer approved by HRCSA manufacturer (Minimum 15% active sulfonate, a total base number of 135 to 165, must maintain a 9-11 to 1 ratio Active Sulfonate to Total Base Number as determined by Total Base Number Determination testing, Procedure No. 817/4.9/T1401.
- b. The proposed coating system shall be certified in writing by the coating manufacturer that the HRCSA Primer/Topcoat and the HRCSA Penetrant Sealer meets the HRCSA generic specification and has been verified by the testing titration protocols indicated above. The Engineer may choose to perform verification testing using the same protocols on materials delivered to the job site.
- c. The proposed coating formulation shall have independent laboratory tests showing that the HRCSA coating, as supplied, has been tested to ASTM D5894 with a 24 hour freeze thaw cycle and has passed a minimum 5000 hours with no rust creepage at the scribe. The manufacturer shall certify that the currently manufactured

formulation used is the same as the formulation that was tested, and can supply supporting documentation.

Lighting shall be equipped with explosion-proof fixtures.

The accumulation of empty paint cans, combustibles, and other debris will not be permitted.

MSDS sheets for all materials shall be maintained on file and provided to the Engineer prior to receipt of the material from the manufacturers.

If required, paint shall be mixed with mechanical mixers in accordance with the paint manufacturer's recommendations.

The primer, stripe, and other coats may be thinned only if recommended by the manufacturer, done in compliance with the manufacturer's instructions, approved by the Engineer, and mixed in the presence of the Engineer. If recommended by the manufacturer and approved by the Engineer, a measuring cup, have graduation in ounces, shall be used in the addition of thinner to any paint. No "eye balling" during addition of thinner to paint will be allowed. Paint mixed with thinner by "eye balling" will be subject to rejection by the Engineer as ruined material.

PENETRANT AND PAINT STORAGE

Do not expose penetrant and paint materials to rain, excessive condensation, long periods of direct sunlight, or temperatures above 100°F or below 40°F. In addition, the Contractor shall place a device which records the high, low, and current temperatures inside the storage location. Follow the manufacturer's storage requirements if more restrictive than the above requirements. Any material found to be damaged or beyond its expiration date shown on the container shall be immediately removed from the project site and will be considered as ruined material.

TESTING OF PAINT SAMPLES:

Engineer reserves the right to conduct tests of the materials at any time, and any number of times during the period of field painting.

The Engineer will sample the paint(s) being used. A representative size sample of each component of paint(s) at the construction site will be transferred to metal containers, identified, sealed, and certified in the presence of the Contractor.

Tests on paint samples may be performed by the Owner in order to confirm the manufacturer's test results submitted with each batch of material.

If the laboratory test results show that the material being used does not comply with the requirements specified in this Special Provision, the Contractor will be directed to stop painting work and remove non-complying paint; pay for testing; re-paint surfaces coated

with rejected paint; or remove rejected paint from previously painted surfaces if, upon re-painting with specified paint, the two coatings are not compatible.

CONSTRUCTION METHODS

CLEANING AND REMOVAL OF PACK RUST

Removal of pack rust shall be done by hand tool cleaning to meet requirements of SSPC-SP 2, or by power tool cleaning to meet requirements of SSPC-SP 3, or a combination of these methods. Any black oxide scale shall be removed, unless otherwise directed by the Engineer. Pay particular attention to crevice areas when removing pack rust and rust scale. Exercise care to avoid nicking or gouging the steel during removal. Remove all rust scale and loose pack rust, followed by high pressure water cleaning.

HIGH PRESSURE WATER CLEANING (HPWC)

The structure (or portions of it to be coated) shall be cleaned with water at a minimum pressure of 5,000 psi and a maximum of 9,500 psi, at 5 gallons per minute, with a rotating tip, at a maximum 4 inch standoff distance from the steel surface, held as perpendicular to the steel surface as possible.

All water to be used in the surface preparation shall be potable water.

Ambient wash water temperature is allowed; hot water is not necessary.

The wash water shall include a soluble salt removing chemical at a minimum ratio of 100:1 and in compliance with manufacturer recommendations.

Care should be taken to ensure that the potable wash water does not have a level of chloride exceeding 15 ppm when tested. If higher, the level of soluble salt removing chemical should be proportionally increased as per manufactures recommendation.

It should be expected that the surfaces of the steel (and connections) are contaminated with soluble salts (e.g. Chlorides, Sulfates, or Nitrates). Using an acceptable sample method in accordance with SSPC Guide 15, ensure that soluble salt levels on the surfaces do not exceed allowable soluble salt limits listed below:

Chloride - NVC3 3 $\mu\text{g}/\text{cm}^2$

Sulfate - NVS10 10 $\mu\text{g}/\text{cm}^2$

Nitrate - NVN10 10 $\mu\text{g}/\text{cm}^2$

The frequency of testing shall be 2 tests per span after all surface preparation has been completed and immediately prior to painting. Select test areas representing the greatest amount of corrosion in the span as determined by the Engineers' representative. Additional testing may be required if significant amounts of chloride are detected.

The surface cleaning shall meet the requirements of SSPC-WJ4, to remove loose paint and loose rust. SSPC SP2 or SP3 (hand or power tool cleaning) may be used in inaccessible areas or when water cleaning is not possible.

In some cases, after HPWC, there may be areas of tightly adhered black oxide that were not removed. All black oxide scale shall be removed, unless otherwise directed by the Engineer.

If there is a question of whether all loose paint has been removed, adhesion testing of the remaining "tightly adhered" paint shall be done in accordance with ASTM D 4541-02 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers, with a minimum value of 300 psi.

Care should be taken to ensure all crevice corroded and pack rusted joints connections and corrosion frozen bearings are flushed with water containing a soluble salt removing chemical, at a minimum pressure of 5,000 psi, at 5 gallons per minute, to ensure removal of all loose materials and to flush out any contaminant.

COMPRESSED AIR DRYING

All joints, connections, and bearings shall be blown dry with clean, dry, oil free, high pressure (100 psi) compressed air, regardless if the areas appear to be dry. Use the white blotter test in accordance with ASTM D4285 to verify the cleanliness of the compressed air used for blowout of "Limited Access" areas and drying. Conduct the test at least once per shift for each compressor system. Sufficient freedom from oil and moisture is confirmed if soiling and/or discoloration are not visible on the paper. If air contamination is evidenced, change filters, clean traps, add moisture separators or filters, or make adjustments as necessary to achieve clean, dry air.

All surfaces shall be inspected at this point. Surface preparation found to be deficient will be repeated at the Contractor's expense as directed by the Engineer. Once areas are agreed to be satisfactory, the Contractor may proceed with penetrating sealer application.

PENETRATING SEALER

Penetrating sealer may be applied by brush, roller, or airless spray method as recommended by the manufacturer. The mixing amount and method of mixing for the sealer components must be in accordance with the manufacturer's instruction. Wet coat sufficiently to completely cover and penetrate the steel surface, but do not apply heavy coat. Use coat thickness as recommended by the manufacturer. Apply liberally to crevices and joints and/or spaces where a gap has been created between plates and around bolts, nuts and washers. Allow material to soak into spaces. Brush out any excess material, so as to not retard curing of the topcoat or result in an unaesthetically pleasing surface.

The penetrating sealer shall be applied within 24-hours after completion of the cleaning operations and before flash-rusting occurs. No bare steel surface prepared for penetrating sealer application shall be left uncoated long enough to allow the formation of rust. Cleaned areas upon which rust has formed shall be re-cleaned in accordance with the cleaning requirement at no additional cost. The presence of rust shall be determined by the Engineer.

The receiving steel surface shall be clean and absolutely dry. The permissible steel surface temperature and the ambient temperature shall be as recommended by the sealer manufacturer. However, in no case, shall the penetrating sealer be applied when the steel surface or the ambient temperatures is below 36°F or above 104°F, or the relative humidity exceeds 99% or a 3.6°F (2°C) temperature-Dew Point temperature spread.

Drying time is temperature, humidity, and film thickness dependent. Use manufacturer's recommended drying schedule to estimate the drying time of the penetrating sealer for application of the other coatings. If the manufacturer's recommendations allow, the use of forced air pressure to dry the surface will be permitted.

HRCSA – STRIPING AND TOPCOAT

No application of any stripe/primer shall be allowed until cleaning and preparation of the substrate has been approved by the Engineer. See drawings to determine exact location of structure components to be painted.

The permissible steel surface temperature and the ambient temperature shall be as recommended by the coating manufacturer. However, in no case, shall the coating be applied when the steel surface or the ambient temperatures is below 36°F or above 104°F, or the relative humidity exceeds 99% or a 3.6°F (2°C) temperature-Dew Point temperature spread

The Contractor shall provide paintbrushes, rollers, and spray equipment to conduct the work as specified in this Section.

The Contractor shall also provide specialized equipment as required for the painting of limited access areas and for other difficult-to-clean areas. Specialized equipment may include, but is not limited to:

- Pole guns for spray painting
- Mitts, daubers, or other methods to supplement brush application

Stripe painting will be required on the following surfaces that have been cleaned: edges of plates, angles, lattice, connections (rivets and bolt heads) or other shapes, corners, crevices, back-to-back angles, and built-up edges. The surfaces of existing steel members to which new steel may be connected (faying surfaces) shall also be cleaned and painted as herein described. The stripe coat shall have a band width of at least 4 in. (101.6 mm) to each side of the adjoining edges and is to completely coat the interior of all crevices. All stripe painting should be applied by spray, but immediately afterwards it may be 'brushed in' using a brush. No other method of paint application will be allowed for stripe painting.

Paint for intermediate coat or topcoat may be applied using spray, brush, or roll methods.

Spray painting will be permitted only within a containment that will contain all of the sprayed material, as approved by the Engineer. Complete protection from paint spatter, spillage, overspray, wind-blown paint, or similar releases of paint shall be provided. Covers, tarps, mesh, and similar materials shall be placed around the work area to protect public and private property, pedestrian, vehicular, marine, or other traffic, all portions of the bridge, highway appurtenances, waterways, and similar surrounding areas and property, upon, beneath, or

adjacent to the structure.

Apply HRCSA as directed by the manufacturer. Wait time between the stripe coats, intermediate coats, and the topcoat shall be as per the manufacturer's recommendations. The following paint schedule shall be used unless special exceptions are submitted and approved according to manufacturer recommendations prior to the start of this work.

Application Location	Description	Film Thickness
SPOT	Liberally apply a stripe coat to crevice corroded and pack rusted bearings and connections, provide extra material to bolts, nuts and any gaps around rivets.	15-18 mils (wet) 10-12 mils (dry)
SPOT	Over exposed metal areas and areas of tightly adhered contaminant free rust or flash rust apply a spot prime with 5 to 7 mils DFT of Topcoat, including areas mentioned in previous SPOT application	7-10 mils (wet) 5-7 mils (dry)

Prior to placing the subsequent coats, the Contractor will ensure that the prior coat is clean of all foreign matter, such as grease, dirt, bird waste, etc., before application of the subsequent coat.

Sealer, stripe, spots, and finish coats shall be applied in sufficient quantity so as to produce the minimum specified Dry Film Thicknesses (DFT). Care should be taken to not over apply the primer/topcoat, especially on flat surfaces. Maximum 25 mils DFT.

Active calcium sulfonate coatings cure slowly, so wet film measurements may be used as criteria for **preliminary** acceptance of the coating. Wet film thickness (WFT) measurements shall be determined as the job progresses and corrections shall be made during paint application.

Dry film thicknesses shall be determined using SSPC-PA2 – using a digital film thickness gage and a shim – after the coating has cured sufficiently to allow accurate measurements. (Note: Depending upon ambient air conditions, it may take more than one week before DFT measurements can be taken.)

Areas failing to meet the specified WFT range shall be over-coated with the same paint to produce at least the total WFT required.

Paint applied containing unauthorized thinners, paint applied to contaminated surfaces, and paint applied contrary to this Specification shall result in the re-cleaning and re-painting of the surface. The work of re-cleaning, re-painting, or over-coating, if required, shall be performed within 10 days following notification by the Engineer and shall be done by the Contractor to the satisfaction of the Engineer, at no additional cost to the Owner.

INSPECTION

Each layer of application shall be verified by both Quality Control (QC) and Quality Assurance (QA).

QUALITY CONTROL INSPECTOR

The Contractor shall provide a quality control inspector in accordance with the SSPC QP guidelines to ensure that all processes, pack rust removal, and each coating application are in accordance with the requirements of the contract. The inspector shall have written authority to perform QC duties to include continuous improvement of all QC internal procedures. The presence of the Engineer or inspector at the work site shall in no way lessen the contractor's responsibility for conformity with the contract.

QUALITY ASSURANCE INSPECTOR

The quality assurance inspector, which may be a Department employee or a designated representative of the Department, shall observe, document, assess, and report that the Contractor is complying with all of the requirements of the contract. Inspectors employed by the Department are authorized to inspect and/ or test all work performed and materials furnished. Such inspection may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. The inspector is not authorized to alter or waive the requirements of the contract. Each stage in preparing the structure to be coated, which includes, but not limited to washing, pack rust removal, sealing, and application paint system, shall be inspected and approved by the Engineer or his authorized representative.

INSPECTION ACCESS

The Contractor shall furnish all necessary OSHA-approved apparatus such as ladders, scaffolds, and platforms as required for the Engineer or his inspector to have reasonable and safe access to all parts of the work. The contractor shall illuminate the surfaces to be inspected to a minimum of 50-foot candles of light. All access points shall be illuminated to a minimum of 20-foot candles of light.

INSPECTION INSTRUMENTS

At a minimum, furnish the following calibrated instruments and conduct the following quality control tests:

- Sling Psychrometer - ASTM E337 - bulb type and tables
- Inspection Mirror
- Surface Temperature Thermometer 30°F to 150°F
- Air Thermometer, pocket type, 30°F to 100°F
- Illuminated Magnifier
- Hypodermic Needle Pressure Gauge
- Surface Condition Standards - SSPC VIS 1-3 and 4
- Wet Film Thickness Gage - ASTM D4414

- Dry Film Thickness Gage - SSPC-PA2 Modified
- Calibration Standards (NIST Traceable)
- Surface Contamination Analysis Kit or (Chloride, Nitrate, and Sulfate Level Test Kit) SSPC Technology Guide 15

QUALITY CONTROL

Maintain a daily quality control record in accordance with Article 442-13 of the *2012 Standard Specifications* and make such records available at the job site for review by the inspector and submit to the Engineer as directed. In addition to the information required on M&T-610, submit all Dry Film Thickness (DFT) or Wet Film Thickness (WFT) readings on a form equivalent to M&T-611.

Film thickness shall be measured at no less than six random spots per bearing (each of four bearing plate edges and two readings on top of the sole plate). Also, film thickness shall be measured at no less than six random spots per span on diaphragms/"K" frames.

Each spot is an average of three to five individual gage readings as defined in SSPC PA-2. No spot average shall be less than 80% of minimum film thickness for each layer applied; this does not apply to stripe coat application. These non-conforming areas shall be corrected by the Contractor prior to applying successive coats.

Areas failing to meet the specified film thickness range shall be over-coated with the same paint to produce at least the total film thickness required.

REPAIR OF DAMAGED COATINGS

All damaged coatings, new or existing, shall be repaired prior to project completion and acceptance in accordance with the above specifications for Re-Coating and Over-coating and as directed by the Engineer, at no additional cost to the Owner.

COATING MANUFACTURER'S REPRESENTATIVE

Unless waived by the Engineer, the Contractor shall make arrangements for a representative of the coating manufacturer to be present on-site as work begins, at a minimum, and as necessary as work progresses, to work together with the Contractor and representatives of the owner and to provide comments and guidance, so that the cleaning, application, and inspection procedures are done properly.

MEASUREMENT AND PAYMENT

Painting Containment for Bridge No. 7 will be paid for at the contract lump sum price which price will be full compensation for all collection, handling, storage, air monitoring, and disposal of debris and wash water, all personal protective equipment, and all personal hygiene requirements, and all equipment, material and labor necessary to fully contain the

paint and water; daily collection of debris into specified containers; and any measures necessary to ensure conformance to all safety and environments regulations as directed by the Engineer.

Cleaning and Painting Existing Bearings with HRCSA Bridge No. 7 will be paid for at the contract lump sum price which will be full compensation for all labor, materials and equipment necessary to complete the work. All work shall be done in a manner satisfactory to the Engineer.

Payment will be made under:

Pay Item	Pay Unit
Painting Containment for Bridge No. 7	Lump Sum
Cleaning and Painting Existing Bearings with HRCSA Bridge No. 7	Each

PILE JACKETS

(SPECIAL)

Description

This specification establishes the minimum requirements for furnishing installing permanent outer pile forms, standoffs, steel reinforcement bands and steel bracing collars for the installation of pile jackets for pile repair. It is intended to ensure that the supplier's forms and installation/reinforcing details shall allow the forms to be filled with concrete without failure, and provide durable, corrosion resistant pile protection.

Materials

Forms:

The form shall be fabricated from fiberglass and polyester resins, or other inert materials that are compatible with Portland cement and produce a form with equal levels of corrosion resistance and durability. The inside face of the forms shall have a texture equal to that provided by sandblasting, and shall have no bond inhibiting agents in contact with cementitious materials. Forms shall include polymer standoffs of sufficient number and spacing to maintain a minimum space of 2" between the reinforcing steel and the jacket. Provide forms with dimensions in accordance with the sizing chart shown in the plans. For pumped applications provide ports in accordance with the plans. The minimum allowable thickness of the forms is 1/8". Upon opening to place around a pile, the form shall be capable of returning to its original shape without assistance or damage. It shall have an interlocking joint along one side, which will permit the form to be assembled and sealed in place around the pile. Contractor shall submit form details to the Engineer for approval prior to beginning work.

Transverse joints (if any) shall be of overlapping configuration.

The material furnished must meet the following physical property requirements:

- (a) Water Absorption (ASTM-D570)1% Maximum
- (b) Ultimate Tensile Strength (ASTM-D638)* 9,000 psi Minimum
- (c) Flexural Strength (ASTM-D796)* 16,000 psi Minimum
- (d) Flexural Modulus of Elasticity (ASTM-D790) 700,000 psi Minimum
- (e) Barcol Hardness (ASTM-D2583)30 – 40
- (f) Color Similar to Federal Color Standard 595 Number 36622 – the color shall be integral in the form material.
- (g) Accelerated Weathering ... The fabricated form material shall be subjected to a 500 hour exposure test in a Twin-Carbon-ARC-Weather-Ometer (ASTM G-23, Type D) at an operating temperature of 145°F. Said test to be made at twenty minute cycles consisting of seventeen minutes of light and three minutes of water spray plus light. At the end of the exposure test the exposed samples shall not show any chipping, flaking or peeling. The test panels shall be prepared from the materials meeting the physical property requirements above, and they shall be in accordance with the manufacturer’s recommendations.

“*”= On original specimen whose flat surfaces are not machined to disturb the fiberglass.

Epoxy Gel Sealant

Use an approved marine epoxy gel to adhere the outer jacket seams. The epoxy paste must be a two component epoxy compound, capable of being applied underwater. The ratio of resin component to hardener component is 1:1 by volume. To assist in evaluating the thoroughness of job site mixing, each component must be of sharply contrasting color.

Concrete

Concrete shall meet the requirements of the *Standard Specs* for Class A Concrete. Use a pea gravel mix suitable for pumped applications. An anti-washout admixture may be used for in water applications. Concrete mix design shall be submitted for approval prior to beginning work.

Reinforcement Bands

Provide reinforcement bands similar to that shown in the plans. The bands shall be reusable, and shall be equipped with quick release fasteners.

Submit details and calculations showing design loads and the placement of the bands on the pile form necessary to reinforce the form against failure from the concrete pressure, or any other loading the form may experience, including its use on battered piles.

Steel Bracing Collar

For forms to be supported on temporary falsework provide a steel bracing collar which will reinforce the bottom of the form and allow connection to the falsework.

Construction Methods

Prior to jacket installation, remove existing jacket if applicable and all delaminated or loose concrete and thoroughly clean pile of marine growth, oil, grease, mud, rust, and any other deleterious material which might prevent proper bonding between the concrete and the pile. Accomplish pile preparation and cleaning by hand or small pneumatic tool (17lb class or less) chipping, grit blasting, high pressure water blasting, or by divers using powered rotary abraders. Any method that produces the quality of cleaning necessary to meet the bond requirements of this specification may be considered. When necessary, perform the pile cleaning in 2 phases where active marine growth occurs. In the first phase, a maximum of 7 days before the encapsulation, remove marine growth, oil, grease, rust, and broken concrete, etc. In the second phase, a maximum of 48 hrs before placement of concrete in the outer pile jacket, perform a final surface preparation, removing all remaining deleterious substances including micro-organisms.

Contractor shall establish mean low water (MLW) elevation and set bottom of jacket a minimum of 2' below that elevation.

Place the jacket assembly and position it around the pile in such a manner as to assure that no damage to stand-offs and rebar cage occur. Ensure there will be no detrimental movement of the joints while joint adhesive is curing. The placement of the jacket is to be determined by the location of the affected pile and in accordance with the contract drawings.

Seal the longitudinal and transverse seams, if any, with marine epoxy paste as described above.

Place concrete using a pump or tremie. Free fall placement of concrete will not be allowed if any part of the jacket is submerged below water. For above water applications free fall placement will only be allowed for jacket lengths up to 10'. Cope the top of the repair to drain water.

No tainted water above pH 9.0 will be allowed to discharge from the work site. Monitoring of pH levels inside and outside of the jacket is required during the pumping operation. Perimeter monitoring site should be no more than 10 ft down flow from the work area. If the pH of the water within the jacket exceeds then pump to a container and hold until the pH level returns to 9.0.

Concrete shall attain a minimum strength of 3000 psi prior to removing form work.

Submittals

Submit shop drawings and calculations to the Engineer for approval prior to start of fabrication. Submittal shall include form dimensions, standoffs, pump ports (where applicable), reinforcing cage installation, reinforcement bands, collars, temporary

falsework, methods to seal the form, form installation, and sequence of concrete placement.

Material Certification

For materials to be used, the Supplier shall furnish a certificate to the Engineer attesting that the materials meet all the requirements contained herein and that they conform in all respects to the materials subjected to the tests required. Copies of current test reports shall be attached to the certificate. No test report for tests made more than one year prior to shipment will be accepted for the form material.

Measurement and Payment

Pile Jackets will be measured and paid for at the contract unit price bid per linear foot of concrete encased pile jacket and will be full compensation for removal, containment and disposal off-site of unsound concrete including the cost of materials, labor, tools, equipment and incidentals necessary to accomplish removal; cleaning the pile, furnishing and installation of reinforcement, jacket installation, falsework; furnishing and placement of concrete including pumping equipment, pH monitoring, pollution control, turbidity curtains, and all else required to repair existing deteriorated concrete or deteriorated steel H-Piles using pile jackets.

Rejackets will be measured and paid for at the contract unit price bid per linear foot of concrete encased pile jacket and will be full compensation for removal, containment and disposal off-site of existing pile jackets, unsound concrete including the cost of materials, labor, tools, equipment and incidentals necessary to accomplish removal; cleaning the pile, furnishing and installation of reinforcement, jacket installation, falsework; furnishing and placement of concrete including pumping equipment, pH monitoring, pollution control, turbidity curtains, and all else required to repair existing deteriorated concrete or deteriorated steel H-Piles using pile jackets.

Payment will be made under:

Pay Item	Pay Unit
Pile Jackets	Linear Feet
Rejackets	Linear Feet

SILICONE JOINT SEALANT

(SPECIAL)

1.0 SEALS

Silicone joint sealant with backer rod shall be on the NCDOT Approved Products List under product group Structures and product category Maint: Replacement & Repair and be under the approved product status. Additionally, it shall be approved for use on joints with at least a 3” joint opening and provide a seal with a working range of 50% compression and extension. Sealant shall be cold applied, troweable or self leveling as per joint manufacturer recommendations for joint opening.

2.0 SEAL INSTALLATION

Install the silicone joint sealant according to the manufacturer's procedures and recommendations and as recommended below. Do not install the joint seal if the ambient air or surface temperature is below 45°F. Have a manufacturer's certified trained factory representative present during the installation of the first seal of the project.

3.0 BASIS OF PAYMENT

Payment for all silicone joint sealant with backer rod will be at contract unit price per linear foot "Silicone Joint Sealant". Prices and payment will be full compensation for furnishing all material, including backer rod, labor, tools and equipment necessary for installing these units in place and accepted.

Payment will be made under:

Pay Item	Pay Unit
Silicone Joint Sealant	Linear Feet

FALSEWORK AND FORMWORK**(4-5-12)****1.0 DESCRIPTION**

Use this Special Provision as a guide to develop temporary works submittals required by the Standard Specifications or other provisions; no additional submittals are required herein. Such temporary works include, but are not limited to, falsework and formwork.

Falsework is any temporary construction used to support the permanent structure until it becomes self-supporting. Formwork is the temporary structure or mold used to retain plastic or fluid concrete in its designated shape until it hardens. Access scaffolding is a temporary structure that functions as a work platform that supports construction personnel, materials, and tools, but is not intended to support the structure. Scaffolding systems that are used to temporarily support permanent structures (as opposed to functioning as work platforms) are considered to be falsework under the definitions given. Shoring is a component of falsework such as horizontal, vertical, or inclined support members. Where the term "temporary works" is used, it includes all of the temporary facilities used in bridge construction that do not become part of the permanent structure.

Design and construct safe and adequate temporary works that will support all loads imposed and provide the necessary rigidity to achieve the lines and grades shown on the plans in the final structure.

2.0 MATERIALS

Select materials suitable for temporary works; however, select materials that also ensure the safety and quality required by the design assumptions. The Engineer has authority to reject material on the basis of its condition, inappropriate use, safety, or nonconformance with the plans. Clearly identify allowable loads or stresses for all materials or manufactured devices

on the plans. Revise the plan and notify the Engineer if any change to materials or material strengths is required.

3.0 DESIGN REQUIREMENTS

A. Working Drawings

Provide working drawings for items as specified in the contract, or as required by the Engineer, with design calculations and supporting data in sufficient detail to permit a structural and safety review of the proposed design of the temporary work.

On the drawings, show all information necessary to allow the design of any component to be checked independently as determined by the Engineer.

When concrete placement is involved, include data such as the drawings of proposed sequence, rate of placement, direction of placement, and location of all construction joints. Submit the number of copies as called for by the contract.

When required, have the drawings and calculations prepared under the guidance of, and sealed by, a North Carolina Registered Professional Engineer who is knowledgeable in temporary works design.

If requested by the Engineer, submit with the working drawings manufacturer's catalog data listing the weight of all construction equipment that will be supported on the temporary work. Show anticipated total settlements and/or deflections of falsework and forms on the working drawings. Include falsework footing settlements, joint take-up, and deflection of beams or girders.

As an option for the Contractor, overhang falsework hangers may be uniformly spaced, at a maximum of 36 inches, provided the following conditions are met:

Member Type (PCG)	Member Depth, (inches)	Max. Overhang Width, (inches)	Max. Slab Edge Thickness, (inches)	Max. Screenshot Wheel Weight, (lbs.)	Bracket Min. Vertical Leg Extension, (inches)
II	36	39	14	2000	26
III	45	42	14	2000	35
IV	54	45	14	2000	44
MBT	63	51	12	2000	50
MBT	72	55	12	1700	48

Overhang width is measured from the centerline of the girder to the edge of the deck slab.

For Type II, III & IV prestressed concrete girders (PCG), 45-degree cast-in-place half hangers and rods must have a minimum safe working load of 6,000 lbs.

For MBT prestressed concrete girders, 45-degree angle holes for falsework hanger rods shall be cast through the girder top flange and located, measuring along the top of the member, 1'-2 1/2" from the edge of the top flange. Hanger hardware and rods must have a minimum safe working load of 6,000 lbs.

The overhang bracket provided for the diagonal leg shall have a minimum safe working load of 3,750 lbs. The vertical leg of the bracket shall extend to the point that the heel bears on the girder bottom flange, no closer than 4 inches from the bottom of the member. However, for 72-inch members, the heel of the bracket shall bear on the web, near the bottom flange transition.

Provide adequate overhang falsework and determine the appropriate adjustments for deck geometry, equipment, casting procedures and casting conditions.

If the optional overhang falsework spacing is used, indicate this on the falsework submittal and advise the girder producer of the proposed details. Failure to notify the Engineer of hanger type and hanger spacing on prestressed concrete girder casting drawings may delay the approval of those drawings.

Falsework hangers that support concentrated loads and are installed at the edge of thin top flange concrete girders (such as bulb tee girders) shall be spaced so as not to exceed 75% of the manufacturer's stated safe working load. Use of dual leg hangers (such as Meadow Burke HF-42 and HF-43) are not allowed on concrete girders with thin top flanges. Design the falsework and forms supporting deck slabs and overhangs on girder bridges so that there will be no differential settlement between the girders and the deck forms during placement of deck concrete.

When staged construction of the bridge deck is required, detail falsework and forms for screed and fluid concrete loads to be independent of any previous deck pour components when the mid-span girder deflection due to deck weight is greater than 3/4".

Note on the working drawings any anchorages, connectors, inserts, steel sleeves or other such devices used as part of the falsework or formwork that remains in the permanent structure. If the plan notes indicate that the structure contains the necessary corrosion protection required for a Corrosive Site, epoxy coat, galvanize or metalize these devices. Electroplating will not be allowed. Any coating required by the Engineer will be considered incidental to the various pay items requiring temporary works.

Design falsework and formwork requiring submittals in accordance with the 1995 AASHTO *Guide Design Specifications for Bridge Temporary Works* except as noted herein.

1. Wind Loads

Table 2.2 of Article 2.2.5.1 is modified to include wind velocities up to 110 mph. In addition, Table 2.2A is included to provide the maximum wind speeds by county in North Carolina.

Table 2.2 - Wind Pressure Values

Height Zone feet above ground	Pressure, lb/ft ² for Indicated Wind Velocity, mph				
	70	80	90	100	110
0 to 30	15	20	25	30	35
30 to 50	20	25	30	35	40
50 to 100	25	30	35	40	45
over 100	30	35	40	45	50

2. Time of Removal

The following requirements replace those of Article 3.4.8.2.

Do not remove forms until the concrete has attained strengths required in Article 420-16 of the Standard Specifications and these Special Provisions.

Do not remove forms until the concrete has sufficient strength to prevent damage to the surface.

Table 2.2A - Steady State Maximum Wind Speeds by Counties in North Carolina

COUNTY	25 YR (mph)	COUNTY	25 YR (mph)	COUNTY	25 YR (mph)
Alamance	70	Franklin	70	Pamlico	100
Alexander	70	Gaston	70	Pasquotank	100
Alleghany	70	Gates	90	Pender	100
Anson	70	Graham	80	Perquimans	100
Ashe	70	Granville	70	Person	70
Avery	70	Greene	80	Pitt	90
Beaufort	100	Guilford	70	Polk	80
Bertie	90	Halifax	80	Randolph	70
Bladen	90	Harnett	70	Richmond	70
Brunswick	100	Haywood	80	Robeson	80
Buncombe	80	Henderson	80	Rockingham	70
Burke	70	Hertford	90	Rowan	70
Cabarrus	70	Hoke	70	Rutherford	70
Caldwell	70	Hyde	110	Sampson	90
Camden	100	Iredell	70	Scotland	70
Carteret	110	Jackson	80	Stanley	70
Caswell	70	Johnston	80	Stokes	70
Catawba	70	Jones	100	Surry	70
Cherokee	80	Lee	70	Swain	80
Chatham	70	Lenoir	90	Transylvania	80
Chowan	90	Lincoln	70	Tyrell	100
Clay	80	Macon	80	Union	70
Cleveland	70	Madison	80	Vance	70
Columbus	90	Martin	90	Wake	70
Craven	100	McDowell	70	Warren	70
Cumberland	80	Mecklenburg	70	Washington	100
Currituck	100	Mitchell	70	Watauga	70
Dare	110	Montgomery	70	Wayne	80
Davidson	70	Moore	70	Wilkes	70
Davie	70	Nash	80	Wilson	80
Duplin	90	New Hanover	100	Yadkin	70
Durham	70	Northampton	80	Yancey	70
Edgecombe	80	Onslow	100		
Forsyth	70	Orange	70		

B. Review and Approval

The Engineer is responsible for the review and approval of temporary works' drawings.

Submit the working drawings sufficiently in advance of proposed use to allow for their review, revision (if needed), and approval without delay to the work.

The time period for review of the working drawings does not begin until complete drawings and design calculations, when required, are received by the Engineer.

Do not start construction of any temporary work for which working drawings are required until the drawings have been approved. Such approval does not relieve the Contractor of the responsibility for the accuracy and adequacy of the working drawings.

4.0 CONSTRUCTION REQUIREMENTS

All requirements of Section 420 of the Standard Specifications apply.

Construct temporary works in conformance with the approved working drawings. Ensure that the quality of materials and workmanship employed is consistent with that assumed in the design of the temporary works. Do not weld falsework members to any portion of the permanent structure unless approved. Show any welding to the permanent structure on the approved construction drawings.

Provide tell-tales attached to the forms and extending to the ground, or other means, for accurate measurement of falsework settlement. Make sure that the anticipated compressive settlement and/or deflection of falsework does not exceed 1 inch. For cast-in-place concrete structures, make sure that the calculated deflection of falsework flexural members does not exceed 1/240 of their span regardless of whether or not the deflection is compensated by camber strips.

A. Maintenance and Inspection

Inspect and maintain the temporary work in an acceptable condition throughout the period of its use. Certify that the manufactured devices have been maintained in a condition to allow them to safely carry their rated loads. Clearly mark each piece so that its capacity can be readily determined at the job site.

Perform an in-depth inspection of an applicable portion(s) of the temporary works, in the presence of the Engineer, not more than 24 hours prior to the beginning of each concrete placement. Inspect other temporary works at least once a month to ensure that they are functioning properly. Have a North Carolina Registered Professional Engineer inspect the cofferdams, shoring, sheathing, support of excavation structures, and support systems for load tests prior to loading.

B. Foundations

Determine the safe bearing capacity of the foundation material on which the supports for temporary works rest. If required by the Engineer, conduct load tests to verify proposed bearing capacity values that are marginal or in other high-risk situations.

The use of the foundation support values shown on the contract plans of the permanent structure is permitted if the foundations are on the same level and on the same soil as those of the permanent structure.

Allow for adequate site drainage or soil protection to prevent soil saturation and washout of the soil supporting the temporary works supports.

If piles are used, the estimation of capacities and later confirmation during construction using standard procedures based on the driving characteristics of the pile is permitted. If preferred, use load tests to confirm the estimated capacities; or, if required by the Engineer conduct load tests to verify bearing capacity values that are marginal or in other high risk situations.

The Engineer reviews and approves the proposed pile and soil bearing capacities.

5.0 REMOVAL

Unless otherwise permitted, remove and keep all temporary works upon completion of the work. Do not disturb or otherwise damage the finished work.

Remove temporary works in conformance with the contract documents. Remove them in such a manner as to permit the structure to uniformly and gradually take the stresses due to its own weight.

6.0 METHOD OF MEASUREMENT

Unless otherwise specified, temporary works will not be directly measured.

7.0 BASIS OF PAYMENT

Payment at the contract unit prices for the various pay items requiring temporary works will be full compensation for the above falsework and formwork.

CRANE SAFETY**(8-15-05)**

Comply with the manufacturer specifications and limitations applicable to the operation of any and all cranes and derricks. Prime contractors, sub-contractors, and fully operated rental companies shall comply with the current Occupational Safety and Health Administration regulations (OSHA).

Submit all items listed below to the Engineer prior to beginning crane operations involving critical lifts. A critical lift is defined as any lift that exceeds 75 percent of the manufacturer's crane chart capacity for the radius at which the load will be lifted or requires the use of more than one crane. Changes in personnel or equipment must be reported to the Engineer and all applicable items listed below must be updated and submitted prior to continuing with crane operations.

CRANE SAFETY SUBMITTAL LIST

- A. **Competent Person:** Provide the name and qualifications of the "Competent Person" responsible for crane safety and lifting operations. The named competent person will have the responsibility and authority to stop any work activity due to safety concerns.
- B. **Riggers:** Provide the qualifications and experience of the persons responsible for rigging operations. Qualifications and experience should include, but not be limited to, weight calculations, center of gravity determinations, selection and inspection of sling and rigging equipment, and safe rigging practices.
- C. **Crane Inspections:** Inspection records for all cranes shall be current and readily accessible for review upon request.
- D. **Certifications:** By July 1, 2006, crane operators performing critical lifts shall be certified by NC CCO (National Commission for the Certification of Crane Operators), or satisfactorily complete the Carolinas AGC's Professional Crane Operator's Proficiency Program. Other approved nationally accredited programs will be considered upon request. All crane operators shall also have a current CDL medical card. Submit a list of anticipated critical lifts and corresponding crane operator(s). Include current certification for the type of crane operated (small hydraulic, large hydraulic, small lattice, large lattice) and medical evaluations for each operator.

GROUT FOR STRUCTURES

(9-30-11)

1.0 DESCRIPTION

This special provision addresses grout for use in pile blockouts, grout pockets, shear keys, dowel holes and recesses for structures. This provision does not apply to grout placed in post-tensioning ducts for bridge beams, girders, or decks. Mix and place grout in accordance with the manufacturer's recommendations, the applicable sections of the Standard Specifications and this provision.

2.0 MATERIAL REQUIREMENTS

Use a Department approved pre-packaged, non-shrink, non-metallic grout. Contact the Materials and Tests Unit for a list of approved pre-packaged grouts and consult the manufacturer to determine if the pre-packaged grout selected is suitable for the required application.

When using an approved pre-packaged grout, a grout mix design submittal is not required.

The grout shall be free of soluble chlorides and contain less than one percent soluble sulfate. Supply water in compliance with Article 1024-4 of the Standard Specifications.

Aggregate may be added to the mix only where recommended or permitted by the manufacturer and Engineer. The quantity and gradation of the aggregate shall be in accordance with the manufacturer's recommendations.

Admixtures, if approved by the Department, shall be used in accordance with the manufacturer's recommendations. The manufacture date shall be clearly stamped on each container. Admixtures with an expired shelf life shall not be used.

The Engineer reserves the right to reject material based on unsatisfactory performance.

Initial setting time shall not be less than 10 minutes when tested in accordance with ASTM C266.

Test the expansion and shrinkage of the grout in accordance with ASTM C1090. The grout shall expand no more than 0.2% and shall exhibit no shrinkage. Furnish a Type 4 material certification showing results of tests conducted to determine the properties listed in the Standard Specifications and to assure the material is non-shrink.

Unless required elsewhere in the contract the compressive strength at 3 days shall be at least 5000 psi. Compressive strength in the laboratory shall be determined in accordance with ASTM C109 except the test mix shall contain only water and the dry manufactured material. Compressive strength in the field will be determined by molding and testing 4" x 8" cylinders in accordance with AASHTO T22. Construction loading and traffic loading shall not be allowed until the 3 day compressive strength is achieved.

When tested in accordance with ASTM C666, Procedure A, the durability factor of the grout shall not be less than 80.

3.0 SAMPLING AND PLACEMENT

Place and maintain components in final position until grout placement is complete and accepted. Concrete surfaces to receive grout shall be free of defective concrete, laitance, oil, grease and other foreign matter. Saturate concrete surfaces with clean water and remove excess water prior to placing grout.

Do not place grout if the grout temperature is less than 50°F or more than 90°F or if the air temperature measured at the location of the grouting operation in the shade away from artificial heat is below 45°F.

Provide grout at a rate that permits proper handling, placing and finishing in accordance with the manufacturer's recommendations unless directed otherwise by the Engineer. Use grout free of any lumps and undispersed cement. Agitate grout continuously before placement.

Control grout delivery so the interval between placing batches in the same component does not exceed 20 minutes.

The Engineer will determine the locations to sample grout and the number and type of samples collected for field and laboratory testing. The compressive strength of the grout will be considered the average compressive strength test results of 3 cube or 2 cylinder specimens at 28 days.

4.0 BASIS OF PAYMENT

No separate payment will be made for "Grout for Structures". The cost of the material, equipment, labor, placement, and any incidentals necessary to complete the work shall be considered incidental to the structure item requiring grout.

SUBMITTAL OF WORKING DRAWINGS

(6-19-15)

1.0 GENERAL

Submit working drawings in accordance with Article 105-2 of the *Standard Specifications* and this provision. For this provision, "submittals" refers to only those listed in this provision. The list of submittals contained herein does not represent a list of required submittals for the project. Submittals are only necessary for those items as required by the contract. Make submittals that are not specifically noted in this provision directly to the Engineer. Either the Structures Management Unit or the Geotechnical Engineering Unit or both units will jointly review submittals.

If a submittal contains variations from plan details or specifications or significantly affects project cost, field construction or operations, discuss the submittal with and submit all copies to the Engineer. State the reason for the proposed variation in the submittal. To minimize review time, make sure all submittals are complete when initially submitted. Provide a contact name and information with each submittal. Direct any questions regarding submittal requirements to the Engineer, Structures Management Unit contacts or the Geotechnical Engineering Unit contacts noted below.

In order to facilitate in-plant inspection by NCDOT and approval of working drawings, provide the name, address and telephone number of the facility where fabrication will actually be done if different than shown on the title block of the submitted working drawings. This includes, but is not limited to, precast concrete items, prestressed concrete items and fabricated steel or aluminum items.

2.0 ADDRESSES AND CONTACTS

For submittals to the Structures Management Unit, use the following addresses:

Via US mail:

Via other delivery service:

Mr. T. K. Koch, P. E.
State Structures Engineer
North Carolina Department
of Transportation
Structures Management Unit
1581 Mail Service Center
Raleigh, NC 27699-1581

Attention: Mr. P. D. Lambert, P. E.

Mr. T. K. Koch, P. E.
State Structures Engineer
North Carolina Department
of Transportation
Structures Management Unit
1000 Birch Ridge Drive
Raleigh, NC 27610

Attention: Mr. P. D. Lambert, P. E.

Submittals may also be made via email.

Send submittals to:

plambert@ncdot.gov (Paul Lambert)

Send an additional e-copy of the submittal to the following address:

jgaither@ncdot.gov (James Gaither)

mrorie@ncdot.gov (Madonna Rorie)

For submittals to the Geotechnical Engineering Unit, use the following addresses:

For projects in Divisions 1-7, use the following Eastern Regional Office address:

Via US mail:

Mr. K. J. Kim, Ph. D., P. E.
Eastern Regional Geotechnical
Manager
North Carolina Department
of Transportation
Geotechnical Engineering Unit
Eastern Regional Office
1570 Mail Service Center
Raleigh, NC 27699-1570

Via other delivery service:

Mr. K. J. Kim, Ph. D., P. E.
Eastern Regional Geotechnical
Manager
North Carolina Department
of Transportation
Geotechnical Engineering Unit
Eastern Regional Office
3301 Jones Sausage Road, Suite 100
Garner, NC 27529

For projects in Divisions 8-14, use the following Western Regional Office address:

Via US mail:

Mr. Eric Williams, P. E.
Western Regional Geotechnical
Manager
North Carolina Department
of Transportation
Geotechnical Engineering Unit
Western Regional Office
5253 Z Max Boulevard
Harrisburg, NC 28075

Via other delivery service:

Mr. Eric Williams, P. E.
Western Region Geotechnical
Manager
North Carolina Department
of Transportation
Geotechnical Engineering Unit
Western Regional Office
5253 Z Max Boulevard
Harrisburg, NC 28075

The status of the review of structure-related submittals sent to the Structures Management Unit can be viewed from the Unit’s web site, via the “Drawing Submittal Status” link.

Direct any questions concerning submittal review status, review comments or drawing markups to the following contacts:

Primary Structures Contact: Paul Lambert (919) 707 – 6407
(919) 250 – 4082 facsimile
plambert@ncdot.gov

Secondary Structures Contacts: James Gaither (919) 707 – 6409
Madonna Rorie (919) 707 – 6508

Eastern Regional Geotechnical Contact (Divisions 1-7):
K. J. Kim (919) 662 – 4710
(919) 662 – 3095 facsimile
kkim@ncdot.gov

Western Regional Geotechnical Contact (Divisions 8-14):
Eric Williams (704) 455 – 8902
(704) 455 – 8912 facsimile
ewilliams3@ncdot.gov

3.0 SUBMITTAL COPIES

Furnish one complete copy of each submittal, including all attachments, to the Engineer. At the same time, submit the number of hard copies shown below of the same complete submittal directly to the Structures Management Unit and/or the Geotechnical Engineering Unit.

The first table below covers “Structure Submittals”. The Engineer will receive review comments and drawing markups for these submittals from the Structures Management Unit. The second table in this section covers “Geotechnical Submittals”. The Engineer will receive review comments and drawing markups for these submittals from the Geotechnical Engineering Unit.

Unless otherwise required, submit one set of supporting calculations to either the Structures Management Unit or the Geotechnical Engineering Unit unless both units require submittal copies in which case submit a set of supporting calculations to each unit. Provide additional copies of any submittal as directed.

STRUCTURE SUBMITTALS

Submittal	Copies Required by	Copies Required by	Contract Reference Requiring Submittal ¹
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	Structures Management Unit	Geotechnical Engineering Unit	
Arch Culvert Falsework	5	0	Plan Note, SN Sheet & "Falsework and Formwork"
Box Culvert Falsework ⁷	5	0	Plan Note, SN Sheet & "Falsework and Formwork"
Cofferdams	6	2	Article 410-4
Foam Joint Seals ⁶	9	0	"Foam Joint Seals"
Expansion Joint Seals (hold down plate type with base angle)	9	0	"Expansion Joint Seals"
Expansion Joint Seals (modular)	2, then 9	0	"Modular Expansion Joint Seals"
Expansion Joint Seals (strip seals)	9	0	"Strip Seals"
Falsework & Forms ² (substructure)	8	0	Article 420-3 & "Falsework and Formwork"
Falsework & Forms (superstructure)	8	0	Article 420-3 & "Falsework and Formwork"
Girder Erection over Railroad	5	0	Railroad Provisions
Maintenance and Protection of Traffic Beneath Proposed Structure	8	0	"Maintenance and Protection of Traffic Beneath Proposed Structure at Station ____"
Metal Bridge Railing	8	0	Plan Note
Metal Stay-in-Place Forms	8	0	Article 420-3
Metalwork for Elastomeric Bearings ^{4,5}	7	0	Article 1072-8
Miscellaneous Metalwork ^{4,5}	7	0	Article 1072-8
Disc Bearings ⁴	8	0	"Disc Bearings"
Overhead and Digital Message Signs (DMS) (metalwork and foundations)	13	0	Applicable Provisions

Placement of Equipment on Structures (cranes, etc.)	7	0	Article 420-20
Precast Concrete Box Culverts	2, then 1 reproducible	0	“Optional Precast Reinforced Concrete Box Culvert at Station ____”
Prestressed Concrete Cored Slab (detensioning sequences) ³	6	0	Article 1078-11
Prestressed Concrete Deck Panels	6 and 1 reproducible	0	Article 420-3
Prestressed Concrete Girder (strand elongation and detensioning sequences)	6	0	Articles 1078-8 and 1078-11
Removal of Existing Structure over Railroad	5	0	Railroad Provisions
Revised Bridge Deck Plans (adaptation to prestressed deck panels)	2, then 1 reproducible	0	Article 420-3
Revised Bridge Deck Plans (adaptation to modular expansion joint seals)	2, then 1 reproducible	0	“Modular Expansion Joint Seals”
Sound Barrier Wall (precast items)	10	0	Article 1077-2 & “Sound Barrier Wall”
Sound Barrier Wall Steel Fabrication Plans ⁵	7	0	Article 1072-8 & “Sound Barrier Wall”
Structural Steel ⁴	2, then 7	0	Article 1072-8
Temporary Detour Structures	10	2	Article 400-3 & “Construction, Maintenance and Removal of Temporary Structure at Station ____”
TFE Expansion Bearings ⁴	8	0	Article 1072-8

FOOTNOTES

- References are provided to help locate the part of the contract where the submittals are required. References in quotes refer to the provision by that name. Articles refer to the *Standard Specifications*.

2. Submittals for these items are necessary only when required by a note on plans.
3. Submittals for these items may not be required. A list of pre-approved sequences is available from the producer or the Materials & Tests Unit.
4. The fabricator may submit these items directly to the Structures Management Unit.
5. The two sets of preliminary submittals required by Article 1072-8 of the *Standard Specifications* are not required for these items.
6. Submittals for Fabrication Drawings are not required. Submittals for Catalogue Cuts of Proposed Material are required. See Section 5.A of the referenced provision.
7. Submittals are necessary only when the top slab thickness is 18" or greater.

GEOTECHNICAL SUBMITTALS

Submittal	Copies Required by Geotechnical Engineering Unit	Copies Required by Structures Management Unit	Contract Reference Requiring Submittal ¹
Drilled Pier Construction Plans ²	1	0	Subarticle 411-3(A)
Crosshole Sonic Logging (CSL) Reports ²	1	0	Subarticle 411-5(A)(2)
Pile Driving Equipment Data Forms ^{2,3}	1	0	Subarticle 450-3(D)(2)
Pile Driving Analyzer (PDA) Reports ²	1	0	Subarticle 450-3(F)(3)
Retaining Walls ⁴	8 drawings, 2 calculations	2 drawings	Applicable Provisions
Temporary Shoring ⁴	5 drawings, 2 calculations	2 drawings	“Temporary Shoring” & “Temporary Soil Nail Walls”

FOOTNOTES

1. References are provided to help locate the part of the contract where the submittals are required. References in quotes refer to the provision by that name. Subarticles refer to the *Standard Specifications*.

2. Submit one hard copy of submittal to the Engineer. Submit a second copy of submittal electronically (PDF via email) or by facsimile, US mail or other delivery service to the appropriate Geotechnical Engineering Unit regional office. Electronic submission is preferred.
3. The Pile Driving Equipment Data Form is available from:
https://connect.ncdot.gov/resources/Geological/Pages/Geotech_Forms_Details.aspx
See second page of form for submittal instructions.
4. Electronic copy of submittal is required. See referenced provision.