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

PROPOSAL

DATE AND TIME OF BID OPENING: **JULY 20, 2021 AT 2:00 PM**

CONTRACT ID	C204331
WBS	15BPR.19

FEDERAL-AID NO.	STATE FUNDED
COUNTY	NEW HANOVER
T.I.P. NO.	
MILES	0.165
ROUTE NO.	US 76
LOCATION	US-76 OVER BANKS CHANNEL STRUCTURE #640021.

TYPE OF WORK BRIDGE PRESERVATION.

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

PROPOSAL FOR THE CONSTRUCTION OF

CONTRACT No. C204331 IN NEW HANOVER COUNTY, NORTH CAROLINA

Date_____ 20_____

DEPARTMENT OF TRANSPORTATION,

RALEIGH, NORTH CAROLINA

The Bidder has carefully examined the location of the proposed work to be known as Contract No. **C204331** has carefully examined the plans and specifications, which are acknowledged to be part of the proposal, the special provisions, the proposal, the form of contract, and the forms of contract payment bond and contract performance bond; and thoroughly understands the stipulations, requirements and provisions. The undersigned bidder agrees to bound upon his execution of the bid and subsequent award to him by the Board of Transportation in accordance with this proposal to provide the necessary contract payment bond and contract performance bond within fourteen days after the written notice of award is received by him. The undersigned Bidder further agrees to provide all necessary machinery, tools, labor, and other means of construction; and to do all the work and to furnish all materials, except as otherwise noted, necessary to perform and complete the said contract in accordance with *the 2018 Standard Specifications for Roads and Structures* by the dates(s) specified in the Project Special Provisions and in accordance with the requirements of the Engineer, and at the unit or lump sum prices, as the case may be, for the various items given on the sheets contained herein.

The Bidder shall provide and furnish all the materials, machinery, implements, appliances and tools, and perform the work and required labor to construct and complete State Highway Contract No. **C204331** in **New Hanover County**, for the unit or lump sum prices, as the case may be, bid by the Bidder in his bid and according to the proposal, plans, and specifications prepared by said Department, which proposal, plans, and specifications show the details covering this project, and hereby become a part of this contract.

The published volume entitled *North Carolina Department of Transportation, Raleigh, Standard Specifications for Roads and Structures, January 2018* with all amendments and supplements thereto, is by reference incorporated into and made a part of this contract; that, except as herein modified, all the construction and work included in this contract is to be done in accordance with the specifications contained in said volume, and amendments and supplements thereto, under the direction of the Engineer.

If the proposal is accepted and the award is made, the contract is valid only when signed either by the Contract Officer or such other person as may be designated by the Secretary to sign for the Department of Transportation. The conditions and provisions herein cannot be changed except over the signature of the said Contract Officer.

The quantities shown in the itemized proposal for the project are considered to be approximate only and are given as the basis for comparison of bids. The Department of Transportation may increase or decrease the quantity of any item or portion of the work as may be deemed necessary or expedient.

An increase or decrease in the quantity of an item will not be regarded as sufficient ground for an increase or decrease in the unit prices, nor in the time allowed for the completion of the work, except as provided for the contract.

Accompanying this bid is a bid bond secured by a corporate surety, or certified check payable to the order of the Department of Transportation, for five percent of the total bid price, which deposit is to be forfeited as liquidated damages in case this bid is accepted and the Bidder shall fail to provide the required payment and performance bonds with the Department of Transportation, under the condition of this proposal, within 14 calendar days after the written notice of award is received by him, as provided in the *Standard Specifications*; otherwise said deposit will be returned to the Bidder.

State Contract Officer

DocuSigned by:
Ronald E. Davenport, Jr. 6/15/2021
F81B6038A47A442...

TABLE OF CONTENTS

COVER SHEET
PROPOSAL SHEET

PROJECT SPECIAL PROVISIONS

CONTRACT TIME AND LIQUIDATED DAMAGES: G-1
INTERMEDIATE CONTRACT TIME NUMBER 1 AND LIQUIDATED DAMAGES: G-1
INTERMEDIATE CONTRACT TIME NUMBER 2 AND LIQUIDATED DAMAGES: G-3
MAJOR CONTRACT ITEMS: G-3
SPECIALTY ITEMS: G-3
SCHEDULE OF ESTIMATED COMPLETION PROGRESS: G-4
MINORITY BUSINESS ENTERPRISE AND WOMEN BUSINESS ENTERPRISE: G-4
RESTRICTIONS ON ITS EQUIPMENT AND SERVICES: G-19
USE OF UNMANNED AIRCRAFT SYSTEM (UAS): G-19
EQUIPMENT IDLING GUIDELINES: G-19
MAINTENANCE OF THE PROJECT: G-20
ELECTRONIC BIDDING: G-21
TWELVE MONTH GUARANTEE: G-21
OUTSOURCING OUTSIDE THE USA: G-22

ROADWAY R-1

STANDARD SPECIAL PROVISIONS

AVAILABILITY FUNDS – TERMINATION OF CONTRACTS SSP-1
ERRATA SSP-2
PLANT AND PEST QUARANTINES SSP-3
MINIMUM WAGES SSP-4
TITLE VI AND NONDISCRIMINATION SSP-5
ON-THE-JOB TRAINING SSP-13

UNIT PROJECT SPECIAL PROVISIONS

PAVEMENT MARKINGS PM-1
TRAFFIC CONTROL TC-1
STRUCTURE / CULVERTS BP-1

PROPOSAL ITEM SHEET

ITEM SHEET(S) (TAN SHEETS)

PROJECT SPECIAL PROVISIONS

GENERAL

CONTRACT TIME AND LIQUIDATED DAMAGES:

(7-1-95) (Rev. 12-18-07) 108 SP1 G10 A

The date of availability for this contract is **September 13, 2021**.

The completion date for this contract is **November 15, 2022**.

Except where otherwise provided by the contract, observation periods required by the contract will not be a part of the work to be completed by the completion date and/or intermediate contract times stated in the contract. The acceptable completion of the observation periods that extend beyond the final completion date shall be a part of the work covered by the performance and payment bonds.

The liquidated damages for this contract are **One Thousand One Hundred Dollars ($ 1,100.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 1 AND LIQUIDATED DAMAGES:

(2-20-07) 108 SP1 G14 A

The Contractor shall complete the required work of installing, maintaining, and removing the traffic control devices for lane closures and restoring traffic to the existing traffic pattern. The Contractor shall not close or narrow a lane of traffic on **US-76** during the following time restrictions:

DAY AND TIME RESTRICTIONS
Monday thru Friday,
6:00 A.M. to 9:00 A.M. and 4:00 P.M. to 6:00 P.M.

In addition, the Contractor shall not close or narrow a lane of traffic on **Any Road**, detain and/or alter the traffic flow on or during holidays, holiday weekends, special events, or any other time when traffic is unusually heavy, including the following schedules:

HOLIDAY AND HOLIDAY WEEKEND LANE CLOSURE RESTRICTIONS

1. For **unexpected occurrence** that creates unusually high traffic volumes, as directed by the Engineer.

2. For **New Year's Day**, between the hours of **6:00 A.M.** December 31st and **6:00 P.M.** January 2nd. If New Year's Day is on a Friday, Saturday, Sunday or Monday, then until **6:00 P.M.** the following Tuesday.

3. For **Easter**, between the hours of **6:00 A.M.** Thursday and **6:00 P.M.** Monday.

4. For **Memorial Day**, between the hours of **6:00 A.M.** Friday and **6:00 P.M.** Tuesday.

5. For **Independence Day**, between the hours of **6:00 A.M.** the day before Independence Day and **6:00 P.M.** the day after Independence Day.

   If **Independence Day** is on a Friday, Saturday, Sunday or Monday, then between the hours of **6:00 A.M.** the Thursday before Independence Day and **6:00 P.M.** the Tuesday after Independence Day.

6. For **Labor Day**, between the hours of **6:00 A.M.** Friday and **6:00 P.M.** Tuesday.

7. For **Thanksgiving**, between the hours of **6:00 A.M.** Tuesday and **6:00 P.M.** Monday.

8. For **Christmas**, between the hours of **6:00 A.M.** the Friday before the week of Christmas Day and **6:00 P.M.** the following Tuesday after the week of Christmas Day.

9. For **each of the following Special Events**, between **four (4)** hours before the start and **four (4)** hours after the end of the **each event, as directed by the Engineer:**

   a. Wrightsville Beach Valentine Run: 5K & 10K
   b. Wrightsville Beach Marathon
   c. Carolina Cup Sup Race
   d. YMCA Triathlon
   e. WUMC Son Run 5K
   f. Ironman 70.3 B2B
   g. Walk to End Alzheimers
   h. Walk for Suicide Prevention
   i. Seaside Shuffle
   j. Thanksgiving Turkey Trot
   k. NC Holiday Flotilla
   l. Jingle Bell Run

Holidays and holiday weekends shall include New Year's, Easter, Memorial Day, Independence Day, Labor Day, Thanksgiving, and Christmas. The Contractor shall schedule his work so that lane closures will not be required during these periods, unless otherwise directed by the Engineer.

The time of availability for this intermediate contract work shall be the time the Contractor begins to install all traffic control devices for lane closures according to the time restrictions listed herein.

The completion time for this intermediate contract work shall be the time the Contractor is required to complete the removal of all traffic control devices for lane closures according to the time restrictions stated above and place traffic in the existing traffic pattern.

The liquidated damages are **Five Hundred Dollars ($ 500.00)** per fifteen **(15)** minute time period.

INTERMEDIATE CONTRACT TIME NUMBER 2 AND LIQUIDATED DAMAGES:
(2-20-07) 108 SP1 G14 C

The Contractor shall complete the required work of installing, maintaining and removing the traffic control devices for lane closures and restoring traffic to the existing traffic pattern. The Contractor shall not close or narrow **two (or more)** lanes of traffic on **US-76** during the following time restrictions:

DAY AND TIME RESTRICTIONS
Monday thru Sunday,
5:00 A.M. to 11:30 P.M.

The time of availability for this intermediate contract time will be the time the Contractor begins to install traffic control devices required for the lane closures according to the time restrictions stated herein.

The completion time for this intermediate contract time will be the time the Contractor is required to complete the removal of traffic control devices required for the lane closures according to the time restrictions stated herein and restore traffic to the existing traffic pattern.

The liquidated damages are **One Thousand Dollars ($ 1,000.00)** per fifteen **(15)** minute time period.

MAJOR CONTRACT ITEMS:
(2-19-02) 104 SP1 G28

The following listed items are the major contract items for this contract (see Article 104-5 of the *2018 Standard Specifications*):

Line #	Description
26	Galvanized Pedestrian Safety Rail
34	Prestressed Conc Girders With Thermal Spray Anode (Non-Monitoring)

SPECIALTY ITEMS:
(7-1-95)(Rev. 7-20-21) 108-6 SP1 G37

Items listed below will be the specialty items for this contract (see Article 108-6 of the *2018 Standard Specifications*).

Line #	Description
26	Fencing
11-13, 17	Long-Life Pavement Markings
18	Permanent Pavement Markers
22, 37	Bridge Painting

SCHEDULE OF ESTIMATED COMPLETION PROGRESS:
(7-15-08) (Rev. 5-13-19) 108-2 SP1 G58

The Contractor's attention is directed to the Standard Special Provision entitled *Availability of Funds Termination of Contracts* included elsewhere in this proposal. The Department of Transportation's schedule of estimated completion progress for this project as required by that Standard Special Provision is as follows:

	Fiscal Year	Progress (% of Dollar Value)
2022	(7/01/21 - 6/30/22)	**81**% of Total Amount Bid
2023	(7/01/22 - 6/30/23)	**19**% of Total Amount Bid

The Contractor shall also furnish his own progress schedule in accordance with Article 108-2 of the *2018 Standard Specifications*. Any acceleration of the progress as shown by the Contractor's progress schedule over the progress as shown above shall be subject to the approval of the Engineer.

MINORITY BUSINESS ENTERPRISE AND WOMEN BUSINESS ENTERPRISE:
(10-16-07)(Rev. 12-17-19) 102-15(J) SP1 G66

Description

The purpose of this Special Provision is to carry out the North Carolina Department of Transportation's policy of ensuring nondiscrimination in the award and administration of contracts financed in whole or in part with State funds.

Definitions

Additional MBE/WBE Subcontractors - Any MBE/WBE submitted at the time of bid that will not be used to meet the Combined MBE /WBE Goal. No submittal of a Letter of Intent is required.

Combined MBE/WBE Goal: A portion of the total contract, expressed as a percentage that is to be performed by committed MBE/WBE subcontractors.

Committed MBE/WBE Subcontractor - Any MBE/WBE submitted at the time of bid that is being used to meet the Combined MBE /WBE goal by submission of a Letter of Intent. Or any MBE or WBE used as a replacement for a previously committed MBE or WBE firm.

Contract Goal Requirement - The approved participation at time of award, but not greater than the advertised Combined MBE/WBE contract goal.

Goal Confirmation Letter - Written documentation from the Department to the bidder confirming the Contractor's approved, committed participation along with a listing of the committed MBE and WBE firms.

Manufacturer - A firm that operates or maintains a factory or establishment that produces on the premises, the materials or supplies obtained by the Contractor.

MBE Participation (Anticipated) - A portion of the total contract, expressed as a percentage that is anticipated to be performed by committed MBE subcontractor(s).

Minority Business Enterprise (MBE) - A firm certified as a Disadvantaged Minority-Owned Business Enterprise through the North Carolina Unified Certification Program.

Regular Dealer - A firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials or supplies required for the performance of the contract are bought, kept in stock, and regularly sold to the public in the usual course of business. A regular dealer engages in, as its principal business and in its own name, the purchase and sale or lease of the products in question. A regular dealer in such bulk items as steel, cement, gravel, stone, and petroleum products need not keep such products in stock, if it owns and operates distribution equipment for the products. Brokers and packagers are not regarded as manufacturers or regular dealers within the meaning of this section.

Replacement / Substitution – A full or partial reduction in the amount of work subcontracted to a committed (or an approved substitute) MBE/WBE firm.

North Carolina Unified Certification Program (NCUCP) - A program that provides comprehensive services and information to applicants for MBE/WBE certification. The MBE/WBE program follows the same regulations as the federal Disadvantaged Business Enterprise (DBE) program in accordance with 49 CFR Part 26.

United States Department of Transportation (USDOT) - Federal agency responsible for issuing regulations (49 CFR Part 26) and official guidance for the DBE program.

WBE Participation (Anticipated) - A portion of the total contract, expressed as a percentage, that is anticipated to be performed by committed WBE subcontractor(s).

Women Business Enterprise (WBE) - A firm certified as a Disadvantaged Women-Owned Business Enterprise through the North Carolina Unified Certification Program.

Forms and Websites Referenced in this Provision

Payment Tracking System - On-line system in which the Contractor enters the payments made to MBE and WBE subcontractors who have performed work on the project. https://apps.dot.state.nc.us/Vendor/PaymentTracking/

DBE-IS *Subcontractor Payment Information* - Form for reporting the payments made to all MBE/WBE firms working on the project. This form is for paper bid projects only. https://connect.ncdot.gov/business/Turnpike/Documents/Form%20DBE-IS%20Subcontractor%20Payment%20Information.pdf

RF-1 *MBE/WBE Replacement Request Form* - Form for replacing a committed MBE or WBE. http://connect.ncdot.gov/projects/construction/Construction%20Forms/DBE%20MBE%20WBE%20Replacement%20Request%20Form.pdf

SAF *Subcontract Approval Form* - Form required for approval to sublet the contract.

http://connect.ncdot.gov/projects/construction/Construction%20Forms/Subcontract%20Approval%20Form%20Rev.%202012.zip

JC-1 *Joint Check Notification Form* - Form and procedures for joint check notification. The form acts as a written joint check agreement among the parties providing full and prompt disclosure of the expected use of joint checks.
http://connect.ncdot.gov/projects/construction/Construction%20Forms/Joint%20Check%20Notification%20Form.pdf

Letter of Intent - Form signed by the Contractor and the MBE/WBE subcontractor, manufacturer or regular dealer that affirms that a portion of said contract is going to be performed by the signed MBE/WBE for the estimated amount (based on quantities and unit prices) listed at the time of bid.
http://connect.ncdot.gov/letting/LetCentral/Letter%20of%20Intent%20to%20Perform%20as%20a%20Subcontractor.pdf

Listing of MBE and WBE Subcontractors Form - Form for entering MBE/WBE subcontractors on a project that will meet the Combined MBE/WBE goal. This form is for paper bids only.
http://connect.ncdot.gov/municipalities/Bid%20Proposals%20for%20LGA%20Content/09%20MBE-WBE%20Subcontractors%20(State).docx

Subcontractor Quote Comparison Sheet - Spreadsheet for showing all subcontractor quotes in the work areas where MBEs and WBEs quoted on the project. This sheet is submitted with good faith effort packages.
http://connect.ncdot.gov/business/SmallBusiness/Documents/DBE%20Subcontractor%20Quote%20Comparison%20Example.xls

Combined MBE/WBE Goal

The Combined MBE/WBE Goal for this project is **0.0 %**

The Combined Goal was established utilizing the following anticipated participation for Minority Business Enterprises and Women Business Enterprises:

(A) Minority Business Enterprises **0.0 %**

(1) *If the anticipated MBE participation is more than zero*, the Contractor shall exercise all necessary and reasonable steps to ensure that MBEs participate in at least the percent of the contract as set forth above.

(2) *If the anticipated MBE participation is zero*, the Contractor shall make an effort to recruit and use MBEs during the performance of the contract. Any MBE participation obtained shall be reported to the Department.

(B) Women Business Enterprises **0.0 %**

(1) *If the anticipated WBE participation is more than zero*, the Contractor shall exercise all necessary and reasonable steps to ensure that WBEs participate in at least the percent of the contract as set forth above.

(2) *If the anticipated WBE participation is zero*, the Contractor shall make an effort to recruit and use WBEs during the performance of the contract. Any WBE participation obtained shall be reported to the Department.

The Bidder is required to submit only participation to meet the Combined MBE/WBE Goal. The Combined Goal may be met by submitting all MBE participation, all WBE participation, or a combination of MBE and WBE participation.

Directory of Transportation Firms (Directory)

Real-time information is available about firms doing business with the Department and firms that are certified through NCUCP in the Directory of Transportation Firms. Only firms identified in the Directory as MBE and WBE certified shall be used to meet the Combined MBE/WBE Goal. The Directory can be found at the following link.
https://www.ebs.nc.gov/VendorDirectory/default.html

The listing of an individual firm in the directory shall not be construed as an endorsement of the firm's capability to perform certain work.

Listing of MBE/WBE Subcontractors

At the time of bid, bidders shall submit all MBE and WBE participation that they anticipate to use during the life of the contract. Only those identified to meet the Combined MBE/WBE Goal will be considered committed, even though the listing shall include both committed MBE/WBE subcontractors and additional MBE/WBE subcontractors. Any additional MBE/WBE subcontractor participation above the goal will follow the banking guidelines found elsewhere in this provision. All other additional MBE/WBE subcontractor participation submitted at the time of bid will be used toward the Department's overall race-neutral goals. Only those firms with current MBE and WBE certification at the time of bid opening will be acceptable for listing in the bidder's submittal of MBE and WBE participation. The Contractor shall indicate the following required information:

(A) Electronic Bids

Bidders shall submit a listing of MBE and WBE participation in the appropriate section of the electronic submittal file.

(1) Submit the names and addresses of MBE and WBE firms identified to participate in the contract. If the bidder uses the updated listing of MBE and WBE firms shown in the electronic submittal file, the bidder may use the dropdown menu to access the name and address of the firms.

(2) Submit the contract line numbers of work to be performed by each MBE and WBE firm. When no figures or firms are entered, the bidder will be considered to have no MBE or WBE participation.

(3) The bidder shall be responsible for ensuring that the MBE and WBE are certified at the time of bid by checking the Directory of Transportation Firms. If the firm is not certified at the time of the bid-letting, that MBE's or WBE's participation will not count towards achieving the Combined MBE/WBE goal.

(B) Paper Bids

(1) *If the Combined MBE/WBE Goal is more than zero,*

(a) Bidders, at the time the bid proposal is submitted, shall submit a listing of MBE/WBE participation, including the names and addresses on *Listing of MBE and WBE Subcontractors* contained elsewhere in the contract documents in order for the bid to be considered responsive. Bidders shall indicate the total dollar value of the MBE and WBE participation for the contract.

(b) If bidders have no MBE or WBE participation, they shall indicate this on the *Listing of MBE and WBE Subcontractors* by entering the word "None" or the number "0." This form shall be completed in its entirety. **Blank forms will not be deemed to represent zero participation.** Bids submitted that do not have MBE and WBE participation indicated on the appropriate form will not be read publicly during the opening of bids. The Department will not consider these bids for award and the proposal will be rejected.

(c) The bidder shall be responsible for ensuring that the MBE/WBE is certified at the time of bid by checking the Directory of Transportation Firms. If the firm is not certified at the time of the bid-letting, that MBE's or WBE's participation will not count towards achieving the Combined MBE/WBE Goal.

(2) *If the Combined MBE/WBE Goal is zero,* entries on the *Listing of MBE and WBE Subcontractors* are not required for the zero goal, however any MBE or WBE participation that is achieved during the project shall be reported in accordance with requirements contained elsewhere in the special provision.

MBE or WBE Prime Contractor

When a certified MBE or WBE firm bids on a contract that contains a Combined MBE/WBE goal, the firm is responsible for meeting the goal or making good faith efforts to meet the goal, just like any other bidder. In most cases, a MBE or WBE bidder on a contract will meet the Combined MBE/WBE Goal by virtue of the work it performs on the contract with its own forces. However, all the work that is performed by the MBE or WBE bidder and any other similarly certified subcontractors will count toward the goal. The MBE or WBE bidder shall list itself along with any MBE or WBE subcontractors, if any, in order to receive credit toward the goal.

MBE/WBE prime contractors shall also follow Sections A and B listed under *Listing of MBE/WBE Subcontractor* just as a non-MBE/WBE bidder would.

Written Documentation – Letter of Intent

The bidder shall submit written documentation for each MBE/WBE that will be used to meet the Combined MBE/WBE Goal of the contract, indicating the bidder's commitment to use the MBE/WBE in the contract. This documentation shall be submitted on the Department's form titled *Letter of Intent*.

The documentation shall be received in the office of the State Contractor Utilization Engineer or at DBE@ncdot.gov no later than 10:00 a.m. of the sixth calendar day following opening of bids, unless the sixth day falls on an official state holiday. In that situation, it is due in the office of the State Contractor Utilization Engineer no later than 10:00 a.m. on the next official state business day.

If the bidder fails to submit the Letter of Intent from each committed MBE and WBE to be used toward the Combined MBE/WBE Goal, or if the form is incomplete (i.e. both signatures are not present), the MBE/WBE participation will not count toward meeting the Combined MBE/WBE Goal. If the lack of this participation drops the commitment below the Combined MBE/WBE Goal, the Contractor shall submit evidence of good faith efforts for the goal, completed in its entirety, to the State Contractor Utilization Engineer or DBE@ncdot.gov no later than 10:00 a.m. on the eighth calendar day following opening of bids, unless the eighth day falls on an official state holiday. In that situation, it is due in the office of the State Contractor Utilization Engineer no later than 10:00 a.m. on the next official state business day.

Banking MBE/WBE Credit

If the bid of the lowest responsive bidder exceeds $500,000 and if the committed MBE/WBE participation submitted exceeds the algebraic sum of the Combined MBE /WBE Goal by $1,000 or more, the excess will be placed on deposit by the Department for future use by the bidder. Separate accounts will be maintained for MBE and WBE participation and these may accumulate for a period not to exceed 24 months.

When the apparent lowest responsive bidder fails to submit sufficient participation by MBE and WBE firms to meet the advertised goal, as part of the good faith effort, the Department will consider allowing the bidder to withdraw funds to meet the Combined MBE/WBE Goal as long as there are adequate funds available from the bidder's MBE and WBE bank accounts.

Submission of Good Faith Effort

If the bidder fails to meet or exceed the Combined MBE/WBE Goal, the apparent lowest responsive bidder shall submit to the Department documentation of adequate good faith efforts made to reach that specific goal.

A hard copy and an electronic copy of this information shall be received in the office of the State Contractor Utilization Engineer or at DBE@ncdot.gov no later than 10:00 a.m. on the sixth calendar day following opening of bids unless the sixth day falls on an official state holiday. In that situation, it would be due in the office of the State Contractor Utilization Engineer no later than 10:00 a.m. on the next official state business day. If the contractor cannot send the information

electronically, then one complete set and 5 copies of this information shall be received under the same time constraints above.

Note: Where the information submitted includes repetitious solicitation letters, it will be acceptable to submit a representative letter along with a distribution list of the firms that were solicited. Documentation of MBE/WBE quotations shall be a part of the good faith effort submittal. This documentation may include written subcontractor quotations, telephone log notations of verbal quotations, or other types of quotation documentation.

Consideration of Good Faith Effort for Projects with a Combined MBE/WBE Goal More Than Zero

Adequate good faith efforts mean that the bidder took all necessary and reasonable steps to achieve the goal which, by their scope, intensity, and appropriateness, could reasonably be expected to obtain sufficient MBE/WBE participation. Adequate good faith efforts also mean that the bidder actively and aggressively sought MBE/WBE participation. Mere *pro forma* efforts are not considered good faith efforts.

The Department will consider the quality, quantity, and intensity of the different kinds of efforts a bidder has made. Listed below are examples of the types of actions a bidder will take in making a good faith effort to meet the goals and are not intended to be exclusive or exhaustive, nor is it intended to be a mandatory checklist.

(A) Soliciting through all reasonable and available means (e.g. attendance at pre-bid meetings, advertising, written notices, use of verifiable electronic means through the use of the NCDOT Directory of Transportation Firms) the interest of all certified MBEs/WBEs that are also prequalified subcontractors. The bidder must solicit this interest within at least 10 days prior to bid opening to allow the MBEs/WBEs to respond to the solicitation. Solicitation shall provide the opportunity to MBEs/WBEs within the Division and surrounding Divisions where the project is located. The bidder must determine with certainty if the MBEs/WBEs are interested by taking appropriate steps to follow up initial solicitations.

(B) Selecting portions of the work to be performed by MBEs/WBEs in order to increase the likelihood that the Combined MBE/WBE Goal will be achieved.

(1) Where appropriate, break out contract work items into economically feasible units to facilitate MBE/WBE participation, even when the prime contractor might otherwise prefer to perform these work items with its own forces.

(2) Negotiate with subcontractors to assume part of the responsibility to meet the advertised goal when the work to be sublet includes potential for MBE/WBE participation (2nd and 3rd tier subcontractors).

(C) Providing interested certified MBEs/WBEs that are also prequalified subcontractors with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.

(D) (1) Negotiating in good faith with interested MBEs/WBEs. It is the bidder's

responsibility to make a portion of the work available to MBE/WBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available MBE/WBE subcontractors and suppliers, so as to facilitate MBE/WBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of MBEs/WBEs that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional agreements could not be reached for MBEs/WBEs to perform the work.

(2) A bidder using good business judgment would consider a number of factors in negotiating with subcontractors, including MBE/WBE subcontractors, and would take a firm's price and capabilities as well as the advertised goal into consideration. However, the fact that there may be some additional costs involved in finding and using MBEs/WBEs is not in itself sufficient reason for a bidder's failure to meet the contract goal, as long as such costs are reasonable. Also, the ability or desire of a prime contractor to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Bidding contractors are not, however, required to accept higher quotes from MBEs/WBEs if the price difference is excessive or unreasonable.

(E) Not rejecting MBEs/WBEs as being unqualified without sound reasons based on a thorough investigation of their capabilities. The bidder's standing within its industry, membership in specific groups, organizations, or associates and political or social affiliations (for example, union vs. non-union employee status) are not legitimate causes for the rejection or non-solicitation of bids in the bidder's efforts to meet the project goal.

(F) Making efforts to assist interested MBEs/WBEs in obtaining bonding, lines of credit, or insurance as required by the recipient or bidder.

(G) Making efforts to assist interested MBEs/WBEs in obtaining necessary equipment, supplies, materials, or related assistance or services.

(H) Effectively using the services of available minority/women community organizations; minority/women contractors' groups; Federal, State, and local minority/women business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of MBEs/WBEs. Contact within 7 days from the bid opening the Business Opportunity and Work Force Development Unit at BOWD@ncdot.gov to give notification of the bidder's inability to get MBE or WBE quotes.

(I) Any other evidence that the bidder submits which shows that the bidder has made reasonable good faith efforts to meet the advertised goal.

In addition, the Department may take into account the following:

(1) Whether the bidder's documentation reflects a clear and realistic plan for achieving the Combined MBE/WBE Goal.

(2) The bidders' past performance in meeting the contract goal.

(3) The performance of other bidders in meeting the advertised goal. For example, when the apparent successful bidder fails to meet the goal, but others meet it, you may reasonably raise the question of whether, with additional reasonable efforts the apparent successful bidder could have met the goal. If the apparent successful bidder fails to meet the advertised goal, but meets or exceeds the average MBE and WBE participation obtained by other bidders, the Department may view this, in conjunction with other factors, as evidence of the apparent successful bidder having made a good faith effort.

If the Department does not award the contract to the apparent lowest responsive bidder, the Department reserves the right to award the contract to the next lowest responsive bidder that can satisfy to the Department that the Combined MBE/WBE Goal can be met or that an adequate good faith effort has been made to meet the advertised goal.

Non-Good Faith Appeal

The State Prequalification Engineer will notify the contractor verbally and in writing of non-good faith. A contractor may appeal a determination of non-good faith made by the Goal Compliance Committee. If a contractor wishes to appeal the determination made by the Committee, they shall provide written notification to the State Prequalification Engineer or at DBE@ncdot.gov. The appeal shall be made within 2 business days of notification of the determination of non-good faith.

Counting MBE/WBE Participation Toward Meeting the Combined MBE/WBE Goal

(A) Participation

The total dollar value of the participation by a committed MBE/WBE will be counted toward the contract goal requirements. The total dollar value of participation by a committed MBE/WBE will be based upon the value of work actually performed by the MBE/WBE and the actual payments to MBE/WBE firms by the Contractor.

(B) Joint Checks

Prior notification of joint check use shall be required when counting MBE/WBE participation for services or purchases that involves the use of a joint check. Notification shall be through submission of Form JC-1 *(Joint Check Notification Form)* and the use of joint checks shall be in accordance with the Department's Joint Check Procedures.

(C) Subcontracts (Non-Trucking)

A MBE/WBE may enter into subcontracts. Work that a MBE subcontracts to another MBE firm may be counted toward the anticipated MBE participation. The same holds true for work that a WBE subcontracts to another WBE firm. Work that a MBE/WBE subcontracts to a non-MBE/WBE firm does <u>not</u> count toward the contract goal requirement. It should be noted that every effort shall be made by MBE and WBE contractors to subcontract to

the same certification (i.e., MBEs to MBEs and WBEs to WBEs), in order to fulfill the MBE or WBE participation breakdown. This, however, may not always be possible due to the limitation of firms in the area. If the MBE or WBE firm shows a good faith effort has been made to reach out to similarly certified firms and there is no interest or availability, and they can get assistance from other certified firms, the Engineer will not hold the prime responsible for meeting the individual MBE or WBE breakdown. If a MBE or WBE contractor or subcontractor subcontracts a significantly greater portion of the work of the contract than would be expected on the basis of standard industry practices, it shall be presumed that the MBE or WBE is not performing a commercially useful function.

(D) Joint Venture

When a MBE or WBE performs as a participant in a joint venture, the Contractor may count toward its contract goal requirement a portion of the total value of participation with the MBE or WBE in the joint venture, that portion of the total dollar value being a distinct clearly defined portion of work that the MBE or WBE performs with its forces.

(E) Suppliers

A contractor may count toward its MBE/ WBE requirement 60 percent of its expenditures for materials and supplies required to complete the contract and obtained from a MBE or WBE regular dealer and 100 percent of such expenditures from a MBE or WBE manufacturer.

(F) Manufacturers and Regular Dealers

A contractor may count toward its MBE/ WBE requirement the following expenditures to MBE/WBE firms that are not manufacturers or regular dealers:

(1) The fees or commissions charged by a MBE/WBE firm for providing a *bona fide* service, such as professional, technical, consultant, or managerial services, or for providing bonds or insurance specifically required for the performance of a DOT-assisted contract, provided the fees or commissions are determined to be reasonable and not excessive as compared with fees and commissions customarily allowed for similar services.

(2) With respect to materials or supplies purchased from a MBE/WBE, which is neither a manufacturer nor a regular dealer, count the entire amount of fees or commissions charged for assistance in the procurement of the materials and supplies, or fees or transportation charges for the delivery of materials or supplies required on a job site (but not the cost of the materials and supplies themselves), provided the fees are determined to be reasonable and not excessive as compared with fees customarily allowed for similar services.

Commercially Useful Function

(A) MBE/WBE Utilization

The Contractor may count toward its contract goal requirement only expenditures to MBEs and WBEs that perform a commercially useful function in the work of a contract. A MBE/WBE performs a commercially useful function when it is responsible for execution of the work of the contract and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. To perform a commercially useful function, the MBE/WBE shall also be responsible with respect to materials and supplies used on the contract, for negotiating price, determining quality and quantity, ordering the material and installing (where applicable) and paying for the material itself. To determine whether a MBE/WBE is performing a commercially useful function, the Department will evaluate the amount of work subcontracted, industry practices, whether the amount the firm is to be paid under the contract is commensurate with the work it is actually performing and the MBE/WBE credit claimed for its performance of the work, and any other relevant factors. If it is determined that a MBE or WBE is not performing a Commercially Useful Function, the contractor may present evidence to rebut this presumption to the Department.

(B) MBE/WBE Utilization in Trucking

The following factors will be used to determine if a MBE or WBE trucking firm is performing a commercially useful function:

(1) The MBE/WBE shall be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract, and there shall not be a contrived arrangement for the purpose of meeting the Combined MBE/WBE Goal.

(2) The MBE/WBE shall itself own and operate at least one fully licensed, insured, and operational truck used on the contract.

(3) The MBE/WBE receives credit for the total value of the transportation services it provides on the contract using trucks it owns, insures, and operates using drivers it employs.

(4) The MBE may subcontract the work to another MBE firm, including an owner-operator who is certified as a MBE. The same holds true that a WBE may subcontract the work to another WBE firm, including an owner-operator who is certified as a WBE. When this occurs, the MBE or WBE who subcontracts work receives credit for the total value of the transportation services the subcontracted MBE or WBE provides on the contract. It should be noted that every effort shall be made by MBE and WBE contractors to subcontract to the same certification (i.e., MBEs to MBEs and WBEs to WBEs), in order to fulfill the participation breakdown. This, however, may not always be possible due to the limitation of firms in the area. If the MBE or WBE firm shows a good faith effort has been made

to reach out to similarly certified transportation service providers and there is no interest or availability, and they can get assistance from other certified providers, the Engineer will not hold the prime responsible for meeting the individual MBE or WBE participation breakdown.

(5) The MBE/WBE may also subcontract the work to a non-MBE/WBE firm, including from an owner-operator. The MBE/WBE who subcontracts the work to a non-MBE/WBE is entitled to credit for the total value of transportation services provided by the non-MBE/WBE subcontractor not to exceed the value of transportation services provided by MBE/WBE-owned trucks on the contract. Additional participation by non-MBE/WBE subcontractors receives credit only for the fee or commission it receives as a result of the subcontract arrangement. The value of services performed under subcontract agreements between the MBE/WBE and the Contractor will not count towards the MBE/WBE contract requirement.

(6) A MBE/WBE may lease truck(s) from an established equipment leasing business open to the general public. The lease must indicate that the MBE/WBE has exclusive use of and control over the truck. This requirement does not preclude the leased truck from working for others during the term of the lease with the consent of the MBE/WBE, so long as the lease gives the MBE/WBE absolute priority for use of the leased truck. This type of lease may count toward the MBE/WBE's credit as long as the driver is under the MBE/WBE's payroll.

(7) Subcontracted/leased trucks shall display clearly on the dashboard the name of the MBE/WBE that they are subcontracted/leased to and their own company name if it is not identified on the truck itself. Magnetic door signs are not permitted.

MBE/WBE Replacement

When a Contractor has relied on a commitment to a MBE or WBE subcontractor (or an approved substitute MBE or WBE subcontractor) to meet all or part of a contract goal requirement, the contractor shall not terminate the MBE/WBE subcontractor for convenience. This includes, but is not limited to, instances in which the Contractor seeks to perform the work of the terminated subcontractor with another MBE/WBE subcontractor, a non-MBE/WBE subcontractor, or with the Contractor's own forces or those of an affiliate.

The Contractor must give notice in writing both by certified mail and email to the MBE/WBE subcontractor, with a copy to the Engineer of its intent to request to terminate and/or substitute, and the reason for the request. The Contractor must give the MBE/WBE subcontractor five (5) business days to respond to the Contractor's Notice of Intent to Request Termination and/or Substitution. If the MBE/WBE subcontractor objects to the intended termination/substitution, the MBE/WBE, within five (5) business days must advise the Contractor and the Department of the reasons why the action should not be approved. The five-day notice period shall begin on the next business day after written notice is provided to the MBE/WBE subcontractor.

A committed MBE/WBE subcontractor may only be terminated after receiving the Department's written approval based upon a finding of good cause for the proposed termination and/or substitution. For purposes of this section, good cause shall include the following circumstances:

(a) The listed MBE/WBE subcontractor fails or refuses to execute a written contract;
(b) The listed MBE/WBE subcontractor fails or refuses to perform the work of its subcontract in a way consistent with normal industry standards. Provided, however, that good cause does not exist if the failure or refusal of the MBE/WBE subcontractor to perform its work on the subcontract results from the bad faith or discriminatory action of the prime contractor;
(c) The listed MBE/WBE subcontractor fails or refuses to meet the prime contractor's reasonable, nondiscriminatory bond requirements;
(d) The listed MBE/WBE subcontractor becomes bankrupt, insolvent, or exhibits credit unworthiness;
(e) The listed MBE/WBE subcontractor is ineligible to work on public works projects because of suspension and debarment proceedings pursuant to 2 CFR Parts 180, 215 and 1,200 or applicable state law;
(f) The listed MBE/WBE subcontractor is not a responsible contractor;
(g) The listed MBE/WBE voluntarily withdraws from the project and provides written notice of withdrawal;
(h) The listed MBE/WBE is ineligible to receive MBE/WBE credit for the type of work required;
(i) A MBE/WBE owner dies or becomes disabled with the result that the listed MBE/WBE contractor is unable to complete its work on the contract;
(j) Other documented good cause that compels the termination of the MBE/WBE subcontractor. Provided, that good cause does not exist if the prime contractor seeks to terminate a MBE/WBE it relied upon to obtain the contract so that the prime contractor can self-perform the work for which the MBE/WBE contractor was engaged or so that the prime contractor can substitute another MBE/WBE or non-MBE/WBE contractor after contract award.

The Contractor shall comply with the following for replacement of a committed MBE/WBE:

(A) Performance Related Replacement

When a committed MBE/WBE is terminated for good cause as stated above, an additional MBE/WBE that was submitted at the time of bid may be used to fulfill the MBE/WBE commitment to meet the Combined MBE/WBE Goal. A good faith effort will only be required for removing a committed MBE/WBE if there were no additional MBE/WBEs submitted at the time of bid to cover the same amount of work as the MBE/WBE that was terminated.

If a replacement MBE/WBE is not found that can perform at least the same amount of work as the terminated MBE/WBE, the Contractor shall submit a good faith effort documenting the steps taken. Such documentation shall include, but not be limited to, the following:

(1) Copies of written notification to MBE/WBEs that their interest is solicited in contracting the work defaulted by the previous MBE/WBE or in subcontracting other items of work in the contract.

(2) Efforts to negotiate with MBE/WBEs for specific subbids including, at a minimum:

(a) The names, addresses, and telephone numbers of MBE/WBEs who were contacted.

(b) A description of the information provided to MBE/WBEs regarding the plans and specifications for portions of the work to be performed.

(3) A list of reasons why MBE/WBE quotes were not accepted.

(4) Efforts made to assist the MBE/WBEs contacted, if needed, in obtaining bonding or insurance required by the Contractor.

(B) Decertification Replacement

(1) When a committed MBE/WBE is decertified by the Department after the SAF (*Subcontract Approval Form*) has been received by the Department, the Department will not require the Contractor to solicit replacement MBE/WBE participation equal to the remaining work to be performed by the decertified firm. The participation equal to the remaining work performed by the decertified firm will count toward the contract goal requirement.

(2) When a committed MBE/WBE is decertified prior to the Department receiving the SAF (*Subcontract Approval Form*) for the named MBE/WBE firm, the Contractor shall take all necessary and reasonable steps to replace the MBE/WBE subcontractor with another MBE/WBE subcontractor to perform at least the same amount of work to meet the Combined MBE/WBE goal requirement. If a MBE/WBE firm is not found to do the same amount of work, a good faith effort must be submitted to NCDOT (see A herein for required documentation).

All requests for replacement of a committed MBE/WBE firm shall be submitted to the Engineer for approval on Form RF-1 *(DBE Replacement Request).* If the Contractor fails to follow this procedure, the Contractor may be disqualified from further bidding for a period of up to 6 months.

Changes in the Work

When the Engineer makes changes that result in the reduction or elimination of work to be performed by a committed MBE/WBE, the Contractor will not be required to seek additional participation. When the Engineer makes changes that result in additional work to be performed by a MBE/WBE based upon the Contractor's commitment, the MBE/WBE shall participate in additional work to the same extent as the MBE/WBE participated in the original contract work.

When the Engineer makes changes that result in extra work, which has more than a minimal impact on the contract amount, the Contractor shall seek additional participation by MBEs/WBEs unless otherwise approved by the Engineer.

When the Engineer makes changes that result in an alteration of plans or details of construction, and a portion or all of the work had been expected to be performed by a committed MBE/WBE, the Contractor shall seek participation by MBEs/WBEs unless otherwise approved by the Engineer.

When the Contractor requests changes in the work that result in the reduction or elimination of work that the Contractor committed to be performed by a MBE/WBE, the Contractor shall seek additional participation by MBEs/WBEs equal to the reduced MBE/WBE participation caused by the changes.

Reports and Documentation

A SAF (*Subcontract Approval Form*) shall be submitted for all work which is to be performed by a MBE/WBE subcontractor. The Department reserves the right to require copies of actual subcontract agreements involving MBE/WBE subcontractors.

When using transportation services to meet the contract commitment, the Contractor shall submit a proposed trucking plan in addition to the SAF. The plan shall be submitted prior to beginning construction on the project. The plan shall include the names of all trucking firms proposed for use, their certification type(s), the number of trucks owned by the firm, as well as the individual truck identification numbers, and the line item(s) being performed.

Within 30 calendar days of entering into an agreement with a MBE/WBE for materials, supplies or services, not otherwise documented by the SAF as specified above, the Contractor shall furnish the Engineer a copy of the agreement. The documentation shall also indicate the percentage (60% or 100%) of expenditures claimed for MBE/WBE credit.

Reporting Minority and Women Business Enterprise Participation

The Contractor shall provide the Engineer with an accounting of payments made to all MBE/ WBE firms, including material suppliers and contractors at all levels (prime, subcontractor, or second tier subcontractor). This accounting shall be furnished to the Engineer for any given month by the end of the following month. Failure to submit this information accordingly may result in the following action:

(A) Withholding of money due in the next partial pay estimate; or

(B) Removal of an approved contractor from the prequalified bidders' list or the removal of other entities from the approved subcontractors list.

While each contractor (prime, subcontractor, 2nd tier subcontractor) is responsible for accurate accounting of payments to MBEs/WBEs, it shall be the prime contractor's responsibility to report all monthly and final payment information in the correct reporting manner.

Failure on the part of the Contractor to submit the required information in the time frame specified may result in the disqualification of that contractor and any affiliate companies from further bidding until the required information is submitted.

Failure on the part of any subcontractor to submit the required information in the time frame specified may result in the disqualification of that contractor and any affiliate companies from being approved for work on future DOT projects until the required information is submitted.

Contractors reporting transportation services provided by non-MBE/WBE lessees shall evaluate the value of services provided during the month of the reporting period only.

At any time, the Engineer can request written verification of subcontractor payments.

The Contractor shall report the accounting of payments through the Department's Payment Tracking System.

Failure to Meet Contract Requirements

Failure to meet contract requirements in accordance with Subarticle 102-15(J) of the *2018 Standard Specifications* may be cause to disqualify the Contractor.

RESTRICTIONS ON ITS EQUIPMENT AND SERVICES:
(11-17-20) SP01 G090

All telecommunications, video or other ITS equipment or services installed or utilized on this project must be in conformance with UNIFORM ADMINISTRATIVE REQUIREMENTS, COST PRINCIPLES, AND AUDIT REQUIREMENTS FOR FEDERAL AWARDS **2 CFR, § 200.216 Prohibition on certain telecommunications and video surveillance services or equipment.**

USE OF UNMANNED AIRCRAFT SYSTEM (UAS):
(8-20-19) SP1 G092

The Contractor shall adhere to all Federal, State and Local regulations and guidelines for the use of Unmanned Aircraft Systems (UAS). This includes but is not limited to US 14 CFR Part 107 *Small UAS Rule*, NC GS 15A-300.2 *Regulation of launch and recovery sites,* NC GS 63-95 *Training required for the operation of unmanned aircraft systems*, NC GS 63-96 *Permit required for commercial operation of unmanned aircraft system,* and NCDOT UAS Policy. The required operator certifications include possessing a current Federal Aviation Administration (FAA) Remote Pilot Certificate, a NC UAS Operator Permit as well as operating a UAS registered with the FAA.

Prior to beginning operations, the Contractor shall complete the NCDOT UAS – Flight Operation Approval Form and submit it to the Engineer for approval. All UAS operations shall be approved by the Engineer prior to beginning the operations.

All contractors or subcontractors operating UAS shall have UAS specific general liability insurance to cover all operations under this contract.

The use of UAS is at the Contractor's discretion. No measurement or payment will be made for the use of UAS. In the event that the Department directs the Contractor to utilize UAS, payment will be in accordance with Article 104-7 Extra Work.

EQUIPMENT IDLING GUIDELINES:
(1-19-21) 107 SP1 G096

Exercise reduced fuel consumption and reduced equipment emissions during the construction of all work associated with this contract. Employees engaged in the construction of this project

should turn off vehicles when stopped for more than thirty (30) minutes and off-highway equipment should idle no longer than fifteen (15) consecutive minutes.

These guidelines for turning off vehicles and equipment when idling do not apply to:

1. Idling when queuing.
2. Idling to verify the vehicle is in safe operating condition.
3. Idling for testing, servicing, repairing or diagnostic purposes.
4. Idling necessary to accomplish work for which the vehicle was designed (such as operating a crane, mixing concrete, etc.).
5. Idling required to bring the machine system to operating temperature.
6. Emergency vehicles, utility company, construction, and maintenance vehicles where the engines must run to perform needed work.
7. Idling to ensure safe operation of the vehicle.
8. Idling when the propulsion engine is providing auxiliary power for other than heating or air conditioning. (such as hydraulic systems for pavers)
9. When specific traffic, safety, or emergency situations arise.
10. If the ambient temperature is less than 32 degrees Fahrenheit. Limited idling to provide for the safety of vehicle occupants (e.g. to run the heater).
11. If the ambient temperature is greater than 90 degrees Fahrenheit. Limited idling to provide for the safety of vehicle occupants of off-highway equipment (e.g. to run the air conditioning) no more than 30 minutes.
12. Diesel powered vehicles may idle for up to 30 minutes to minimize restart problems.

Any vehicle, truck, or equipment in which the primary source of fuel is natural gas or electricity is exempt from the idling limitations set forth in this special provision.

MAINTENANCE OF THE PROJECT:

(11-20-07) (Rev. 1-17-12) 104-10 SP1 G125

Revise the *2018 Standard Specifications* as follows:

Page 1-39, Article 104-10 Maintenance of the Project, line 25, add the following after the first sentence of the first paragraph:

All guardrail/guiderail within the project limits shall be included in this maintenance.

Page 1-39, Article 104-10 Maintenance of the Project, line 30, add the following as the last sentence of the first paragraph:

The Contractor shall perform weekly inspections of guardrail and guiderail and shall report damages to the Engineer on the same day of the weekly inspection. *Where damaged guardrail or guiderail is repaired or replaced as a result of maintaining the project in* accordance with this article, such repair or replacement shall be performed within 7 consecutive calendar days of such inspection report.

Page 1-39, Article 104-10 Maintenance of the Project, lines 42-44, replace the last sentence of the last paragraph with the following:

The Contractor will not be directly compensated for any maintenance operations necessary, except for maintenance of guardrail/guiderail, as this work will be considered incidental to the work covered by the various contract items. The provisions of Article 104-7, Extra Work, and Article 104-8, Compensation and Record Keeping will apply to authorized maintenance of guardrail/guiderail. Performance of weekly inspections of guardrail/guiderail, and the damage reports required as described above, will be considered to be an incidental part of the work being paid for by the various contract items.

ELECTRONIC BIDDING:

(2-19-19) 101, 102, 103 SP1 G140

Revise the *2018 Standard Specifications* as follows:

Page 1-4, Article 101-3, DEFINITIONS, BID (OR PROPOSAL) ***Electronic Bid,*** **line 1,** replace "Bid Express®" with "the approved electronic bidding provider".

Page 1-15, Subarticle 102-8(B), Electronic Bids, lines 39-40, replace "to Bid Express®" with "via the approved electronic bidding provider".

Page 1-15, Subarticle 102-8(B)(1), Electronic Bids, line 41, delete "from Bid Express®"

Page 1-17, Subarticle 102-9(C)(2), Electronic Bids, line 21, replace "Bid Express® miscellaneous folder within the .ebs" with "electronic submittal".

Page 1-29, Subarticle 103-4(C)(2), Electronic Bids, line 32, replace ".ebs miscellaneous data file of Expedite" with "electronic submittal file"

TWELVE MONTH GUARANTEE:

(7-15-03) 108 SP1 G145

(A) The Contractor shall guarantee materials and workmanship against latent and patent defects arising from faulty materials, faulty workmanship or negligence for a period of twelve months following the date of final acceptance of the work for maintenance and shall replace such defective materials and workmanship without cost to the Department. The Contractor will not be responsible for damage due to faulty design, normal wear and tear, for negligence on the part of the Department, and/or for use in excess of the design.

(B) Where items of equipment or material carry a manufacturer's guarantee for any period in excess of twelve months, then the manufacturer's guarantee shall apply for that particular piece of equipment or material. The Department's first remedy shall be through the manufacturer although the Contractor is responsible for invoking the warranted repair work with the manufacturer. The Contractor's responsibility shall be limited to the term of the manufacturer's guarantee. NCDOT would be afforded the same warranty as provided by the Manufacturer.

This guarantee provision shall be invoked only for major components of work in which the Contractor would be wholly responsible for under the terms of the contract. Examples would include pavement structures, bridge components, and sign structures. This provision will not be used as a mechanism to force the Contractor to return to the project to make repairs or perform

additional work that the Department would normally compensate the Contractor for. In addition, routine maintenance activities (i.e. mowing grass, debris removal, ruts in earth shoulders,) are not parts of this guarantee.

Appropriate provisions of the payment and/or performance bonds shall cover this guarantee for the project.

To ensure uniform application statewide the Division Engineer will forward details regarding the circumstances surrounding any proposed guarantee repairs to the Chief Engineer for review and approval prior to the work being performed.

OUTSOURCING OUTSIDE THE USA:

(9-21-04) (Rev. 5-16-06) SP1 G150

All work on consultant contracts, services contracts, and construction contracts shall be performed in the United States of America. No work shall be outsourced outside of the United States of America.

Outsourcing for the purpose of this provision is defined as the practice of subcontracting labor, work, services, staffing, or personnel to entities located outside of the United States.

The North Carolina Secretary of Transportation shall approve exceptions to this provision in writing.

PROJECT SPECIAL PROVISIONS

ROADWAY

BURNING RESTRICTIONS:

(7-1-95) 200, 210, 215 SP2 R05

Open burning is not permitted on any portion of the right-of-way limits established for this project. Do not burn the clearing, grubbing or demolition debris designated for disposal and generated from the project at locations within the project limits, off the project limits or at any waste or borrow sites in this county. Dispose of the clearing, grubbing and demolition debris by means other than burning, according to state or local rules and regulations.

SUPPLEMENTAL SURVEYING:

(4-20-21) 801 SP8 R03

Revise the *2018 Standard Specifications* as follows:

Page 8-7, Article 801-3 MEASUREMENT AND PAYMENT, lines 10-11, replace with the following:

Supplemental Surveying Office Calculations will be paid at the stated price of $85.00 per hour. *Supplemental Field Surveying* will be paid at the stated price of $145.00 per hour. The

PORTLAND CEMENT CONCRETE PRODUCTION AND DELIVERY:

(9-15-20) 1000, 1014, 1024 SP10 R01

Revise the *2018 Standard Specifications* as follows:

Page 10-6, Table 1000-1, REQUIREMENTS FOR CONCRETE, replace with the following:

TABLE 1000-1
REQUIREMENTS FOR CONCRETE

Class of Concrete	Min. Compressive Strength at 28 days	Maximum Water-Cement Ratio				Consistency Maximum Slump		Cement Content			
		Air-Entrained Concrete		Non-Air-Entrained Concrete		Vibrated	Non-Vibrated	Vibrated		Non-Vibrated	
		Rounded Aggregate	Angular Aggregate	Rounded Aggregate	Angular Aggregate			Min.	Max.	Min.	Max.
Units	*psi*					*inch*	*inch*	*lb/cy*	*lb/cy*	*lb/cy*	*lb/cy*
AA	4500	0.381	0.426	---	---	3.5[A]	---	639	715	---	---
AA Slip Form	4500	0.381	0.426	---	---	1.5	---	639	715	---	---
Drilled Pier	4500	---	---	0.450	0.450	---	5 – 7 dry 7 - 9 wet	---	---	640	800
A	3000	0.488	0.532	0.550	0.594	3.5 [A]	4.0	564	---	602	---

B	2500	0.488	0.567	0.559	0.630	1.5 machine placed 2.5 [A] hand placed	4.0	508	---	545	---
Sand Light-weight	4500	---	0.420	---	---	4.0 [A]	---	715	---	---	---
Latex Modified	3000 (at 7 days)	0.400	0.400	---	---	6.0	---	658	---	---	---
Flowable Fill excavatable	150 max. (at 56 days)	as needed	as needed	as needed	as needed	---	Flowable	---	---	40	100
Flowable Fill non-excavatable	125	as needed	as needed	as needed	as needed	---	Flowable	---	---	100	as needed
Pavement	4500 Design, field 650 flexural, design only	0.559	0.559	---	---	1.5 slip form 3.0 hand placed	---	526	---	---	---
Precast	See Table 1077-1	as needed	as needed	---	---	6.0	as needed	as needed	as needed	as needed	as needed
Prestressed	per contract	See Table 1078-1	See Table 1078-1	---	---	8.0	---	564	as needed	---	---

A. The slump may be increased to 6 inches, provided the increase in slump is achieved by adding a chemical admixture conforming to Section 1024-3. In no case shall the water-cement ratio on the approved design be exceeded. Concrete exhibiting segregation and/or excessive bleeding will be rejected. Utilizing an Admixture to modify slump does not relinquish the contractor's responsibility to ensure the final product quality and overall configuration meets design specifications. Caution should be taken when placing these modified mixes on steep grades to prevent unintended changes to the set slope.

POLYUREA PAVEMENT MARKING MATERIAL – TYPE 2 TYPICAL CERTIFIED MILL TEST REPORT:

3-19-19 1087 SP10 R06

Amend the *2018 Standard Specifications* as follows:

Page 10-184, Subarticle 1087-8 Material Certification, in accordance with Subarticle 106-3 provide a Type 2 Typical Certified Mill Test Report and a Type 3 Manufacturer's Certification for Polyurea pavement marking material.

When tested, the material shall meet the physical and chemical characteristics provided by the manufacturer. NCDOT reserves the right to compare these test results to baseline test results gathered by the NCDOT Materials and Test Unit.

MATERIALS FOR PORTLAND CEMENT CONCRETE:

(9-15-20) 1000, 1024 SP10 R24

Revise the *2018 Standard Specifications* as follows:

Page 10-52, Article 1024-4, WATER, lines 3-6, delete and replace with the following:

Test water from wells at all locations. Test public water supplies from all out of state locations and in the following counties: Beaufort, Bertie, Brunswick, Camden, Carteret, Chowan, Craven, Currituck, Dare, Gates, Hyde, New Hanover, Onslow, Pamlico, Pasquotank, Pender, Perquimans, Tyrell and Washington unless the Engineer waives the testing requirements.

Page 10-52, Table 1024-2, PHYSICAL PROPERTIES OF WATER, replace with the following:

Property	Requirement	Test Method
Compression Strength, minimum percent of control at 3 and 7 days	90%	ASTM C1602
Time of set, deviation from control	From 1:00 hr. earlier to 1:30 hr. later	ASTM C1602
pH	4.5 to 8.5	ASTM D1293 *
Chloride Ion Content, Max.	250 ppm	ASTM D512 *
Total Solids Content (Residue), Max.	1,000 ppm	SM 2540B *
Resistivity, Min.	0.500 kohm-cm	ASTM D1125 *

*Denotes an alternate method is acceptable. Test method used shall be referenced in the test report.

WORK ZONE INSTALLER:

(7-20-21) 1101, 1150 SP11 R04

Provide the service of at least one qualified work zone installer during the setup, installation, and removal of temporary traffic control within the highway right of way. The qualified work zone installer shall serve as crew leader and shall be on site and directing the installation and removal of temporary traffic control. If multiple temporary traffic control installations or removals are occurring simultaneously, then each shall have a qualified work zone installer.

The work zone installer shall be qualified by an NCDOT approved training agency in the safe and competent set up of temporary traffic control. For a complete listing of approved training agencies, see the Work Zone Safety Training webpage.

A work zone supervisor, in accordance with Article 1101-13 of the *Standard Specifications*, may fulfill the role of the work zone installer during the setup, installation, and removal of temporary traffic control within the highway right of way provided they are on site and directing the installation and removal of temporary traffic control.

All other individuals participating in the setup, installation, and removal of temporary traffic control within the highway right of way shall be certified as a qualified flagger in accordance with Article 1150-3 of the *Standard Specifications*, even if flagging is not being performed as part of the traffic control.

Provide the name and contact information of all qualified work zone installers to the Engineer prior to or at the preconstruction conference. Additionally, provide a qualification statement that all other individuals participating in the setup, installation, and removal of temporary traffic control are qualified flaggers that have been properly trained through an NCDOT approved training agency.

STANDARD SPECIAL PROVISION
AVAILABILITY OF FUNDS – TERMINATION OF CONTRACTS

(5-20-08) Z-2

General Statute 143C-6-11. (h) Highway Appropriation is hereby incorporated verbatim in this contract as follows:

(h) Amounts Encumbered. – Transportation project appropriations may be encumbered in the amount of allotments made to the Department of Transportation by the Director for the estimated payments for transportation project contract work to be performed in the appropriation fiscal year. The allotments shall be multiyear allotments and shall be based on estimated revenues and shall be subject to the maximum contract authority contained in *General Statute 143C-6-11(c)*. Payment for transportation project work performed pursuant to contract in any fiscal year other than the current fiscal year is subject to appropriations by the General Assembly. Transportation project contracts shall contain a schedule of estimated completion progress, and any acceleration of this progress shall be subject to the approval of the Department of Transportation provided funds are available. The State reserves the right to terminate or suspend any transportation project contract, and any transportation project contract shall be so terminated or suspended if funds will not be available for payment of the work to be performed during that fiscal year pursuant to the contract. In the event of termination of any contract, the contractor shall be given a written notice of termination at least 60 days before completion of scheduled work for which funds are available. In the event of termination, the contractor shall be paid for the work already performed in accordance with the contract specifications.

Payment will be made on any contract terminated pursuant to the special provision in accordance with Subarticle 108-13(D) of the *2018 Standard Specifications*.

STANDARD SPECIAL PROVISION

ERRATA

(10-16-18) (Rev.2-16-21) Z-4

Revise the *2018 Standard Specifications* as follows:

Division 6

Page 6-7, Article 609-1 DESCRIPTION, line 29, replace article number "609-10" with "609-9".

Division 7

Page 7-27, Article 725-1 MEASUREMENT AND PAYMENT, line 4, replace article number "725-1" with "724-4".

Page 7-28, Article 725-1 MEASUREMENT AND PAYMENT, line 10, replace article number "725-1" with "725-3".

Division 10

Page 10-78, Article 1056-4 GEOTEXTILES, TABLE 1056-1, Permittivity, Type 2, replace "Table 6[D]" with "Table 7[D]" and **Permittivity, Type 3[B],** replace "Table 7[D]" with "Table 8[D]".

Page 10-121, Article 1076-7, REPAIR OF GALVANIZING, line 8, replace article number "1080-9" with "1080-7".

Page 10-162, Article 1080-50 PAINT FOR VERTICAL MARKERS, line 1, replace article number "1080-50" with "1080-10".

Page 10-162, Article 1080-61 EPOXY RESIN FOR REINFORCING STEEL, line 5, replace article number "1080-61" with "1080-11".

Page 10-162, Article 1080-72 ABRASIVE MATERIALS FOR BLAST CLEANING STEEL, line 22, replace article number "1080-72" with "1080-12".

Page 10-163, Article 1080-83 FIELD PERFORMANCE AND SERVICES, line 25, replace article number "1080-83" with "1080-13".

Division 17

Page 17-15, Article 1715-4 MEASUREMENT AND PAYMENT, lines 42-44, replace the second sentence with the following:

An example is an installation of a single 1.25 inch HDPE conduit would be paid as:

Directional Drill (1)(1.25″) Linear Foot

STANDARD SPECIAL PROVISION

PLANT AND PEST QUARANTINES
(Imported Fire Ant, Gypsy Moth, Witchweed, Emerald Ash Borer, Guava Root Knot Nematode, And Other Noxious Weeds)

(3-18-03) (Rev. 5-21-19) Z-04a

Within Quarantined Area

This project may be within a county regulated for plant and/or pests. If the project or any part of the Contractor's operations is located within a quarantined area, thoroughly clean all equipment prior to moving out of the quarantined area. Comply with federal/state regulations by obtaining a certificate or limited permit for any regulated article moving from the quarantined area.

Originating in a Quarantined County

Obtain a certificate or limited permit issued by the N.C. Department of Agriculture/United States Department of Agriculture. Have the certificate or limited permit accompany the article when it arrives at the project site.

Contact

Contact the N.C. Department of Agriculture/United States Department of Agriculture at 1-800-206-9333, 919-707-3730, or *https://www.ncagr.gov/plantindustry/Plant/quaran/table2.htm* to determine those specific project sites located in the quarantined area or for any regulated article used on this project originating in a quarantined county.

Regulated Articles Include

1. Soil, sand, gravel, compost, peat, humus, muck, and decomposed manure, separately or with other articles. This includes movement of articles listed above that may be associated with cut/waste, ditch pulling, and shoulder cutting.
2. Plants with roots including grass sod.
3. Plant crowns and roots.
4. Bulbs, corms, rhizomes, and tubers of ornamental plants.
5. Hay, straw, fodder, and plant litter of any kind.
6. Clearing and grubbing debris.
7. Used agricultural cultivating and harvesting equipment.
8. Used earth-moving equipment.
9. Any other products, articles, or means of conveyance, of any character, if determined by an inspector to present a hazard of spreading imported fire ant, gypsy moth, witchweed, emerald ash borer, guava root knot nematode, or other noxious weeds.

STANDARD SPECIAL PROVISION

MINIMUM WAGES

(7-21-09) Z-5

FEDERAL: The Fair Labor Standards Act provides that with certain exceptions every employer shall pay wages at the rate of not less than SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

STATE: The North Carolina Minimum Wage Act provides that every employer shall pay to each of his employees, wages at a rate of not less than SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

The minimum wage paid to all skilled labor employed on this contract shall be SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

The minimum wage paid to all intermediate labor employed on this contract shall be SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

The minimum wage paid to all unskilled labor on this contract shall be SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

This determination of the intent of the application of this act to the contract on this project is the responsibility of the Contractor.

The Contractor shall have no claim against the Department of Transportation for any changes in the minimum wage laws, Federal or State. It is the responsibility of the Contractor to keep fully informed of all Federal and State Laws affecting his contract.

STANDARD SPECIAL PROVISION

TITLE VI AND NONDISCRIMINATION:

(6-28-77)(Rev 6/19/2018) Z-6

Revise the *2018 Standard Specifications* as follows:

Replace Article 103-4(B) with the following:

The North Carolina Department of Transportation is committed to carrying out the U.S. Department of Transportation's policy of ensuring nondiscrimination in the award and administration of contracts.

The provisions of this section related to United States Department of Transportation (US DOT) Order 1050.2A, Title 49 Code of Federal Regulations (CFR) part 21, 23 United States Code (U.S.C.) 140 and 23 CFR part 200 (or 49 CFR 303, 49 U.S.C. 5332 or 49 U.S.C. 47123) are applicable to all North Carolina Department of Transportation (NCDOT) contracts and to all related subcontracts, material supply, engineering, architectural and other service contracts, regardless of dollar amount. Any Federal provision that is specifically required not specifically set forth is hereby incorporated by reference.

(1) **Title VI Assurances (USDOT Order 1050.2A, Appendix A)**

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

(a) Compliance with Regulations

The contractor (hereinafter includes consultants) shall comply with the Acts and the Regulations relative to Nondiscrimination in Federally-assisted programs of the U.S. Department of Transportation, Federal Highway Administration (FHWA), as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.

(b) Nondiscrimination

The contractor, with regard to the work performed by it during the contract, shall not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor shall not participate directly or indirectly in the discrimination prohibited by the Acts and the Regulations, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR Part 21.

(c) Solicitations for Subcontractors, Including Procurements of Materials and Equipment

In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier shall be notified by the contractor of the contractor's obligations under this contract and the Acts and the Regulations relative to Nondiscrimination on the grounds of race, color, or national origin.

(d) Information and Reports

The contractor shall provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Recipient or the FHWA to be pertinent to ascertain compliance with such Acts,

Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the contractor shall so certify to the Recipient or the FHWA, as appropriate, and shall set forth what efforts it has made to obtain the information.

(e) Sanctions for Noncompliance:
In the event of a contractor's noncompliance with the Non-discrimination provisions of this contract, the Recipient will impose such contract sanctions as it and/or the FHWA may determine to be appropriate, including, but not limited to:
(i) Withholding payments to the contractor under the contract until the contractor complies; and/or
(ii) Cancelling, terminating, or suspending a contract, in whole or in part.

(f) Incorporation of Provisions
The contractor shall include the provisions of paragraphs (a) through (f) in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. The contractor shall take action with respect to any subcontract or procurement as the Recipient or the FHWA may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request the Recipient to enter into any litigation to protect the interests of the Recipient. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

(2) **Title VI Nondiscrimination Program (23 CFR 200.5(p))**
The North Carolina Department of Transportation (NCDOT) has assured the USDOT that, as a condition to receiving federal financial assistance, NCDOT will comply with Title VI of the Civil Rights Act of 1964 and all requirements imposed by Title 49 CFR part 21 and related nondiscrimination authorities to ensure that no person shall, on the ground of race, color, national origin, limited English proficiency, sex, age, or disability (including religion/creed or income-level, where applicable), be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any programs, activities, or services conducted or funded by NCDOT. Contractors and other organizations under contract or agreement with NCDOT must also comply with Title VI and related authorities, therefore:

(a) During the performance of this contract or agreement, contractors (e.g., subcontractors, consultants, vendors, prime contractors) are responsible for complying with NCDOT's Title VI Program. Contractors are not required to prepare or submit Title VI Programs. To comply with this section, the prime contractor shall:
1. Post NCDOT's Notice of Nondiscrimination and the Contractor's own Equal Employment Opportunity (EEO) Policy in conspicuous locations accessible to all employees, applicants and subcontractors on the jobsite.
2. Physically incorporate the required Title VI clauses into all subcontracts on federally-assisted and state-funded NCDOT projects, and ensure inclusion by subcontractors into all lower-tier subcontracts.
3. Required Solicitation Language. The Contractor shall include the following notification in all solicitations for bids and requests for work or material, regardless of funding source:
"The North Carolina Department of Transportation, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 US.C. §§

2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award. In accordance with other related nondiscrimination authorities, bidders and contractors will also not be discriminated against on the grounds of sex, age, disability, low-income level, creed/religion, or limited English proficiency in consideration for an award."

4. Physically incorporate the FHWA-1273, in its entirety, into all subcontracts and subsequent lower tier subcontracts on Federal-aid highway construction contracts only.
5. Provide language assistance services (i.e., written translation and oral interpretation), free of charge, to LEP employees and applicants. Contact NCDOT OCR for further assistance, if needed.
6. For assistance with these Title VI requirements, contact the NCDOT Title VI Nondiscrimination Program at 1-800-522-0453.

(b) Subrecipients (e.g. cities, counties, LGAs, planning organizations) may be required to prepare and submit a Title VI Plan to NCDOT, including Title VI Assurances and/or agreements. Subrecipients must also ensure compliance by their contractors and subrecipients with Title VI. (23 CFR 200.9(b)(7))

(c) If reviewed or investigated by NCDOT, the contractor or subrecipient agrees to take affirmative action to correct any deficiencies found within a reasonable time period, not to exceed 90 calendar days, unless additional time is granted by NCDOT. (23 CFR 200.9(b)(15))

(d) The Contractor is responsible for notifying subcontractors of NCDOT's External Discrimination Complaints Process.

1. Applicability
   Title VI and related laws protect participants and beneficiaries (e.g., members of the public and contractors) from discrimination by NCDOT employees, subrecipients and contractors, regardless of funding source.
2. Eligibility
   Any person—or class of persons—who believes he/she has been subjected to discrimination based on race, color, national origin, Limited English Proficiency (LEP), sex, age, or disability (and religion in the context of employment, aviation, or transit) may file a written complaint. The law also prohibits intimidation or retaliation of any sort.
3. Time Limits and Filing Options
   Complaints may be filed by the affected individual(s) or a representative and must be filed no later than 180 calendar days after the following:
   (i) The date of the alleged act of discrimination; or
   (ii) The date when the person(s) became aware of the alleged discrimination; or
   (iii) Where there has been a continuing course of conduct, the date on which that conduct was discontinued or the latest instance of the conduct.

   Title VI and related discrimination complaints may be submitted to the following entities:

- North Carolina Department of Transportation, Office of Civil Rights, Title VI Program, 1511 Mail Service Center, Raleigh, NC 27699-1511; toll free 1-800-522-0453
- Federal Highway Administration, North Carolina Division Office, 310 New Bern Avenue, Suite 410, Raleigh, NC 27601, 919-747-7010
- US Department of Transportation, Departmental Office of Civil Rights, External Civil Rights Programs Division, 1200 New Jersey Avenue, SE, Washington, DC 20590; 202-366-4070

4. Format for Complaints
   Complaints must be in writing and signed by the complainant(s) or a representative, and include the complainant's name, address, and telephone number. Complaints received by fax or e-mail will be acknowledged and processed. Allegations received by telephone will be reduced to writing and provided to the complainant for confirmation or revision before processing. Complaints will be accepted in other languages, including Braille.
5. Discrimination Complaint Form
   Contact NCDOT Civil Rights to receive a full copy of the Discrimination Complaint Form and procedures.
6. Complaint Basis
   Allegations must be based on issues involving race, color, national origin (LEP), sex, age, disability, or religion (in the context of employment, aviation or transit). "Basis" refers to the complainant's membership in a protected group category.

TABLE 103-1
COMPLAINT BASIS

Protected Categories	Definition	Examples	Applicable Nondiscrimination Authorities
Race and Ethnicity	An individual belonging to one of the accepted racial groups; or the perception, based usually on physical characteristics that a person is a member of a racial group	Black/African American, Hispanic/Latino, Asian, American Indian/Alaska Native, Native Hawaiian/Pacific Islander, White	Title VI of the Civil Rights Act of 1964; 49 CFR Part 21; 23 CFR 200; 49 U.S.C. 5332(b); 49 U.S.C. 47123. *(Executive Order 13166)*
Color	Color of skin, including shade of skin within a racial group	Black, White, brown, yellow, etc.	
National Origin *(Limited English Proficiency)*	Place of birth. Citizenship is not a factor. (*Discrimination based on language or a person's accent is also covered)*	Mexican, Cuban, Japanese, Vietnamese, Chinese	
Sex	Gender. The sex of an individual. *Note:* Sex under this program does not include sexual orientation.	Women and Men	1973 Federal-Aid Highway Act; 49 U.S.C. 5332(b); 49 U.S.C. 47123.
Age	Persons of any age	21-year-old person	Age Discrimination Act of 1975 49 U.S.C. 5332(b); 49 U.S.C. 47123.
Disability	Physical or mental impairment, permanent or temporary, or perceived.	Blind, alcoholic, para-amputee, epileptic, diabetic, arthritic	Section 504 of the Rehabilitation Act of 1973; Americans with Disabilities Act of 1990

Religion (in the context of employment) *(Religion/ Creed in all aspects of any aviation or transit-related construction)*	An individual belonging to a religious group; or the perception, based on distinguishable characteristics that a person is a member of a religious group. In practice, actions taken as a result of the moral and ethical beliefs as to what is right and wrong, which are sincerely held with the strength of traditional religious views. ***Note:*** Does not have to be associated with a recognized religious group or church; if an individual sincerely holds to the belief, it is a protected religious practice.	Muslim, Christian, Sikh, Hindu, etc.	Title VII of the Civil Rights Act of 1964; 23 CFR 230; FHWA-1273 Required Contract Provisions. *(49 U.S.C. 5332(b);* *49 U.S.C. 47123)*

(3) **Pertinent Nondiscrimination Authorities**

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest agrees to comply with the following non-discrimination statutes and authorities, including, but not limited to:

(a) Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d et seq., 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin); and 49 CFR Part 21.

(b) The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);

(c) Federal-Aid Highway Act of 1973, (23 U.S.C. § 324 et seq.), (prohibits discrimination on the basis of sex);

(d) Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 et seq.), as amended, (prohibits discrimination on the basis of disability) and 49 CFR Part 27;

(e) The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 et seq.), (prohibits discrimination on the basis of age);

(f) Airport and Airway Improvement Act of 1982, (49 USC § 471, Section 47123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);

(g) The Civil Rights Restoration Act of 1987, (PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);

(h) Titles II and III of the Americans with Disabilities Act, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131-12189) as implemented by Department of Transportation regulations at 49 C.F.R. parts 37 and 38;

(i) The Federal Aviation Administration's Nondiscrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);

(j) Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures Nondiscrimination against minority populations by discouraging programs, policies, and activities with

disproportionately high and adverse human health or environmental effects on minority and low-income populations;

(k) Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of Limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);

(l) Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. 1681 et seq).

(m) Title VII of the Civil Rights Act of 1964 (42 U.S.C. § 2000e et seq., Pub. L. 88-352), (prohibits employment discrimination on the basis of race, color, religion, sex, or national origin).

(4) **Additional Title VI Assurances**

***The following Title VI Assurances (Appendices B, C and D) shall apply, as applicable*

(a) Clauses for Deeds Transferring United States Property (1050.2A, Appendix B)

The following clauses will be included in deeds effecting or recording the transfer of real property, structures, or improvements thereon, or granting interest therein from the United States pursuant to the provisions of Assurance 4.

NOW, THEREFORE, the U.S. Department of Transportation as authorized by law and upon the condition that the North Carolina Department of Transportation (NCDOT) will accept title to the lands and maintain the project constructed thereon in accordance with the North Carolina General Assembly, the Regulations for the Administration of the Federal-Aid Highway Program, and the policies and procedures prescribed by the Federal Highway Administration of the U.S. Department of Transportation in accordance and in compliance with all requirements imposed by Title 49, Code of Federal Regulations, U.S. Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Nondiscrimination in Federally-assisted programs of the U.S Department of Transportation pertaining to and effectuating the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252; 42 U.S.C. § 2000d to 2000d-4), does hereby remise, release, quitclaim and convey unto the NCDOT all the right, title and interest of the U.S. Department of Transportation in and to said lands described in Exhibit A attached hereto and made a part hereof.

(HABENDUM CLAUSE)

TO HAVE AND TO HOLD said lands and interests therein unto the North Carolina Department of Transportation (NCDOT) and its successors forever, subject, however, to the covenants, conditions, restrictions and reservations herein contained as follows, which will remain in effect for the period during which the real property or structures are used for a purpose for which Federal financial assistance is extended or for another purpose involving the provision of similar services or benefits and will be binding on the NCDOT, its successors and assigns.

The NCDOT, in consideration of the conveyance of said lands and interests in lands, does hereby covenant and agree as a covenant running with the land for itself, its successors and assigns, that (1) no person will on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination with regard to any facility located wholly or in part on, over, or under such lands hereby conveyed [,] [and]* (2) that the NCDOT will use the lands and interests in lands and interests in lands so conveyed, in compliance with all requirements imposed by or pursuant to Title 49, Code of Federal Regulations, U.S. Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Non-discrimination in Federally-assisted programs of the U.S. Department of Transportation, Effectuation of Title VI of the Civil Rights Act of 1964, and as said Regulations and Acts may be amended [, and (3) that in the event of breach of any of the above-mentioned nondiscrimination conditions, the Department will have a right to enter or re-enter said lands and facilities on said land, and that above described land and facilities will thereon revert to and vest in and become the absolute property of the U.S. Department of Transportation and its assigns as such interest existed prior to this instruction].*

(*Reverter clause and related language to be used only when it is determined that such a clause is necessary in order to make clear the purpose of Title VI.)

(b) Clauses for Transfer of Real Property Acquired or Improved Under the Activity, Facility, or Program (1050.2A, Appendix C)

The following clauses will be included in deeds, licenses, leases, permits, or similar instruments entered into by the North Carolina Department of Transportation (NCDOT) pursuant to the provisions of Assurance 7(a):

1. The (grantee, lessee, permittee, etc. as appropriate) for himself/herself, his/her heirs, personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant and agree [in the case of deeds and leases add "as a covenant running with the land"] that:
   (i.) In the event facilities are constructed, maintained, or otherwise operated on the property described in this (deed, license, lease, permit, etc.) for a purpose for which a U.S. Department of Transportation activity, facility, or program is extended or for another purpose involving the provision of similar services or benefits, the (grantee, licensee, lessee, permittee, etc.) will maintain and operate such facilities and services in compliance with all requirements imposed by the Acts and Regulations (as may be amended) such that no person on the grounds of race, color, or national origin, will be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities.
2. With respect to licenses, leases, permits, etc., in the event of breach of any of the above Nondiscrimination covenants, the NCDOT will have the right to terminate the (lease, license, permit, etc.) and to enter, re-enter, and repossess said lands and facilities thereon, and hold the same as if the (lease, license, permit, etc.) had never been made or issued. *
3. With respect to a deed, in the event of breach of any of the above Nondiscrimination covenants, the NCDOT will have the right to enter or re-enter the lands and facilities thereon, and the above described lands and facilities will there upon revert to and vest in and become the absolute property of the NCDOT and its assigns. *

(*Reverter clause and related language to be used only when it is determined that such a clause is necessary to make clear the purpose of Title VI.)

(c) Clauses for Construction/Use/Access to Real Property Acquired Under the Activity, Facility or Program (1050.2A, Appendix D)

The following clauses will be included in deeds, licenses, permits, or similar instruments/ agreements entered into by the North Carolina Department of Transportation (NCDOT) pursuant to the provisions of Assurance 7(b):

1. The (grantee, licensee, permittee, etc., as appropriate) for himself/herself, his/her heirs, personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant and agree (in the case of deeds and leases add, "as a covenant running with the land") that (1) no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities, (2) that in the construction of any improvements on, over, or under such land, and the furnishing of services thereon, no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or otherwise be subjected to discrimination, (3) that the (grantee, licensee, lessee, permittee, etc.) will use the premises in compliance with all other requirements imposed by or pursuant to the Acts and Regulations, as amended, set forth in this Assurance.
2. With respect to (licenses, leases, permits, etc.), in the event of breach of any of the above Non¬ discrimination covenants, the NCDOT will have the right to terminate the (license, permit, etc., as appropriate) and to enter or re-enter and repossess said land and the facilities thereon, and hold the same as if said (license, permit, etc., as appropriate) had never been made or issued. *
3. With respect to deeds, in the event of breach of any of the above Nondiscrimination covenants, the NCDOT will there upon revert to and vest in and become the absolute property of the NCDOT and its assigns. *

(*Reverter clause and related language to be used only when it is determined that such a clause is necessary to make clear the purpose of Title VI.)

STANDARD SPECIAL PROVISION

ON-THE-JOB TRAINING

(10-16-07) (Rev. 4-21-15) Z-10

Description

The North Carolina Department of Transportation will administer a custom version of the Federal On-the-Job Training (OJT) Program, commonly referred to as the Alternate OJT Program. All contractors (existing and newcomers) will be automatically placed in the Alternate Program. Standard OJT requirements typically associated with individual projects will no longer be applied at the project level. Instead, these requirements will be applicable on an annual basis for each contractor administered by the OJT Program Manager.

On the Job Training shall meet the requirements of 23 CFR 230.107 (b), 23 USC – Section 140, this provision and the On-the-Job Training Program Manual.

The Alternate OJT Program will allow a contractor to train employees on Federal, State and privately funded projects located in North Carolina. However, priority shall be given to training employees on NCDOT Federal-Aid funded projects.

Minorities and Women

Developing, training and upgrading of minorities and women toward journeyman level status is a primary objective of this special training provision. Accordingly, the Contractor shall make every effort to enroll minority and women as trainees to the extent that such persons are available within a reasonable area of recruitment. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training, whether a member of a minority group or not.

Assigning Training Goals

The Department, through the OJT Program Manager, will assign training goals for a calendar year based on the contractors' past three years' activity and the contractors' anticipated upcoming year's activity with the Department. At the beginning of each year, all contractors eligible will be contacted by the Department to determine the number of trainees that will be assigned for the upcoming calendar year. At that time the Contractor shall enter into an agreement with the Department to provide a self-imposed on-the-job training program for the calendar year. This agreement will include a specific number of annual training goals agreed to by both parties. The number of training assignments may range from 1 to 15 per contractor per calendar year. The Contractor shall sign an agreement to fulfill their annual goal for the year.\

Training Classifications

The Contractor shall provide on-the-job training aimed at developing full journeyman level workers in the construction craft/operator positions. Preference shall be given to providing training in the following skilled work classifications:

Equipment Operators	Office Engineers
Truck Drivers	Estimators
Carpenters	Iron / Reinforcing Steel Workers
Concrete Finishers	Mechanics
Pipe Layers	Welders

The Department has established common training classifications and their respective training requirements that may be used by the contractors. However, the classifications established are not all-inclusive. Where the training is oriented toward construction applications, training will be allowed in lower-level management positions such as office engineers and estimators. Contractors shall submit new classifications for specific job functions that their employees are performing. The Department will review and recommend for acceptance to FHWA the new classifications proposed by contractors, if applicable. New classifications shall meet the following requirements:

Proposed training classifications are reasonable and realistic based on the job skill classification needs, and

The number of training hours specified in the training classification is consistent with common practices and provides enough time for the trainee to obtain journeyman level status.

The Contractor may allow trainees to be trained by a subcontractor provided that the Contractor retains primary responsibility for meeting the training and this provision is made applicable to the subcontract. However, only the Contractor will receive credit towards the annual goal for the trainee.

Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training. The number of trainees shall be distributed among the work classifications on the basis of the contractor's needs and the availability of journeymen in the various classifications within a reasonable area of recruitment.

No employee shall be employed as a trainee in any classification in which they have successfully completed a training course leading to journeyman level status or in which they have been employed as a journeyman.

Records and Reports

The Contractor shall maintain enrollment, monthly and completion reports documenting company compliance under these contract documents. These documents and any other information as requested shall be submitted to the OJT Program Manager.

Upon completion and graduation of the program, the Contractor shall provide each trainee with a certification Certificate showing the type and length of training satisfactorily completed.

Trainee Interviews

All trainees enrolled in the program will receive an initial and Trainee/Post graduate interview conducted by the OJT program staff.

Trainee Wages

Contractors shall compensate trainees on a graduating pay scale based upon a percentage of the prevailing minimum journeyman wages (Davis-Bacon Act). Minimum pay shall be as follows:

60 percent	of the journeyman wage for the first half of the training period
75 percent	of the journeyman wage for the third quarter of the training period
90 percent	of the journeyman wage for the last quarter of the training period

In no instance shall a trainee be paid less than the local minimum wage. The Contractor shall adhere to the minimum hourly wage rate that will satisfy both the NC Department of Labor (NCDOL) and the Department.

Achieving or Failing to Meet Training Goals

The Contractor will be credited for each trainee employed by him on the contract work who is currently enrolled or becomes enrolled in an approved program and who receives training for at least 50 percent of the specific program requirement. Trainees will be allowed to be transferred between projects if required by the Contractor's scheduled workload to meet training goals.

If a contractor fails to attain their training assignments for the calendar year, they may be taken off the NCDOT's Bidders List.

Measurement and Payment

No compensation will be made for providing required training in accordance with these contract documents.

DocuSigned by:
Matthew V. Springer
BC60F6E8B584403...
8/27/2020

POLYUREA PAVEMENT MARKING MEDIA AND THICKNESS:
(08-27-20)

Amend the *NCDOT 2018 Standard Specifications* as follows:

Page 12-8, Subarticle 1205-5(B), lines 14-16, replace with the following:

Produce polyurea pavement marking lines that have a minimum dry thickness of 20 mils above the pavement surface when placed on concrete and asphalt pavements. Produce polyurea pavement marking lines that have a minimum dry thickness of 30 mils above the pavement surface on textured surfaces such as OGFC and on surfaces where the polyurea will be placed over a previously removed pavement marking.

Page 12-9, replace **Table 1205-4 Minimum Reflectometer Requirement for Polyurea** with the following:

TABLE 1205-4
MINIMUM REFLECTOMETER REQUIREMENTS
FOR POLYUREA

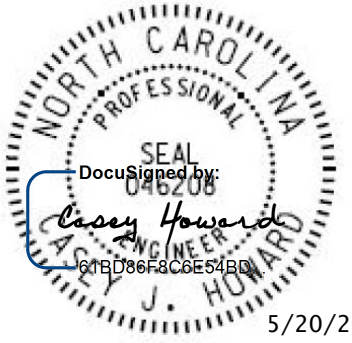
Item	Color	Reflectivity
Standard Glass Beads	White	375 mcd/lux/m^2
	Yellow	250 mcd/lux/m^2

The installer may choose to use an AASHTO Type 4/Type 1 or AASHTO Type 3/Type 1 double drop system, but no price adjustment will be made, and these systems will be incidental to the polyurea pavement marking.

Pay Item	Pay Unit
Polyurea Pavement Marking Lines,___",_____mils (Standard Glass Beads)	Linear Foot

WORK ZONE TRAFFIC CONTROL
Project Special Provisions
Table of Contents

Special Provision	Page
ADA Compliant Pedestrian Traffic Control Devices	TC-2



ADA COMPLIANT PEDESTRIAN TRAFFIC CONTROL DEVICES:
(10/31/2017)

Description

Furnish, install, and maintain all ADA compliant pedestrian traffic control devices for existing pedestrian facilities that are disrupted, closed, or relocated by planned work activities.

The ADA compliant pedestrian traffic control devices used to either close, redirect, divert or detour pedestrian traffic are Pedestrian Channelizing Devices.

Construction Methods

The ADA compliant pedestrian traffic control devices involved in the closing or redirecting of pedestrians as designated on the Transportation Management Plan (TMP) shall be manufactured and assembled in accordance with the requirements of the Americans with Disabilities Act (ADA) and be on the NCDOT approved products list.

Pedestrian Channelizing Devices shall be manufactured and assembled to be connected as to eliminate any gaps that allow pedestrians to stray from the channelizing path. Any Pedestrian Channelizing Devices used to close or block a pedestrian facility shall have a "SIDEWALK CLOSED" sign affixed to it and any audible warning devices, if designated on the TMP.

Measurement and Payment

Pedestrian Channelizing Devices will be measured and paid as the maximum number of linear feet of *Pedestrian Channelizing Devices* furnished, acceptably placed, and in use at any one time during the life of the project.

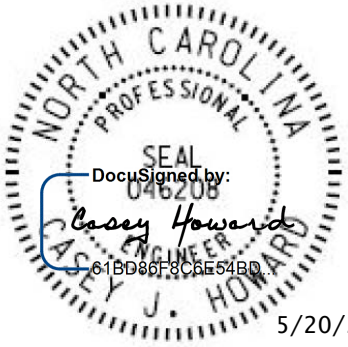
No direct payment will be made for any sign affixed to a pedestrian channelizing device. Signs mounted to pedestrian channelizing devices will be considered incidental to the device.

Payment will be made under:

Pay Item	Pay Unit
Pedestrian Channelizing Devices	Linear Foot

Project Special Provisions
Structures

SCOPE OF WORK 2
SUBMITTAL OF WORKING DRAWINGS (1-29-21) 3
CRANE SAFETY (6-20-19) 9
MAINTENANCE OF WATER TRAFFIC (12-5-12) 9
COORDINATION WITH THE U. S. COAST GUARD (SPECIAL) 10
WORK IN, OVER OR ADJACENT TO NAVIGABLE WATERS (12-5-12) 10
SECURING OF VESSELS (10-12-01) 11
GROUT FOR STRUCTURES (12-1-17) 11
FALSEWORK AND FORMWORK (4-5-12) 12
SHOTCRETE REPAIRS (SPECIAL) 18
CONCRETE REPAIRS (SPECIAL) 23
EPOXY OVERLAY SYSTEM I (SPECIAL) 26
CLEANING AND PAINTING EXISTING BEARINGS WITH HRCSA (SPECIAL) 31
FOAM JOINT SEALS FOR PRESERVATION (SPECIAL) 47
POURABLE SILICONE JOINT SEALANT (SPECIAL) 51
EPOXY COATING AND DEBRIS REMOVAL (SPECIAL) 53
BRIDGE JACKING (SPECIAL) 55
REMOVE AND RESET BEARINGS (SPECIAL) 56
PRESTRESSED CONCRETE GIRDERS WITH THERMAL SPRAY ANODE (SPECIAL) 57
GALVANIZED PEDESTRIAN SAFETY RAIL (SPECIAL) 68
BEAM END EPOXY PROTECTIVE COATING (SPECIAL) 69
GALVANIC CATHODIC PROTECTION INTEGRAL PILE JACKET (SPECIAL) 71
PILE CAP HYBRID (POWERED) GALVANIC ANODES (SPECIAL) 82
EPOXY RESIN INJECTION (SPECIAL) 95
CONCRETE DECK REPAIR FOR EPOXY OVERLAY (12-12-13) 100
FLOATING TURBIDITY CURTAIN (SPECIAL) 101



SCOPE OF WORK

Location and Description of Bridge #21
New Hanover Bridge No. 21 is located on US 76 over the Banks Channel between Wrightsville Beach and Harbor Island, NC. The bridge was built in 1972 and is approximately 870' long and consists of 14 spans of 45" AASHTO Type III prestressed concrete girders. The clear roadway width is 47'-10". The navigation channel has a vertical clearance of +/-11'.

Description of Work
This work shall consist of furnishing all labor, materials and equipment to rehabilitate the deck, superstructure and substructure as shown in the contract documents and plans. Work includes; prestressed concrete girder repairs, cathodic protection system for prestressed concrete girders, cleaning and painting bearings with high ratio calcium sulfonate alkyd (HRCSA), hybrid cathodic protection of the cap, shotcrete/concrete repairs to substructure elements, epoxy sealing of girder ends, epoxy coating of substructure elements, pile jackets with cathodic protection, replacement of joints and epoxy overlay repair on approach slab.

Contractor shall provide all necessary access; barges, platforms, scaffolding, ladders, etc.; provide all traffic control; coordinate with the US Coast Guard; provide all staging area, material storage; provide environmental controls to limit loss of materials into water and air; jacking, drilling, sawing and chipping equipment; and all else necessary to complete the work.

No separate payment will be made for portable lighting as the cost of such is incidental to the work being performed.

The contractor shall be responsible for fulfilling all requirements of the NCDOT Standard Specifications for Roads and Structures dated January 2018, except as otherwise specified herein.

SUBMITTAL OF WORKING DRAWINGS (1-29-21)

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:

Mr. B. C. Hanks, P. E.
State Structures Engineer
North Carolina Department
of Transportation
Structures Management Unit
1581 Mail Service Center
Raleigh, NC 27699-1581

Attention: Mr. J. L. Bolden, P. E.

Via other delivery service:

Mr. B. C. Hanks, P. E.
State Structures Engineer
North Carolina Department
of Transportation
Structures Management Unit
1000 Birch Ridge Drive
Raleigh, NC 27610

Attention: Mr. J. L. Bolden, P. E.

Submittals may also be made via email.

Send submittals to:

jlbolden@ncdot.gov (James Bolden)

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

eomile@ncdot.gov (Emmanuel Omile)

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. David Hering, L. G., 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. David Hering, L. G., 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

Via Email: EastGeotechnicalSubmittal@ncdot.gov

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

Via US mail or other delivery service:

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 Email: WestGeotechnicalSubmittal@ncdot.gov

The status of the review of structure-related submittals sent to the Structures Management Unit can be viewed from the Unit's website, via the "Drawing Submittal Status" link.

The status of the review of geotechnical-related submittals sent to the Geotechnical Engineering Unit can be viewed from the Unit's website, via the "Geotechnical Construction Submittals" link.

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

Primary Structures Contact:	James Bolden (919) 250 – 4082 facsimile jlbolden@ncdot.gov	(919) 707 – 6408

Secondary Structures Contacts: Emmanuel Omile (919) 707 – 6451
Madonna Rorie (919) 707 – 6508

Eastern Regional Geotechnical Contact (Divisions 1-7):
David Hering (919) 662 – 4710
dthering@ncdot.gov

Western Regional Geotechnical Contact (Divisions 8-14):
Eric Williams (704) 455 – 8902
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 Structures Management Unit	Copies Required by Geotechnical Engineering Unit	Contract Reference Requiring Submittal [1]
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

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. 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]	1 drawings, 1 calculations	2 drawings	Applicable Provisions
Temporary Shoring [4]	1 drawings, 1 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), 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.

CRANE SAFETY (6-20-19)

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 (OSHA) regulations.

Submit all items listed below to the Engineer prior to beginning crane operations. 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:** Crane operators shall be certified by the National Commission for the Certification of Crane Operators (NCCCO) or the National Center for Construction Education and Research (NCCER). Other approved nationally accredited programs will be considered upon request. In addition, crane operators shall have a current CDL medical card. Submit a list of crane operator(s) and include current certification for each type of crane operated (small hydraulic, large hydraulic, small lattice, large lattice) and medical evaluations for each operator.

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.

No direct payment will be made for work under this section. All costs shall be considered incidental to items for which direct payment is made.

COORDINATION WITH THE U. S. COAST GUARD (SPECIAL)

At no time during work will the waterway be closed or narrowed to navigation without prior approval from the U.S. Coast Guard. The contractor is required to maintain close and regular contact with the Coast Guard, Sector North Carolina to keep them informed to activities in the waterway. The U.S. Coast Guard Sector North Carolina contacts are MST1 Matt Tyson at (910)-772-2221 or MSTC Joshua O'Rourke at (910) 772-2227. The Contractor must also contact and send project plans to the 5th Coast Guard District Bridges Branch, Mr. Hal Pitts 757-398-6222 or email at Hal.R.Pitts@uscg.mil.

The Contractor shall bear full responsibility for all required coordination with the Coast Guard. Advance coordination with the Coast Guard for any anticipated disruptions to waterway traffic shall begin within 30 days following award of Contract and prior to commencing on-site activities. Approval for scheduled waterway disruptions shall be initiated approximately 180 days in advance, and confirmed no less than 30 days but no more than 45 days, in advance of the first disruption.

All work shall be conducted so that free navigation of the waterway is not unreasonably interfered with and the present navigable depths are not impaired. Timely notice of any and all events that affect navigation shall be given to the District Commander during the work on the channel span. The channel shall be promptly cleared of all obstructions placed therein or caused by the contractor.

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.

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.

GROUT FOR STRUCTURES (12-1-17)

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, decks, end bent caps, or bent caps. 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

Unless otherwise noted on the plans, use a Type 3 Grout in accordance with Section 1003 of the Standard Specifications.

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

Construction loading and traffic loading shall not be allowed until the 3 day compressive strength is achieved.

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.

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.

FALSEWORK AND FORMWORK (4-5-12)

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.

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.

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. Screed 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 ½" 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 ¾".

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.

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.

C. 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.

D. 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.

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.

METHOD OF MEASUREMENT

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

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.

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 structural 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 dry mix 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.)
Air Content - As Shot (%)	ASTM C231 or ASTM C457	-	5 ± 2
Minimum Compressive Strength (psi)	ASTM C109	7 28	3,000 5,000
Minimum Bond Pull-off Strength (psi)	ASTM C1583 or ASTM C882	28	250
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 five (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 ½" 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. 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.

Provide stainless welded wire fabric at each repair area larger than one square foot if the depth of the repair exceeds 2 inches from the existing, intact exterior face of the concrete member. 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.

With the exception of overhead applications, 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 five (5) calendar days. If the time allowance exceeds (5) calendar 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 three (3) calendar 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 three (3) to four (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 two (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 dimensions and configuration, unless otherwise required to provide a minimum 2” of cover for reinforcing steel exposed during repair. If necessary to extend shotcrete repair material beyond the original member dimensions and geometry, coordinate with the Engineer to determine methods, geometry, and dimensions of the final finished surface to provide a minimum 2” of cover on reinforcing steel. 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.

Cure the completed shotcrete surface in accordance with Article 420-15(B) Water Method, of the *Standard Specifications* for seven (7) calendar days. If the water method is impracticable or if approved by the Engineer, a membrane curing compound may be used in accordance with Subarticle 420-15(C) at double the manufacturer's recommended coverage rate.

MATERIAL TESTING & ACCEPTANCE

Each day shotcreting takes place, the nozzleman shall shoot one 18" x 18" x 3.5" 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 and do not disturb for the first 24 hours after shotcreting.

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.

In accordance with Subarticle 1002-3(H) of the Standard Specifications, core three (3) 3" diameter samples from each test panel. Compressive strength values on test panels shall equal or exceed the required 28-day strength requirements. Should failures occur on the test panel cores, acceptance of the material will be determined by tests on cores from the installed work on the structure. A minimum of (3) three cores shall be taken from the area in question of the structure. The average compressive strength of the cores taken from the structure shall equal or exceed the specified strength of the shotcrete applied, and no single core shall have strength less than 85% of the specified value. Any cores taken from the structure shall penetrate into the existing concrete at least two (2) inches. Cores shall also be inspected for delamination, sand pockets, segregation, and voids.

The adequacy of the bond between the existing concrete and the shotcrete shall be determined by direct tension bond testing, in accordance with ASTM C1583 or ASTM C882, as directed by the Engineer. A minimum bond strength of 250 psi will be accepted as satisfactory. Bond failure less than 250 psi attributable to the failure of existing concrete will not be cause for rejection. The cost of up to three passing direct tension bond tests shall be the responsibility of the Contractor; additional passing pull-off tests will be the responsibility of the Department.

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 the repaired structure to the satisfaction of the Engineer.

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. If modifications to the dimensions and geometry are approved by the Engineer to achieve proper clearance over reinforcing steel, depth measurements will be made from the modified final outside 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 and bond strength, curing of shotcrete and taking core samples from the test panels and the structure.

Payment will be made under:

Pay Item	**Pay Unit**
Shotcrete Repairs	Cubic Feet

CONCRETE REPAIRS (SPECIAL)

DESCRIPTION

Work includes removal of concrete in spalled, delaminated and/or cracked areas of the existing bent caps, bent columns, underside of bridge decks, deck slabs, girders, and bridge rails in reasonably close conformity with the lines, depth, and details shown on the plans, described herein and as established by the Engineer. This work also includes straightening, cleaning, and replacement of reinforcing steel, doweling new reinforcing steel, removing all loose materials, removing and disposing of debris, formwork, applying repair material, and protecting adjacent areas of the bridge and environment from material leakage. The repair material shall be one of the materials described in this Special Provision, unless otherwise noted in the plans or special provisions.

The location and extent of repairs shown on the plans described herein 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. The Contractor shall coordinate removal operations with the Engineer. No more than 30% of a round or square column or 30% of the bearing area under a beam shall be removed without a temporary support system and approval from the Engineer.

Repair, to the Engineer's satisfaction, any portion of the structure that is damaged from construction operations. No extra payment is provided for these repairs.

SURFACE PREPARATION

Adhere to the following surface preparation requirements or the repair material manufacturer's requirements, whichever is more stringent.

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 concrete removal, introduce a shallow saw cut, ½" in depth, around the repair area at right angles to the concrete surface. Sawcut should be located a minimum 2" beyond the perimeter of the deteriorated concrete area to be repaired. Remove all concrete within the sawcut to a minimum depth of ½". If concrete removal exposes reinforcing steel, remove all deteriorated concrete 1" 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" 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. After blasting, 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. This might require additional removal of concrete, in order to achieve an appropriate splice length of the reinforcing steel.

Thoroughly clean the repair area of all dirt, grease, oil, or foreign matter, and remove all loose or weakened material by abrasive blasting before applying concrete repair material. Acid etch with 15% hydrochloric acid, 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 ten (10) or higher.

Follow all abrasive blasting with vacuum cleaning.

The time between removal of deteriorated concrete and applying concrete repair material shall not exceed 72 hours. If the time allowance exceeds 72 hours, prepare the surface at the direction of the Engineer before applying concrete repair material.

APPLICATION AND SURFACE FINISH

Apply repair material to damp surfaces only when allowed by repair material recommendations and approved by the Engineer. Prepare damp surfaces in accordance with the *Standard Specifications* and/ or repair material manufacturer's recommendations. Use a blowpipe to facilitate removal of free surface water. Only oil-free compressed air is to be used in the blowpipe.

When surface preparation is completed, mix and apply repair material in accordance with the *Standard Specifications* and/ or repair material manufacturer's recommendations.

Use aggregate that is washed, kiln-dried, and bagged. Maximum size of aggregate shall not exceed 2/3 of the minimum depth of the repair area, or 3/4 of the depth of excavation behind the reinforcing steel, whichever is smaller.

Unless otherwise required by the repair material manufacturer, apply bonding agent to all repair areas immediately prior to placing repair material.

Repair areas shall be formed unless otherwise approved by the Engineer. Form and finish all repaired areas, including chamfered edges, as close as practicable to their original "As Built" dimensions and configuration. After applying the repair material, remove excessive material and provide a smooth, flush surface, unless directed otherwise.

Cure finished Class A concrete repair material by maintaining 95% relative humidity at the repair and surrounding areas by fogging, moist curing, or other approved means for seven (7) days. Cure polymer modified concrete repair material in accordance with manufacturer's recommendations.

REPAIR MATERIAL OPTIONS

(A) Polymer Modified Concrete Repair Material
Repair material shall be polymer modified cement mortar for vertical or overhead applications and shall be suitable for applications in marine environments. Material shall be approved for use by NCDOT. Submit repair material to the Engineer for review and approval prior to beginning the work. Color of repair material shall be concrete gray.

(B) Class A Concrete Repair Material
Repair material shall be Class A Portland Cement Concrete as described in Article 1000-4 of the *Standard Specifications*.

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.

MEASUREMENT AND PAYMENT

Concrete 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, reinforcing steel, 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 abrasive blasting, surface cleaning and preparation, blast cleaning of reinforcing steel, placement of new reinforcing steel, cost of temporary work platform, testing of the soundness of the exposed concrete surface, furnishing and installation of repair mortar material, curing and sampling of concrete, and protection/cleaning of adjacent areas from splatter or leakage.

Reinforcing Steel that is required for the repairs will be in accordance with Section 425 of the *Standard Specifications*.

Payment will be made under:

Pay Item	Pay Unit
Concrete Repairs	Cubic Feet

EPOXY OVERLAY SYSTEM I (SPECIAL)

GENERAL

This special provision is intended for use on bridges with an Average Daily Traffic (ADT) exceeding 5,000. This work shall consist of furnishing and applying 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 ⅜" 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 guarantee period will start on the date of Department final acceptance of the project. This applies to the performance bond guarantee (12 month) and the warranty bond guarantee (36 month).

The performance bond will be invoked if 25 square feet of the deck surface meets the defect criteria prior to the end of the 12-month project guarantee period.

At the end of the 36-month warranty 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 (1:1) or two to one (2:1) 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.

The Contractor shall submit a Certified Test Report from independent labs for all of the materials associated with the overlay in accordance with this special provision.

All components shall be shipped in strong, substantial containers, bearing the manufacturer's label specifying batch/lot number, brand name, and quantity. If bulk resin is to be used, the contractor shall notify the Engineer in writing ten (10) working days prior to the delivery of the bulk resin to the job site. Bulk resin is any resin that is stored in containers in excess of 55 gallons.

(A) 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	AASHTO T237
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

(B) Aggregate

Aggregate used for all layers shall be non-friable, non-polishing, clean and free from surface moisture. Unless otherwise approved by the Engineer, the aggregate shall be flint rock, basalt, or calcined bauxite, 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. Calcined bauxite shall have a minimum aluminum oxide content of 87%, in accordance with ASTM C25. 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 T327
Absorption	< 1%	ASTM C128

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 special provision.

Prior to overlay placement and upon completion of the deck repairs, clean the entire deck surface by steel shot blasting 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 shot-blasting until all grinding or milling operations are completed. Use sandblasting equipment on areas that cannot be reached by the shot-blasting operation. If expansion joints are not being replaced or have been replaced prior to shot-blasting they shall be protected from damage from the shot-blasting 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 shot-blasting operation. Mortar that is soundly bonded to the coarse aggregate shall have open pores to be considered adequate for bond. Provide a self-propelled vacuum capable of picking up dust and other loose material from the shot-blasting operation. Provide air compressors equipped with oil/water separators, capable of blowing off all remaining dust and debris, and drying all moisture from the bridge deck. Care shall be taken, and methods used to fully capture and collect the excess material.

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 (2) pre-selected 1.5’ x 3’ test patches. Test locations will be determined by the Engineer. The average minimum bond strength of the epoxy overlay system on normal weight concrete shall be 250 psi, with no individual test measured below 225 psi. An acceptable test will demonstrate that the overlay bond strength is sufficient, or by producing a concrete subsurface failure area greater than 50% of the test surface 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. Test locations shall be repaired with approved repair materials.

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.

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, aggregate spreader, application squeegee, vacuum truck, and a source of lighting if work is to be performed at night. The distribution system 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 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. The vacuum truck shall be self-propelled.

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 two (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 ⅜". 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 eight (8) hours after application or if air temperatures would cause the gel time to be less than ten (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 to the top of the concrete deck surface and replacing the various courses in accordance with this special provision at no additional cost to the Department.

Prior to acceptance, perform bond testing for each span or 300 square yards, whichever is smaller, in accordance with ASTM C1583. Test locations will be determined by the Engineer. The average minimum bond strength of the epoxy overlay system on normal weight concrete shall be 250 psi, with no individual test measured below 225 psi. An acceptable test will demonstrate that the overlay bond strength is sufficient, or by producing a concrete subsurface failure area greater than 50% of the test surface 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 I 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, providing a 36-month warranty bond, and all tools, labor, materials, bond strength testing and any incidentals necessary to complete the work.

Payment will be made under:

Pay Item	**Pay Unit**
Epoxy Overlay System I	Square Feet

CLEANING AND PAINTING EXISTING BEARINGS WITH HRCSA (SPECIAL)

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.

The bridge bearings shall be cleaned 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 rust scale areas. A paint system with a co-polymerized high ratio of 'active' calcium sulfonate (HRCSA) shall be used as a stripe coat at all connections/crevices and as a topcoat over the bearings.

The bearings shall be considered to be plates (including masonry plates, sole plates, embedded plates, and other associated plates), bolts, nuts, washers, rockers, and any other components or hardware that comprise the bearing assembly.

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 *Standard Specifications*). To complete successfully 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 at least two (2) weeks for the review process.

(A) The existing paint systems include toxic substances such as red lead oxide, which are considered hazardous if improperly removed. The contractor shall be currently Society for Protective Coatings (SSPC) Quality Program (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. Lead abatement work completed within the 18 month period shall have been 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, personal protective equipment (PPE), etc.); and containment. This requirement is in addition to the contractor pre-qualification requirements covered by Article 102-2 of the *Standard Specifications*.

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 Engineer a "Lead Abatement Affidavit". This form may be downloaded from: https://www.ncdot.gov/initiatives-policies/Transportation/bridges/Documents/leadabatementaffidavit.pdf

(B) 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.

(C) Containment system plans and design calculations in accordance with SSPC Guide 6, Class 2A and other project requirements, signed and sealed by a Professional Engineer licensed by the State of North Carolina.

(D) Bridge wash water sampling and disposal plan.

(E) Subcontractor identification.

(F) Lighting plan for night work in accordance with Section 1413 of the *Standard Specifications*.

(G) Traffic control plan with NCDOT certified supervisors, flaggers and traffic control devices.

(H) 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 high pressure water jet (HPWJ).

(I) Provide the Engineer a letter of certification that all employees performing work on the project have blood lead levels that are below the Occupational Safety and Health Administration (OSHA) action level.

(J) Provide the Engineer with Competent Person qualifications and summary of work experience.

(K) Environmental Compliance Plan.

(L) Quality Control Plan (Project Specific) with quality control qualifications and summary of work experience.

(M) Bridge and Public Protection Plan (Overspray, Utilities, etc. - Project/Task Specific).

(N) Abrasive Blast Media:

(1) Product Data Sheet.

(2) Blast Media Test Reports in accordance with Article 1080-12 of the *Standard Specification*.

(O) 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.

(5) Acceptance letters from paint manufacturer's for work practices that conflict with 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 two (2) weeks for a review process. When requesting a pre-construction meeting, contact the Engineer at least seven (7) working days in advance of the desired pre-construction date. The contractor's project supervisor, Competent Person, quality control personnel 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 SYSTEM

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, and 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.

Prior to performing any construction or painting operations on the structure, the Contractor shall furnish the Engineer with plans and design calculations for a sufficiently designed containment system, which will provide access for any repairs on structural steel members, cleaning and surface preparations for structural steel members, and coating operations for structural steel members of the bridge. The containment system shall not be installed, and no work shall begin, until the Engineer has reviewed and approved, in writing, the submitted containment system plans and design calculations. Containment system plans and design calculations shall be prepared, sealed, and signed by a Professional Engineer licensed by the State of North Carolina. Allow a minimum of two (2) weeks for review of the containment plans and calculations.

The containment system shall meet or exceed the requirements of Class 3W containment in accordance with SSPC Guide 6. The Contractor shall determine the required capacity of the containment system, which, at a minimum, shall include loads due to wind, repair materials and repair operations, equipment, and tools; however, the capacity shall not be less than that required by Federal or State regulations. 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. The containment system shall be constructed of materials capable of withstanding damage from any of the work required on this project and shall provide a two (2) hour resistance to fire.

In the containment system plans, describe how debris is contained and collected. Describe the type of tarpaulin, bracing materials, and the maximum designed wind load. Design wind loads shall be in accordance with the Falsework and Formwork special provision. Describe the dust collection

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

Drilling holes in the superstructure for the purpose of attaching the containment system is prohibited.

The Contractor will be responsible for certifying the containment system has been constructed in accordance with the approved plans.

The containment system shall be cleaned after each workday.

Upon completion of work, remove all anchorages in the substructure and repair the substructure at no additional cost to the Department.

Protect non-metallic parts of bearings from blasting and painting (i.e.: Pot Bearings, Elastomeric Pads, and Disc Bearings).

WASH WATER SAMPLING AND DISPOSAL PLAN

All wash water shall be collected and sampled prior to disposal. Representative sampling and testing methodology shall conform to North Carolina Administrative Code 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:
https://www.ncdot.gov/initiatives-policies/Transportation/bridges/Documents/WashWater.pdf

WASTE HANDLING OF PAINT AND ABRASIVES

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 Generator Compliance Manual* is published by the Compliance Branch of the Division of Waste Management of NCDEQ, and can be found at: https://files.nc.gov/ncdeq/Waste%20Management/DWM/HW/Compliance/Generator%20Compliance%20Manual.pdf

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. Use an approved waste management company from the following link:
https://www.ebs.nc.gov/VendorDirectory/results.html?sap-params=cD0xJTIwJmN1cnJlbnRfc2VhcmNoX3BhZ2U9d2Mmc2VsZWN0aW9uX2Zpcm1fbmFtZT0mc2VsZWN0aW9uX2NlcnQ9JnNlbGVjdGlvbl9maXJtdHlwZT0meXNjX2Zpcm10eXBlPSZzZWxlY3Rpb25fd29ya2xvY2F0aW9uPSZ5c2Nfd29ya2xvY2F0aW9uPSZzZWxlY3Rpb25fYWRkcnN0YXRlPSZ5c2NfYWRkcnN0YXRlPSZzZWxlY3Rpb25fYWRkcmNvdW50eT0meXNjX2FkZHJjb3VudHk9JnNlbGVjdGlvbl93a2NvZGU9MDAzMDQwJnlzY193a2NvZGU9MDAzMDQwJTIwQ09OVEFNSU5BVEVEJTIwTUFURVJJQUxxTJTIwUkVNT1ZBTCZzZWxlY3Rpb25fZGlzYz0meXNjX2Rpc2M9JnNlbGVjdGlvbl9uYWljcz0meXNjX25haWNzPSZzZWxlY3Rpb25fY3R5cGU9MA%3d%3d

All removed paint and spent abrasive media shall be tested for lead following the SW-846 Toxicity Characteristic Leaching Procedure (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 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. Composite 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 Generator Manual*. 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 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 Environmental Protection Agency (EPA) ID number from:

Melodi Deaver
Division of Waste Management/Hazardous Waste Section
North Carolina Department of Environmental Quality
1646 Mail Service Center
Raleigh, NC 27699
Phone: (919) 707-8204, Email: melodi.deaver@ncdenr.gov

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 calendar 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:
https://deq.nc.gov/about/divisions/waste-management/hw/provisional-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:
https://slphreporting.ncpublichealth.com/Certification/CertifiedLaboratory.asp

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

(A) For leachable lead:

(1) Soils/Solid/Liquid- EPA 1311/200.7/6010

Area sampling will be performed for the first two (2) days at each bridge location. The area sample will be located within five (5) 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 $\mu g/m^3$ corrective measures shall be taken and monitoring shall be continued until two (2) consecutive sample results are less than 20 $\mu g/m^3$.

Time Weighted Average (TWA) may suspend the work if there are visible emissions outside the containment enclosure or pump monitoring results exceeding the level of 30 $\mu g/m^3$.

Where schools, housing and/or buildings are within 500 feet of the containment, the Contractor shall perform initial Total Suspended Monitoring (TSP) Lead monitoring for the

first ten (10) days of the project during abrasive blasting, vacuuming and containment removal. Additional monitoring will be required during abrasive blasting two (2) days per month thereafter. Results of the TSP monitoring at any location shall not exceed 1.5 $\mu g/m^3$.

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.

QUALITY CONTROL INSPECTOR

Provide a quality control (QC) inspector in accordance with the SSPC QP guidelines to ensure that all processes, preparation, blasting and 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 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, blasting, coating testing and inspection shall be inspected and approved by the Engineer or an authorized representative.

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.

PREPARATION OF SURFACES

(A) Removal of Soil, Concrete, Debris, and Other Material

Soil, concrete, debris, and other foreign material that might be on or attached to the bearings, plates, or any other bearing components shall be removed. Removal of such material may require the use of brooms, brushes, hand tools, hammers, chisels, pneumatic hammers, or other tools or power tools. Pneumatic hammers used for removal of such material shall weigh a nominal 15 lbs. or less. Exercise care to avoid nicking or gouging the bearing components during removal of soil, concrete, debris, and other foreign material. Should damage occur,

repairs shall be made to the bearings at no cost to the Department.

(B) Cleaning and Removal of Pack Rust

Removal of pack rust shall be done by hand tool cleaning to meet requirements of SSPC Surface Preparation (SP)-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 bearing components during removal. Remove all rust scale and loose pack rust, followed by high pressure water cleaning.

(C) High Pressure Water Cleaning (HPWC)

The bearings shall be cleaned with water at a minimum pressure of 5,000 psi, at five (5) gallons per minute, with a rotating tip, at a maximum four (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 parts per million (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 slat levels on the surfaces do not exceed allowable soluble salt limits listed below:

(1) Chloride - NVC3 3 $\mu g/cm^2$
(2) Sulfate - NVS10 10 $\mu g/cm^2$
(3) Nitrate - NVN10 10 $\mu g/cm^2$

The frequency of testing shall be two (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 Waterjet (WJ)-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 five (5) gallons per minute, to ensure removal of all loose materials and to flush out any contaminant.

(D) 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.

PAINTING OF STEEL

(A) 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.

(B) 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 paint brushes, rollers, and spray equipment to conduct the work as specified in this special provision.

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:

(1) Pole guns for spray painting.
(2) 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 four (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, spot, 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 Paint Application (PA) PA2 – using a digital film thickness gage and a shim – after the coating has cured sufficiently to allow accurate measurements. 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 special provision 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 ten (10) working 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 Department.

MATERIALS

(A) 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 special provision.

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:

(1) The proposed coating system shall be an HRCSA coating as defined by this special provision and shall be submitted for approval.
   (a) 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.
   (b) Formulations with greater than 27% Alkyd or co-polymer are not valid HRCSA.
   (c) Zero Volatile Organic Compounds (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.

(2) 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 special provision 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.

(3) 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 5,000 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.

Material Safety Data Sheets (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, having 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.

(B) 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.

All storage of paint, solvents, and other materials applied to structures shall be stored in accordance with Subarticle 442-9(C) of the *Standard Specifications* or the manufacturers' requirements. The more restrictive requirements will apply.

(C) 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 Department 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 (2) coatings are not compatible.

INSPECTION

Surface Preparation for System 1 shall be in accordance with SSPC SP-10. Any area(s) not meeting the requirements of SSPC SP-10 shall be remediated prior to application of coating. Surface inspection is considered ready for inspection when all blast abrasive, residue and dust is removed from surfaces to be coated.

(A) Quality Assurance Inspection

The Contractor furnishes all necessary OSHA approved apparatus such as ladders, scaffolds and platforms as required for the inspector to have reasonable and safe access to all parts of the work. The contractor illuminates 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.

NCDOT reserves the right for ongoing Quality Assurance (QA) inspection to include but not limited to surface contamination testing, adhesion pull testing, and DFT readings as necessary to assure quality.

Inform the Engineer and the Division Safety Engineer of all scheduled and unannounced inspections from SSPC, OSHA, EPA and/or others that come on site. Furnish the Engineer a copy of all inspection reports except for reports performed by a third party and or consultant on behalf of the Contractor.

(B) Inspection Instruments

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

(1) Sling Psychrometer - ASTM E337 - bulb type
(2) Surface Temperature Thermometer
(3) Wind Speed Indicator
(4) Tape Profile Tester - ASTM D4417 Method C
(5) Surface Condition Standards - SSPC VIS-1 and VIS-3
(6) Wet Film Thickness Gage - ASTM D4414
(7) Dry Film Thickness Gage - SSPC-PA2 Modified
(8) Solvent Rub Test Kit - ASTM D4752
(9) Adhesion Test Kit - ASTM D3359 Method A (Tape Test)
(10) Adhesion Pull test - ASTM D4541
(11) Surface Contamination Analysis Kit or (Chloride Level Test Kit) SSPC Technology Guide 15

(C) Quality Control

Maintain a daily quality control record in accordance with Subarticle 442-12(D) of the *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 Form M&T-610, submit all Dry Film Thickness (DFT) readings on a form equivalent to Form M&T-611. These forms can be found at:
https://connect.ncdot.gov/resources/Materials/Pages/Materials-Manual-by-Material.aspx?Order=MM-03-02

Film thickness shall be measured at no less than six (6) random spots per bearing (each of four (4) bearing plate edges and two (2) readings on top of the sole plate). Also, film thickness shall be measured at no less than six (6) random spots per span on diaphragms/cross frames.

Each spot is an average of three (3) to five (5) 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 Department.

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 Department and to provide comments and guidance, so that the cleaning, application, and inspection procedures are done properly.

SAFETY AND ENVIRONMENTAL COMPLIANCE PLANS

Personnel access boundaries are delineated for each work site using signs, tape, cones, or other approved means. Submit copies of safety and environmental compliance plans that comply with SSPC QP 2 Certification requirements.

HEALTH AND SAFETY RESPONSIBILITIES

This project may involve toxic metals such as arsenic, lead, cadmium and hexavalent chromium. It is the contractor's responsibility to test for toxic metals and if found, comply with the OSHA regulations, which may include medical testing.

Ensure a "Competent Person" as defined in OSHA 29 CFR 1926.62; one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them; is on site during all surface preparation activities and monitors the effectiveness of containment, dust collection systems and waste sampling. Before any work begins, provide a written summary of the Competent Person's safety training.

Comply with Subarticle 442-14(B) of the *Standard Specifications*.

Comply with Subarticle 442-14(D) of the *Standard Specifications*. Ensure employee blood sampling test results are less than 50 micrograms per deciliter. Remove employees with a blood sampling test of 50 or more micrograms per deciliter from work activities involving any lead exposure.

An employee who has been removed with a blood level of 50 micrograms per deciliter or more shall have two (2) consecutive blood sampling tests spaced one week apart indicating that the employee's blood lead level is at or below 40 micrograms per deciliter before returning to work activities involving any lead exposure.

All OSHA recordable accidents that occur during the project duration are to be reported to the Engineer within twenty-four (24) hours of occurrence. In addition, for accidents that involve civilians or property damage that occurs within the work zone the Division Safety Engineer shall be notified immediately.

Prior to blasting operations, the Contractor shall have an operational OSHA approved hand wash station at each bridge location and a decontamination trailer at each bridge or between bridges unless the work is on the roadway, or the Contractor shall show reason why it is not feasible to do so and provide an alternative site as approved by the Engineer. The Contractor shall assure that all employees whose airborne exposure to lead is above the Permissible Exposure Limit (PEL) shall shower at the end of their work shift.

STORAGE OF PAINT AND EQUIPMENT

Provide a location for materials, equipment, and waste storage. Spread tarpaulins over all pavements and surfaces underneath equipment used for abrasive recycling and other waste handling equipment or containers. All land and or lease agreements that involve private property shall disclose to the property owner that heavy metals may be present on the Contractor's equipment. Prior to storing the Contractor's equipment on private property, provide a notarized written consent signed by the land owner received by the Engineer at least forty-eight (48) hours before using property. All storage of paint, solvents, and other materials applied to structures shall be stored in accordance with Subarticle 442-9(C) of the *Standard Specifications* or the manufacturers' requirements. The more restrictive requirements will apply.

UTILITIES

Protect all utility lines or mains that may be supported on, under, or adjacent to bridge work sites from damage and paint overspray.

MEASUREMENT AND PAYMENT

Painting Containment for Bridge No. 640021 will be paid for at the contract lump sum price which will be full compensation for the design, materials, installation, maintenance, and removal of the containment system.

Pollution Control will be paid at the contract lump sum price which 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 for the daily collection of the blast debris into specified containers; and any measures necessary to ensure conformance to all safety and environmental regulations as directed by the Engineer.

Cleaning and Painting Existing Bearings with High Ratio Calcium Sulfonate will be measured and paid for each bearing location. The price for each bearing 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. 640021	Lump Sum
Pollution Control	Lump Sum
Cleaning and Painting Existing Bearings with High Ratio Calcium Sulfonate	Each

FOAM JOINT SEALS FOR PRESERVATION (SPECIAL)

SEALS

Use preformed seals compatible with concrete and resistant to abrasion, oxidation, oils, gasoline, salt, and other materials that are spilled on or applied to the surface. Use a resilient, UV stable, preformed, impermeable, flexible, expansion joint seal. The joint seal shall consist of low-density, closed cell, cross-linked polyethylene non-extrudable foam. The joint seal shall contain no EVA (Ethylene Vinyl Acetate). Cell generation shall be achieved by being physically blown using nitrogen. No chemical blowing agents shall be used in the cell generation process.

Use seals manufactured with grooves ⅛" ± wide by ⅛" ± deep and spaced between ¼" and ½" apart along the bond surface running the length of the joint. Use seals with a depth that meets the manufacturer's recommendation, but is not less than 70% of the uncompressed width. Provide a seal designed so that, when compressed, the center portion of the top does not extend upward above the original height of the seal by more than ¼". Provide a seal that has a working range of 30% tension and 60% compression and meets the requirements given below.

TEST	TEST METHOD	REQUIREMENT
Tensile Strength	ASTM D3575, Suffix T	110 – 130 psi
Compression Set	ASTM D1056 Suffix B, 2 hr recovery	10% - 16%
Water Absorption	ASTM D3575	< 0.03 lb/ft^2
Elongation at Break	ASTM D3575	180% - 210%
Tear Resistance	ASTM D624 (D3575, Suffix G)	14 – 20 pli
Density	ASTM D3575, Suffix W, Method A	1.8 – 2.2 lb/ft^3
Toxicity	ISO-10993.5	Pass (not cytotoxic)

Have the top of the joint seal clearly shop marked. Inspect the joint seals upon receipt to ensure that the marks are clearly visible before installation.

BONDING ADHESIVE

Use a two-component, 100% solid, modified epoxy adhesive supplied by the joint seal manufacturer that meets the requirements given below.

TEST	TEST METHOD	REQUIREMENT
Tensile strength	ASTM D638	3,000 psi (min.)
Compressive strength	ASTM D695	7,000 psi (min.)
Hardness	Shore D Scale	75-85 psi
Water Absorption	ASTM D570	0.25% by weight max.
Elongation to Break	ASTM D638	5% (max.)
Bond Strength	ASTM C882	2,000 psi (min.)

Use an adhesive that is workable to 40°F. When installing in ambient air or surface temperatures below 40°F or for application on moist, difficult to dry concrete surfaces, use an adhesive specified by the manufacturer of the joint seal.

SAWING THE JOINT

The concrete at the face of the joint (elastomeric concrete, polyester polymer concrete, Portland cement concrete, etc.) shall have sufficient time to cure such that no damage can occur to the concrete prior to sawing to the final width and depth as specified in the plans.

When sawing the joint to receive the foam seal, always use a rigid guide to control the saw in the desired direction. To control the saw and to produce a straight line as indicated on the plans, anchor and positively connect a template or a track to the bridge deck. Do not saw the joint by visual means such as a chalk line. Fill the holes used for holding the template or track to the deck with an approved flowable, non-shrink, non-metallic grout.

Saw cut to the desired width and depth in one (1) or two (2) passes of the saw by placing and spacing two (2) metal blades on the saw shaft to the desired width for the joint opening.

The desired depth is the depth of the seal plus ¼” above the top of the seal plus approximately 1” below the bottom of the seal. An irregular bottom of sawed joint is permitted as indicated on the plans. Grind exposed corners on saw cut edges to a ¼” chamfer.

Saw cut a straight joint, centered over the formed opening and to the desired width specified in the plans. Prevent any chipping or damage to the sawed edges of the joint.

Remove any staining or deposited material resulting from sawing with a wet blade to the satisfaction of the Engineer.

PREPARATION OF SAWED JOINT FOR SEAL INSTALLATION

The elastomeric concrete or polyester polymer concrete at the joint shall cure a minimum of 24 hours prior to seal installation. Portland cement concrete at the joint shall cure following the special provisions.

After sawing the joint, the Engineer will thoroughly inspect the sawed joint opening for spalls, popouts, cracks, etc. All necessary repairs will be made by the Contractor prior to blast cleaning and installing the seal, at no cost to the Department.

Clean the joints by sandblasting with clean dry sand immediately before placing the bonding agent. Sandblast the joint opening to provide a firm, clean joint surface free of curing compound, loose material and any foreign matter. Sandblast the joint opening without causing pitting or uneven surfaces. The aggregate in the joint concrete may be exposed after sandblasting.

After blasting, either brush the surface with clean brushes made of hair, bristle, or fiber, blow the surface with compressed air, or vacuum the surface until all traces of blast products and abrasives are removed from the surface, pockets, and corners.

If nozzle blasting is used to clean the joint opening, use compressed air that does not contain detrimental amounts of water or oil.

Examine the blast-cleaned surface and remove any traces of oil, grease, or smudge deposited in the cleaning operations.

Bond the seal to the blast-cleaned surface on the same day the surface is blast cleaned.

SEAL INSTALLATION

Install the joint seal 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.

Before installing the joint seal, check the uninstalled seal length to ensure the seal is the same length as the deck opening. When the joint seal requires splicing, use the heat welding method by placing the joint material ends against a Teflon heating iron of 425-475°F for 7 - 10 seconds, then pressing the ends together tightly. Do not test the welding until the material has completely cooled.

Begin installation by protecting the top edges of the concrete deck adjacent to the vertical walls of the joint as a means to minimize clean up. Stir each epoxy bonding agent component independently, using separate stirring rods for each component to prevent premature curing of the bonding agent. Pour the two (2) components, at the specified mixing ratio, into a clean mixing bucket. Mix the components with a low speed drill (400 rpm max.) until a uniform gray color is achieved without visible marbling. Apply bonding agent to both sides of the joint concrete, as well as both sides of the joint seal, making certain to fill completely the grooves with epoxy. With

gloved hands, compress the joint seal and with the help of a blunt probe, push the seal into the joint opening until the seal is recessed approximately ¼" below the surface. When pushing down on the joint seal, apply pressure only in a downward direction. Do not push the joint seal into the joint opening at an angle that would stretch the material. Seals that are stretched during installation shall be removed and rejected. Once work on placing a seal begins, do not stop until it is completed. Clean the excess epoxy from the top of the joint seal immediately with a trowel. Do not use solvents or any cleaners to remove the excess epoxy from the top of the seal. Remove the protective cover at the joint edges and check for any excess epoxy on the surface. Remove excess epoxy with a trowel, the use of solvents or any cleaners will not be allowed.

The installed system shall be watertight and will be monitored until final inspection and approval.

(A) Watertight Integrity Test

(1) Upon completion of each foam seal expansion joint, perform a water test on the top surface to detect any leakage. Cover the roadway section of the joint from curb to curb, or barrier rail to barrier rail, with water, either ponded or flowing, not less than 1 inch above the roadway surface at all points. Block sidewalk sections and secure an unnozzled water hose delivering approximately 1 gallon of water per minute to the inside face of the bridge railing, trained in a downward position about six (6) inches above the sidewalk, such that there is continuous flow of water across the sidewalk and down the curb face of the joint.

(2) Maintain the ponding or flowing of water on the roadway and continuous flow across sidewalks and curbs for a period of five (5) hours. At the conclusion of the test, the underside of the joint is closely examined for leakage. The foam seal expansion joint is considered watertight if no obvious wetness is visible on the Engineer's finger after touching a number of underdeck areas. Damp concrete that does not impart wetness to the finger is not considered a sign of leakage.

(3) If the joint system leaks, locate the place(s) of leakage and take any repair measures necessary to stop the leakage at no additional cost to the Department. Use repair measures recommended by the manufacturer and approved by the Engineer prior to beginning corrective work.

(4) If measures to eliminate leakage are taken, perform a subsequent water integrity test subject to the same conditions as the original test. Subsequent tests carry the same responsibility as the original test and are performed at no additional cost to the Department.

Do not place pavement markings on top of foam joint seals.

BASIS OF PAYMENT

Foam Joint Seals for Preservation will be measured and paid for at the contract unit price bid per linear foot and will be full compensation for furnishing all material, labor, tools, and equipment necessary for the removal of existing joint and installing these seals in place and accepted.

Pay Item	Pay Unit
Foam Joint Seals for Preservation	Linear Feet

POURABLE SILICONE JOINT SEALANT (SPECIAL)

SEALS

Provide and install a low modulus silicone sealant (non-sag or self-leveling) and backer rod which conforms to the *Standard Specifications* (Subsections 1028-3 and 1028-4, respectively) and this special provision. Use silicone approved for use on joint openings as indicated on project plans and provide a seal with a working range of minimum 50% compression and extension. Silicone joint seal product shall be designated as approved for use on the NCDOT Approved Products List. If non-sag and self-leveling sealants are to be in contact with each other, they shall be from the same manufacturer and shall be compatible for such use.

SAWING THE JOINT

Joint concrete material or joint concrete header material shall have sufficient time to cure such that no damage can occur to the concrete prior to sawing to the final width and depth as specified in the plans.

When sawing the joint to receive the seal, always use a rigid guide to control the saw in the desired direction. To control the saw and to produce a straight line as indicated on the plans, anchor and positively connect a template or a track to the bridge deck. Do not saw the joint by visual means such as a chalk line. Fill the holes used for holding the template or track to the deck with an approved flowable, non-shrink, non-metallic grout.

Saw cut to the desired width and depth in one or two (2) passes of the saw by placing and spacing two (2) metal blades on the saw shaft to the desired width for the joint opening.

The desired depth is the depth of the seal plus ¼ ” above the top of the seal plus approximately 1” below the bottom of the seal. An irregular bottom of sawed joint is permitted as indicated on the plans. Grind exposed corners on saw cut edges to a ¼ ” chamfer.

Saw cut a straight joint, centered over the formed opening and to the desired width specified in the plans. Prevent any chipping or damage to the sawed edges of the joint.

Remove any staining or deposited material resulting from sawing with a wet blade to the satisfaction of the Engineer.

PREPARATION OF FORMED OR SAWED JOINT FOR SEAL INSTALLATION

Joint concrete material or joint concrete header material shall cure a minimum of 24 hours prior to seal installation.

After forming or sawing the joint, the Engineer will thoroughly inspect the joint opening for spalls, popouts, cracks, etc. All necessary repairs will be made by the Contractor prior to blast cleaning and installing the seal, at no cost to the Department.

Clean the joints by sandblasting the joint opening to provide a firm, clean joint surface free of curing compound, loose material, and any foreign matter. Sandblast the joint opening without causing pitting or uneven surfaces. The aggregate in the polyester polymer concrete may be exposed after sandblasting.

After blasting, either brush the surface with clean brushes made of hair, bristle, or fiber, blow the surface with compressed air, or vacuum the surface until all traces of blast products and abrasives are removed from the surface, pockets, and corners. If nozzle blasting is used to clean the joint opening, use compressed air that does not contain detrimental amounts of water or oil.

Examine the blast-cleaned surface and remove any traces of oil, grease, or smudge deposited in the cleaning operations.

Apply recommended primer in accordance with the manufacturer's recommendations. Uniformly coat the entire surface. Over application may affect adhesion. Allow to thoroughly dry before installing backer rod and sealant.

Install a circular backer rod that is a minimum 25 percent oversized into the joint approximately 1 in. below the surface. The backer rod shall be sized according to the manufacturer's recommendation for the size of the joint to be sealed as measured by the Contractor. If two (2) pieces must be joined, abut the two (2) ends and tape them together to prevent sealant run down. The backer rod may be installed by hand, but roller device shall be used to insure a consistent, uniform placement at the proper depth below the top surface.

Install the backer rod and silicone sealant in the blast-cleaned opening on the same day the surface is blast cleaned.

SEAL INSTALLATION

Install the silicone joint sealant(s) as indicated on the plans, in accordance with 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, to provide guidance for the proper installation of the silicone joint sealant(s).

The sealant must be recessed a minimum ½ in. below the pavement surface to prevent traffic abrasion or snow plow damage.

After a joint has been sealed, remove excess joint sealer on the pavement or bridge deck concrete as soon as possible.

The installed system shall be watertight and will be monitored until final inspection and approval.

Do not place pavement markings on top of pourable joint seals.

(B) Watertight Integrity Test

(1) Upon completion of each pourable silicone joint, perform a water test on the top surface to detect any leakage. Cover the roadway section of the joint from curb to curb, or barrier rail to barrier rail, with water, either ponded or flowing, not less than 1 inch above the roadway surface at all points. Block sidewalk sections and secure an unnozzled water hose delivering approximately 1 gallon of water per minute to the inside face of the bridge railing, trained in a downward position about six (6) inches above the sidewalk, such that there is continuous flow of water across the sidewalk and down the curb face of the joint.

(2) Maintain the ponding or flowing of water on the roadway and continuous flow across sidewalks and curbs for a period of five (5) hours. At the conclusion of the test, the underside of the joint is closely examined for leakage. The strip seal expansion joint is considered watertight if no obvious wetness is visible on the Engineer's finger after touching a number of underdeck areas. Damp concrete that does not impart wetness to the finger is not considered a sign of leakage.

(3) If the joint system leaks, locate the place(s) of leakage and take any repair measures necessary to stop the leakage at no additional cost to the Department. Use repair measures recommended by the manufacturer and approved by the Engineer prior to beginning corrective work.

(4) If measures to eliminate leakage are taken, perform a subsequent water integrity test subject to the same conditions as the original test. Subsequent tests carry the same responsibility as the original test and are performed at no additional cost to the Department.

BASIS OF PAYMENT

Pourable Silicone Joint Sealant will be measured and paid for at the contract unit price bid per linear foot and will be full compensation for furnishing all material, including backer rod, labor, tools, and equipment necessary for the removal of existing joint and installing these seals in place and accepted.

Pay Item	Pay Unit
Pourable Silicone Joint Sealant	Linear Feet

EPOXY COATING AND DEBRIS REMOVAL (SPECIAL)

GENERAL

This work applies to all bents and end bents of all bridges throughout the project as noted in the plans. Pressure wash, clean and epoxy coat top of the all bent and end bent caps under open joints and at the expansion joints of steel girder spans after painting of all girders is concluded.

Debris removal from the top of bent caps shall be incidental to epoxy coating the top of bent caps.

Use a Type 4A flexible and moisture insensitive epoxy coating in accordance with Section 1081 of the *Standard Specifications*. Provide a Type 3 material certification in accordance with Article 106-3 showing the proposed epoxy meets Type 4A requirements.

SURFACES

Apply the epoxy protective coating to the top surface area, including chamfer area of bent caps under open joints and expansion joints of the steel girder spans, excluding areas under elastomeric bearings.

Thoroughly clean all dust, dirt, grease, oil, laitance and other objectionable material from the concrete surfaces to be coated. Air blast all surfaces immediately before applying the protective coating.

Use only cleaning agents preapproved by the Engineer.

APPLICATION

Apply epoxy protective coating only when the air temperature is at least 40°F and rising, but less than 95°F and the surface temperature of the area to be coated is at least 40°F. Remove any excess or free-standing water from the surfaces before applying the coating. Apply one coat of epoxy protective coating at a rate such that it covers between 100 and 200 sf/gal.

Under certain combinations of circumstances, the cured epoxy protective coating may develop an oily condition on the surface due to amine blush. This condition is not detrimental to the applied system.

Apply the coating so the entire designated surface of the concrete is covered and all pores are filled. To provide a uniform appearance, use the exact same material on all visible surfaces.

BASIS OF PAYMENT

Epoxy Coating will be measured and paid for by the contract unit price per square foot and shall be full compensation for furnishing all material, labor, tools and equipment necessary for cleaning and coating the tops of bent caps. Debris removal from the top of bent caps shall be incidental to epoxy coating the top of bent caps.

Pay Item	Pay Unit
Epoxy Coating	Square Feet

BRIDGE JACKING (SPECIAL)

DESCRIPTION

Bridge jacking at end bents and interior bents is to facilitate beam or bent cap repairs and to replace and/ or reset bearings, as necessary. This work shall consist of furnishing all engineering, labor, equipment, and materials necessary for construction and subsequent removal of jacking support system, including jacks, jack supports, shims and all necessary blocking. Included under this item shall be all work to raise and support the existing structure as specified on the plans and as noted herein.

UTILITY COORDINATION

Utility owners with active utilities on the bridge shall be notified by the contractor of the jacking operation 30 days before the operation begins.

SCOPE OF WORK

Work for bridge jacking includes calculating existing and applied bridge loads, designing proper strength jacking scheme, evaluating stresses imposed on the bridge members, setting blocking and jacks, jacking bridge girders, mechanically locking jacks, and lowering bridge spans onto bearing assemblies.

Submit calculations, working drawings, and jacking procedure to the Engineer for review and approval prior to the start of work. Calculations and jacking procedure shall account for all loads expected while bridge is jacked or temporarily supported. Working drawings and all calculations (for determination of all applied loads, for design of the jacking scheme, to evaluate stresses imposed on the bridge members, and any other necessary calculations) for the required jacking scheme shall be sealed by an engineer licensed in the State of North Carolina. Included in the submittal, the Contractor shall submit all relevant information about the jacking system to be used.

Prior to bridge jacking, complete all diaphragm modifications necessary at the location where jacking is to occur. If a span connected to an end bent is to be jacked, ensure the curtain wall is either clear of the girders, or fully free to move with the jacked span prior to jacking. Lock jacks and install blocking while the bridge is in the raised condition. While in the raised condition, follow bridge plans for any work that may be required. After all repairs requiring bridge jacking are completed, lower the bridge onto the bearing assemblies. Complete repair work, as needed.

Unless otherwise allowed by the Engineer, all bridge jacking operations shall be complete before new deck overlay or deck joints and seals are placed on the existing structure.

Bridge jacking will be designated as one of two jacking arrangements, as follows:

Type I

Type I Bridge Jacking shall be applicable for jacking at individual beam or bearing locations. On a particular bridge bent or end bent, there might be more than one Type I Bridge Jacking. When jacking individual beam or bearing locations, all adjacent bearings of beams not being jacked may

be loosened to decrease the resistance of the deck slab during jacking. The maximum differential between adjacent beams that are being jacked is 1/8". Should the jacking of an individual beam require the jacking of adjacent beams to reduce stresses or damage in the bridge, the jacking of the individual beam and adjacent beams shall be considered one Type I Bridge Jacking. All bearings loosened shall be tightened back after repair operations are completed and the jacks and blocking have been removed.

Type II

Type II Bridge Jacking shall be applicable for jacking an entire span end (i.e., all beams at one time) on a bent or end bent.

BASIS OF PAYMENT

Payment will be made at the price bid for each set-up to complete *Type I Bridge Jacking Bridge No. 640021* or *Type II Bridge Jacking Bridge No. 640021* as shown in the contract plans. The price per each jacking set-up Type required will be full compensation for designing proper strength jacking scheme (calculations, working drawings, and jacking procedure), all materials, equipment, tools, labor, and incidentals necessary to complete the work of this scope, including any jacking frames, jacking plates, and concrete repair required due to jacking operations.

Payment will be made under:

Pay Item	Pay Unit
Type I Bridge Jacking Bridge No. 640021	Each
Type II Bridge Jacking Bridge No. 640021	Each

REMOVE AND RESET BEARINGS (SPECIAL)

DESCRIPTION

Remove and reset steel bearings at locations shown on the plans and as determined by the Engineer. Remove and reset bearings shall be done in conjunction with the concrete repairs to the top of the bent caps. This work shall consist of jacking the beam, removing and cleaning the bearing, removing the damaged concrete around the bearing, making the concrete repairs, resetting the bearing, and removing the jacking support system.

At locations where bearings are removed and reset, repair existing anchor bolts if the Engineer determines that they are damaged. This work shall consist of those items listed above as well as cutting and removing the damaged portion of the anchor bolt, and welding a new section of anchor bolt as shown on the plans.

SCOPE OF WORK

(A) Furnish and Install Anchor Bolt Nuts. Where anchor bolt nuts are missing, the anchor bolts shall be cleaned and their threads checked to be sure that they are usable with the approval of

the Engineer. If the threads cannot be made usable, new anchor bolts shall be installed as indicated below. New nuts shall be made or purchased to be placed on the existing bolts. New anchor bolt nuts shall be furnished and installed with the bolt threads burred above the new nut.

(B) Drill and Grout New Anchor Bolts. Where existing anchor bolts are missing, broken off, or their threads deteriorated such that missing nuts cannot be replaced on the existing anchor bolts; new anchor bolts shall be drilled and grouted in place and the bearing modified as shown in the plans. New anchor bolts shall match the original diameter of the existing anchor bolts. Portions of the existing anchor bolt that impede the new work shall be removed.

(C) Reset Bearings. The existing expansion bearing plates are out of position and shall be reset to the appropriate position, as indicated in the plans or as directed by the engineer. The Contractor shall jack the beam end at the expansion bearing and remove and reset the sole plate. The existing sole plate to embedded plate weld must be removed and surfaces ground smooth and the sole plate must be welded to the bottom flange with the size weld as shown on the contract drawings. The Contractor may jack bearings only when they do not have vehicular loads on them.

Requirements for Concrete Repairs and Bridge Jacking are found in their respective Project Special Provisions, found elsewhere in the project documents.

BASIS OF PAYMENT

Remove and Reset Bearings will be measured and paid in units of each. The price per each will be full compensation for repairing existing anchor bolts, all materials, equipment, tools, labor, and incidentals necessary to complete the work.

Pay Item	Pay Unit
Remove and Reset Bearings	Each

PRESTRESSED CONCRETE GIRDERS WITH THERMAL SPRAY ANODE (SPECIAL)

GENERAL

The work covered by this Special Provision includes removal of concrete in spalled and/ or delaminated areas of the existing prestressed concrete girders, in reasonably close conformity with the lines, depth, and details shown on the plans, described herein, and as established by the Engineer. This work also includes straightening, cleaning, and replacement of reinforcing steel; doweling/ adhesively anchoring new reinforcing steel or studs; repair and retensioning of damaged prestressing strand; removing all loose materials; removing and disposing of debris; formwork; applying repair material; and protecting adjacent areas of the bridge and environment from material leakage.

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.

The Contractor shall coordinate removal operations with the Engineer. No more than 30% of the bearing area under a beam shall be removed without a temporary support system and approval from the Engineer.

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.

Additionally, the work includes the application of Thermal Spray Anode (TSA) coating to select girders as specified in the contract plans. This application shall be performed by thermal spraying (metalizing) the concrete with the required surface preparation necessary to produce a good bond between the TSA coating and the concrete. A good bond is essential to provide an efficient galvanic cathodic protection (CP) system.

The installation specified in the plans is for a non-monitored system. In the non-monitoring type, the anode coating is electrically shorted to the reinforcing steel in the concrete, a small direct current will flow from the galvanic anode to the steel, and thus protect the steel from any further corrosion.

Furnish labor, materials, testing and installation equipment, and apply TSA coating on all surfaces within the CP zones defined in the Contract Documents or as directed by the Engineer.

The Contractor shall be mindful of the coordination required between the CP Specialist schedule to accomplish the required testing, and obtaining Engineer's approval to adhere to the overall project schedule. No additional time will be granted. The Engineer will stop work at any time without consequence to the Department due to poor workmanship, use of unapproved materials, or unapproved work procedure. The Contractor is ultimately responsible for the integrity and performance of all repairs and CP systems.

MATERIAL AND EQUIPMENT REQUIREMENTS

WORK VESSEL

Refer to the Securing of Vessels project special provision if utilizing barges or other vessels.

Provide an emergency boat with communication equipment (phone or radio) at the job site at all times when work is being performed. Assure that at any time any worker is present at the job site, there is immediate transportation to shore in the event of an emergency. The emergency boat shall be in addition to the boat provided for CP Specialist or NCDOT inspectors. Do not use the emergency boat as a work platform.

Materials

E. Grout Material

Grout shall only be used for backfilling of holes for continuity checking. Grout shall be on the NCDOT Approved Product List (APL) and shall have 15,000 ohm-cm resistivity or less. Use of admixtures such as flash, silica fume, or slag is not allowed.

F. Concrete Repair Material

Repair material shall be a polymer modified concrete repair material for vertical or overhead applications and shall be suitable for applications in marine environments with a maximum electrical resistivity of 15,000 ohm-cm. The selected material shall achieve a minimum compressive strength of 5,000 psi in seven days. Admixtures such as silica fume, fly ash, slag, and others that increase electrical resistivity are not allowed in repair concrete. Material shall be approved for use by NCDOT. Color of repair material shall be concrete gray.

Unless otherwise allowed by the repair material recommendations, forms shall remain in place until repair material achieves 75% of its design compressive strength.

METALIZING EQUIPMENT

The TSA coating shall be applied using electric-arc spray equipment. The arc spray equipment shall consist of a spray gun, wire feed unit, power supply and air compressor. To readily spray the coiled anode wire, a straightening device may be necessary. The Contractor shall be responsible for making any necessary modifications and adjustments to the thermal spray equipment so that the alloy wire can be sprayed to achieve the desired properties and adhesion.

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

QUALITY CONTROL

Personal Qualification - Metalizing Technicians

The metalizing technicians must have a minimum of two years of experience in the operation of metalizing equipment and shall have completed at least two projects of size similar to this project within the last five years. The metallizing technician shall hold a current (dated within the last 12 months) certificate of satisfactory completion of training from the metalizing equipment manufacturer.

Personnel Qualifications - CP Specialist Qualifications

Secure the services of a CP Specialist with the following qualifications:

1. A National Association of Corrosion Engineers (NACE) certification in CP of level CP-4 or a P.E. License.
2. A minimum of 5 years of experience in the installation and testing of CP systems to protect reinforced concrete structures.
3. Performed QC and performance testing of CP systems for concrete structures in a minimum of 3 projects in the past 5 years.
4. The CP Specialist shall be an independent subcontractor, not otherwise associated with the Contractor, the CP systems manufacturer, distributor, or any other entities providing materials or services for this project. The CP Specialist may be one firm for multiple CP systems or one firm for each of the single CP systems. No CP work will be allowed if at any time an approved CP Specialist is not active or otherwise involved in the project.

CP Technician(s), who work under the CP Specialist's direction, shall have the following qualification:

1. A minimum of 2 years of experience in the installation and testing of CP systems to protect reinforced concrete structures.

CP Specialist Responsibilities

CP Specialist shall provide the following services:

1. Review all Contractor Documents related to the CP work prior to submittal to NCDOT for approval.
2. Conduct a minimum of one QC visit to the job site per month.
3. Directly update the Engineer in writing monthly on the quality of the work along with a list of rejections or recommended corrections.
4. Certify QC Plan in accordance with this special provision and submit to the Engineer for approval.
5. Test and certify strand/stirrup continuity and continuity corrections.
6. Verify wire labels and inspect wires and splices after wiring is completed.
7. Certify overall installation of CP on each girder.
8. Submit a final report along with all the test data in an electronic format.

CP Specialist Quality Control Plan

Provide a Quality Control (QC) Plan certified by the CP Specialist. The Plan shall include all tasks to be performed by the CP Specialist, or the technician under his direction. The Plan shall include but not be limited to: verification of material compositions, verification of shop drawings prior to submittal, method and frequency of the Contractor's QC testing, methods of measuring electrical continuity, method of anode application, anode connection plate installation, voltages/currents/potentials measurements, time dedicated by the Contractor for proper training of thermal spray applicators, method of updating the Engineer, and method(s) for energizing of the CP systems.

CP Report

The CP Specialist shall also provide a final report to the Engineer describing the general characteristics of the metalizing work, installation sequence, results of the continuity testing, locations of continuity corrections (where applicable), electrical resistance measurements, reference electrode function, the thickness and bond strength results for each metalized component/zone, the required monthly updates sent to the Engineer describing the quality of work, and CP energizing results.

In the final report, the CP Specialist shall document (written/photo documentation) any unapproved deviations from the Contract Documents that pertain to the CP system along with the Department approved Request(s) For Information, Request(s) For Modification, Submittals, etc. for the approved deviations. Include in the final report, as an addendum. The report and all data shall be in typed form and a digital version of the report shall be provided along with 4 bound hard copies. Submit copies of the final report to the Engineer.

SUBMITTALS

The Contractor shall prepare and submit all required certifications, data sheets, shop drawings, materials and methods and submittals within 90 days after NTP. Work on girders shall not begin until the submittals are approved by the Engineer.

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.

Submit shop drawings of all the CP zones with dimensions.

Submit Aluminum-Zinc-Indium (Al-Zn-In) anode wire in accordance with the metallizing equipment manufacturer's recommendations. Submit a certified analysis (NCDOT Type 2 Certification) for each lot of anode wire material.

Submit a catalog cut sheet and the Material Safety Data Sheet (MSDS) for the breathable sealer.

Submit technical sheet and MSDS for the blasting media.

Submit technical specifications or manufacturers' certifications for marine grade epoxy, connection plates, fasteners, and strand repair materials in accordance with NCDOT Standard Specifications Section 106.

Submit a concrete mix design of the repair material. Provide method of application including manufacturer's technical specifications, formulation if applicable, and pot and curing times.

Submit manufacturer's technical specifications, method of application, formulation (if applicable), and pot and curing times for proposed cement grout material to backfill holes or excavations during continuity checking/correction and reference electrode installation.

Submit calibration certificate for all test equipment to be used in testing all CP related systems.

Submit qualifications of the CP specialist(s) and CP Technician(s) with experience records.

Submit a CP Specialist QC Plan.

Submit metalizing technician qualifications.

SURFACE PREPARATION

Concrete Removal

Refer to the contract plans for concrete repair locations. Mark all areas of concrete damage. Areas of concrete damage identified beyond what is shown in the contract plans shall be brought to the attention of the Engineer for confirmation. The Engineer is the sole judge in determining the limits

of deterioration. The Contractor shall not proceed further without the Engineer's confirmation and approval of additional repair locations.

Prior to removal, introduce a shallow saw cut a minimum ½" in depth around the repair area, at right angles to the concrete surface. Within the sawcut, remove all concrete to a minimum depth of ½". Remove all unsound concrete in the repair area, and where the bond between existing concrete and reinforcing steel has been compromised, or where more than half of the diameter of the reinforcing steel is exposed, remove concrete 1 inch behind the reinforcing steel. For concrete removal, use a 17 pound (maximum) pneumatic hammer with points that do not exceed the width of the shank or use 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. Prevent cutting, stretching, or damaging of reinforcing steel.

Remove concrete and prepare concrete substrate such that placement of repair material in forms will adequately fill the repair area and will not result in air pockets or honeycombed area. Inside faces of the excavation should generally be normal to the exterior face, except that the top should slope up toward the front of the form at an approximate 1-to-3 slope. Provide air vents as necessary. Interior corners should be rounded to a radius of approximately one inch.

Abrasive blast all exposed concrete surfaces and existing reinforcing steel and strand in the repair area to remove all debris, loose concrete, loose mortar, rust, scale, etc.

After blast cleaning, examine the reinforcing steel and prestressing strand. If there is more than 10% reduction in the diameter of reinforcing steel, splice in and securely tie supplemental reinforcing bars within the original concrete cover, lapping the bars sufficiently to develop the full strength of the bar and, if necessary, provide additional removal of concrete to achieve the required splice length. Reinforcing steel that is required for the repairs shall be in accordance with Section 425 of the *NCDOT Standard Specifications.*

If four or more prestressing strands have 50% or greater section loss from their original diameter, one half of the compromised strands shall be repaired by splicing of new strand section at the location of the section loss. Device for splicing shall be a turnbuckle type device and shall be submitted for approval before beginning work. New splice section shall match size of existing strand, and splice device shall be sized for that size strand. Do not splice two adjacent strands unless approved by the Engineer. For strands that are to be spliced, remove concrete such that full section of the prestressing strand is exposed for a minimum of six inches on each side of the section loss area. Following device manufacturer's recommendations, prepare the strand, removing concrete as necessary, and install splice device and new splice strand. Tensioning of the splice shall be turn-of-the-nut method.

At locations where strand splicing is required, replacement of concrete with repair material shall provide a minimum cover of one inch.

Thoroughly clean surfaces to be repaired and remove all loose materials. Remove grease, wax, salt, oil and other contaminants, as necessary for proper bond of repair material. Remove weak or deteriorated concrete to sound concrete by bush hammering, grit blasting, scarifying, water blasting, or other approved methods. Remove dirt, dust, laitance and curing compounds by blasting. Remove all dust and loose material with air blast or vacuum cleaning.

Electrical Continuity

Any strand that is broken but is not required to be spliced shall receive electrical continuity correction as shown in the contract plans.

Prior to applying the TSA coating, perform electrical continuity test among all outer layer of strands, stirrups, and any other steel components within the metalizing limits. Strands and other metals that are found to be discontinuous shall be made continuous with each other. Electrical continuity of the reinforcing steel shall be established during the concrete restoration operation, and shall be tested and approved by the CP Specialist.

Strands/rebar for continuity test shall be exposed by drilling a 0.5" diameter hole to each strand/rebar in the concrete and measuring inter-strand voltage using a high impedance voltmeter ($\geq$ 10MΩ). Where continuity corrections are required, additional concrete excavation may be necessary. All excavations required for continuity corrections shall be minimal. Continuity shall be provided by mechanical connection (U-bolt and similar approved) and a continuity wire to each strand/rebar requiring continuity correction inside the excavation. Trench, as needed, by means of saw-cutting a 0.5" wide trench (between continuity connection points) to place the continuity wire. Establish continuity by tying discontinuous reinforcement together with 16 gauge 316 stainless steel wire. No more than 5 strands shall be exposed at a time unless otherwise directed by the Engineer. The Contractor shall exercise great care to prevent damage to the existing reinforcing steel. The Contractor shall retest continuity between the connections. All electrical continuity work found to be discontinuous shall be repaired by the Contractor at no additional cost to the Department. Continuity shall be verified by the CP Specialist after the continuity corrections are completed. Fill trench to original profile with approved grout material after continuity is established.

The Contractor shall provide details of the procedure for continuity testing and corrections for approval by the CP Specialist. After approval by the CP Specialist, such procedure shall be included in the CP Specialist QC/QA Plan for approval by the Engineer.

Concrete Repairs

Prior to the application of concrete repair material, prepare concrete substrate as indicated in "Concrete Removal". Final preparation of the substrate concrete surface prior to repair material application shall be in accordance with the repair material manufacturer's recommendations.

When surface preparation is completed and electrical continuity has been approved by the CP specialist, mix and apply concrete repair material in accordance with manufacturer's recommendations. Use aggregate that is washed, kiln-dried, and bagged. As recommended by the repair material manufacturer, apply bonding agent to all repair areas immediately prior to placing concrete repair material. Repair areas shall be formed, unless otherwise approved by the Engineer. Form areas to establish the original neat lines of the member being repaired, unless

otherwise approved by the Engineer. After placing the concrete repair material and form removal, remove excessive material and provide a smooth, flush surface.

CP INSTALLATION

Blasting

All concrete surfaces to be metalized shall be thoroughly blasted with silica sand or other suitable material to remove all existing coatings, cement splatter or foreign materials prior to Al-Zn-In coating application. Sandblasting of the concrete should leave a clean, rough surface, which leaves the appearance of medium grit sandpaper (grit numbers from 60 to 100) without exposing the coarse aggregate.

The exposed steel shall receive an abrasive blast to remove any epoxy coating, mill scale, rust, oil, and/or other foreign matter present, to the extent that a near white appearance is obtained as per the Society for Protective Coatings (SSPC) SP-10 Standard. The abrasive stream should be directed normally perpendicular to the concrete surface or at an angle of approximately 15 degrees but no more than 30 degrees from the normal plane. Level of sandblasting of the concrete surface to achieve the highest possible bond of the TSA coating shall be determined in the field for every type of concrete present to receive metalizing. Blast material must be plant packaged and maintained in a clean and dry condition at all times. Material stored in the sand-blaster pot overnight shall not be used.

Connection for Connection Plates

After the concrete restoration areas are cured, the Contractor shall connect the zinc plate as shown on the Contract Document. The Contractor shall install the connections for the connection plates during the concrete removal/restoration operation. The surface of the concrete to be in contact with the connection plates shall be sufficiently smooth and uniform as to provide 100% contact between the plates and the concrete. The number of connection plates and method of installation are shown in the Contract Plans.

i. Installation of Anode Connection Plates for Non-Monitoring Sites

The anode connection plates facilitate a direct electrical connection between the sacrificial anode and the reinforcing steel. For each anode connection plate, a threaded stainless steel rod (stud) shall be attached to the rebar to facilitate attachment of the anode connection plate, as shown on the Contract Document.

TSA COATING APPLICATION

Test Sections-Target Bond

Prior to commencing the arc-spraying operation, the Contractor shall metalize a minimum of four on-site test sections with minimum dimensions of four square feet each. The work on test section shall not proceed without the presence of Engineer. The Contractor shall coordinate his work on test sections with the Engineer's schedule and availability. These test sections shall be used to determine the field application rate for the specified thickness and the grain size, texture acceptability and target adhesion strength. The test sections shall cover representative sections of all the concrete conditions present on the bridge to receive metalizing. Bond strength on the test

sections shall be measured at no less than 24 hours after metalizing and shall be conducted as described by ASTM D4541 (latest version). All bond tests shall be made in triplicate and the results averaged.

Preliminary test areas and adhesion tests shall be performed on the bridge prior to commencing production metalizing. Adhesion strength shall be measured on all test sections to determine the target bond for production and acceptance. Target bond shall be established based on the higher strengths obtained from the test areas. It is expected that a minimum of 150 psi of bond strength will be achieved and strengths lower than the expected will not be accepted. Various levels of sandblasting of concrete at the test sections may be necessary to determine the proper surface condition to achieve the target bond. The Contractor shall provide a minimum of 14 days advanced notice for the preparation and metalizing of the test sections such that the CP Specialist and appropriate Department personnel be present for the application and testing.

Prior to TSA coating application, the concrete surface shall be air blasted to remove any residue from the sandblasting operation. Air stream shall be 100% moisture free and discharge a minimum pressure of 50 psi. Moisture and pressure of the air stream shall be tested on a daily basis.

TSA Coating Application

Metalizing shall be performed on completely dry concrete. Thermal spraying operation shall not be performed during periods where rainfall, high seas, rough waters or any other wet conditions are present. TSA coating shall not be performed when excessive wind is blowing which could interfere with the operation as determined by the Engineer. The Contractor shall be responsible for compliance with any Federal, State or local codes regulating the quality of the surface waters.

Metalizing shall cover the concrete restored area and to the limits as shown on the Contract Documents. The coating should be applied in multiple passes and should overlap on each pass in a crosshatch pattern before the first layer of material cools down. Uniform gun movement should be used to ensure a consistent thickness. Metalized areas shall have uniform appearance, free of visible coating defects such as: cracking, burning, blistering, uncoated areas, and other similar defects that will affect the functioning of the coating. Sufficient anode material shall be sprayed to achieve an average thickness of 16 mils. This should correspond to a deposition rate of 0.2 pounds per square foot of sprayed area. Typically, each pass results in 4 mil thick anode coating. A total of 4 passes should correspond to a thickness of 12 to 16 mils. The thickness of the anode coating shall be a minimum of 12 mils but not exceed 16 mils. Material usage logs shall be used to document installation of the proper anode quantity. Metalizing shall only be applied to surface areas that have been properly prepared as per this Project Special Provision and approved satisfactory by the Engineer. Metalizing shall be continuous and un-interrupted within each repair area. Cold overlaps of the TSA coating will only be allowed for deficiencies correction.

Metalizing Time Window

Coordinate the metalizing and concrete restoration operations such that metalizing is completed and connected to the reinforcement on each component at no less than 10 days and no more than 90 days after concrete repair/restoration operation. Metalizing shall be completed within two hours following sandblasting and before any contamination on the concrete occurs.

Thickness Measurements

A minimum of one thickness measurement shall be obtained at 100 square foot intervals of production, Measurements shall be obtained and recorded by the Contractor as part of the Contractor's QC, and verified by the Engineer. Thickness measurements shall be obtained using a spherical anvil and spindle micrometer with digital display capable of performing measurements ranging from zero to one inch. Electronic thickness measuring devices may be allowed as approved by the Engineer. The Contractor shall use his measuring equipment in the test areas and coordinate the results with the equipment used by the Engineer/CP specialist prior to using his test equipment during installation of CP anode.

Where deficient coat thickness values are found, the deficient section and the immediate surface around (one square foot minimum), shall receive additional coating so that the coat thickness of the repaired area will reach a minimum of 12 mils. This shall be performed immediately (not to exceed 2 hours) following the first application or the metalizing shall be removed and the element shall then be re-metalized to cover the entire limits identified in the Contract Plans.

Bond Strength Test

The Contractor shall use his measuring equipment in the test areas and coordinate the results with the equipment used by the Engineer/CP specialist prior to using his test equipment during installation of CP anode.

The Contractor shall conduct a minimum of one coating adhesion strength test (pull-off test) at every 100 square feet of anode. Each spot measurement shall be made in triplicate and the values averaged to comprise a test. Results shall be recorded by the Contractor, reviewed by the CP Specialist, and shall be subject to verification by the Engineer.

Pull-off tests shall be conducted using a mechanical 0 to 500 psi, fixed alignment adhesion tester as per ASTM -D 4541 (latest version) using 20 mm dollies. Pull-off strength shall be a minimum of 90% of the target values determined from the preliminary on-site test areas on the bridge. Measurements shall be obtained at no less than 3 hours after metalizing but at no more than 72 hours. Limits of areas not meeting the required bond strength shall be identified and marked, and then blasted clean of all sprayed metal prior to re-spraying as directed by the Engineer. Description of such areas shall be included in the CP report.

TSA Coating Uniformity

Surfaces not intended to be metalized that are adjacent or in close proximity to the surface to be metalized, shall be protected with suitable masking during the TSA coating application. The masked surfaces shall form neat horizontal and vertical lines. Surfaces of the TSA coated sections shall be uniform in appearance, free of visible coating defects such as; cracking, burning, blistering and un-coated areas and/or other defects that will affect the function and/or durability of the coating. The Contractor shall visually inspect the surface of the metalizing to ensure the above using a lens with a minimum magnification of 10. The coating uniformity is subject to verification by the Engineer and the Engineer’s decision is final.

TSA Coating Defects

If a defective coating area is found, the correction shall be performed in the same manner as for deficient thickness correction. Sandblasting of the defective areas may be required as directed by the Engineer. Cold overlaps during reapplication may be necessary. However, re-application on

the sprayed Al-Zn-In anode over previously metalized areas shall not blister, burn, or otherwise damage the bottom anode layer. Should this occur, the entire element should be sandblasted and re-metalized.

BREATHABLE SEALER

After TSA coating is approved satisfactory by the Engineer, the Contractor shall apply a coat of breathable sealer over the metalized areas. The Contractor shall apply this sealer only after the Engineer approves and accepts the sprayed anode. The sealer shall be Prmakote, or approved equal. The breathable coating shall have a minimum dry film thickness of 5 mils. A minimum of three thickness measurements shall be obtained per metalized zone or as directed by the Engineer. Concrete surfaces adjacent to the areas receiving breathable coating shall be masked during sealer application to protect from over spraying or over-run. The masked surface shall form clean horizontal/vertical lines.

Prmakote is a non-sacrificial sealer. It is water based and breathable. It is manufactured by Visual Pollution Technologies, Inc. (480) 657-9183.

The following alternate breathable sealers are allowed to be used upon approval by the Engineer:

1. Sure Klean® Weather Seal Blok-Guard® & Graffiti Control II
   ProSoCo, Inc.
   3741 Greenway Circle
   Lawrence, KS 66046
   Phone: (800) 255-4255

2. Si-COAT® 531™
   CSL Silicones Inc.
   144 Woodlawn Rd. W.
   Guelph, ON N1H 1B5
   Canada
   Phone: 1 (519) 836-9044

MEASUREMENT AND PAYMENT

Unless otherwise approved by the Engineer, take all measurements horizontally and vertically. The method or combination of methods of measurements shall be those that will reflect, with reasonable accuracy, the actual surface area of finished metalized work as determined by the Engineer.

Prestressed Concrete Girder Repair 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, reinforcing steel, 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 reinforcing steel, cost of temporary work platform, testing of the soundness of the exposed

concrete surface, furnishing and installation of concrete repair material/grout material, curing and sampling of concrete repair material, and protection/cleaning of adjacent areas from splatter or leakage.

Reinforcing Steel that is required for the repairs will be in accordance with Section 425 of the Standard Specifications.

Splicing of Prestressing Strand will be measured and paid for at the contract unit price bid per each and will be full compensation for removal, containment and disposal off-site of unsound concrete and compromised prestressing strand, including the cost of materials, prestressing strand, turnbuckle strand splice device, labor, tools, equipment and incidentals necessary to complete the repair work. The Contractor and Engineer will determine quantities after removal of unsound concrete and blast cleaning of prestressing strand and before prestressing strand repair. Payment will also include the cost of blast cleaning, removal of concrete necessary for installation of splice devices, installation of splice devices, and tensioning of the strand and splice section.

TSA Full length (Non-Monitoring) shall be at the unit price and shall be made based on actual area (square feet) of metalized concrete surface approved satisfactory by the Engineer. Payment shall provide full compensation for related items including but not limited to surface preparation, TSA coating application, breathable sealer application, CP Specialist services, testing, continuity corrections, manufacturer's representative, anode connection plates, threaded rods, reference electrodes, and any other incidental items associated with this work.

Pay Item	**Pay Unit**
Prestressed Concrete Girder Repair	Cubic Feet
Splicing of Prestressing Strand	Each
Prestressed Concrete Girders with Thermal Spray Anode (Non-Monitoring)	Square Feet

GALVANIZED PEDESTRIAN SAFETY RAIL **(SPECIAL)**

The Contractor shall remove the existing railing, furnish and place an in-kind new metal Galvanized Pedestrian Safety Rail in accordance with the plans and Standard Specifications or as directed by the Engineer. The Contractor shall field verify the existing railing dimensions and provide the Engineer shop drawings for approval of the proposed railing prior to purchasing materials. It is up to the Contractor to determine if the existing railing's anchoring system is adequate for securely anchoring of the proposed railing, if it is not the Contractor should include the required anchoring system in the shop drawing submittal.

Galvanized Pedestrian Safety Rail will be measured and paid for the actual number of linear feet furnished, installed and accepted by the Engineer. These prices and payments will be full compensation for all removal and disposal of existing railing system, materials, labor, equipment, tools, and incidentals necessary to satisfactorily complete the work

Payment will be made under:

Pay Item	**Pay Unit**
Galvanized Pedestrian Safety Rail	Linear Feet

BEAM END EPOXY PROTECTIVE COATING (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, prestressing steel and applying epoxy.

The location and extent of repairs shown on the plans are specific to the ends of prestressed beams.

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.

Epoxy Protective Coating shall be governed by Section 420-18.

MATERIAL REQUIREMENTS

Concrete surface preparation materials shall be submitted by the Contractor and approved by the engineer prior to use. Potential implements, include but are not limited to hammers, brushes, needles, saws, grinders and other mechanical tools, sand blast media, shot blast media, pressurized air and water.

Epoxy shall be Type 4A per Section 1081 of the Standard Specifications.

Other materials are as specified in Section 420 of the Standard Specifications.

SURFACE PREPARATION

Prior to performing any surface preparation, repair deteriorated concrete in accordance with concrete documents. Remove all deteriorated concrete with tools as described above or as directed by the Engineer. Do not cut or remove the existing reinforcing steel except as described in the plans. Unless specifically directed by the Engineer, do not remove concrete deeper than ¼-inch.

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, grit blasting, scarifying, water blasting, or other approved methods. Remove dirt, dust, laitance and curing compounds by grit blasting, 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.

Use proposed methods of surface preparation to achieve a concrete surface profile of CSP 3 per ICRI guidelines 310-2

Thoroughly clean the repair area of all dirt, grease, oil or foreign matter, and remove all loose or weakened material before applying epoxy.

Contain areas where concrete surface preparation is being performed and ensure no foreign substances leave the containment or enter the water. All removed material, debris, dirt, etc will be removed from the beam end and cap and removed of off-site in accordance with Standard Specifications.

APPLICATION AND SURFACE FINISH

When surface preparation is completed, apply epoxy to the areas specified in the contract plans and established by the Engineer. Apply epoxy mortar to damp surfaces only when approved. In such instances, remove all free water by air-blasting.

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

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

MATERIAL TESTING & ACCEPTANCE

Concrete Surface Profiles shall be verified per ICRI Guidelines 310.

MEASUREMENT AND PAYMENT

Beam End Epoxy Coatings will be measured and paid for at the contract unit price bid per square foot of end coated 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. The Contractor and Engineer will measure quantities based on plan amount for beam ends. Payment will also include the cost of sandblasting, surface cleaning and preparation, cleaning of reinforcing steel, cost of temporary work platform, testing for soundness, curing of epoxy and any necessary testing.

Payment will be made under:

Pay Item	Pay Unit
Beam End Epoxy Coatings	Square Foot

GALVANIC CATHODIC PROTECTION INTEGRAL PILE JACKET (SPECIAL)

GENERAL

The work under this Special Provision consists of supplying, installing, testing, and energizing Cathodic Protection (CP) system for selected piles, as shown on the Contract Documents. The CP system requires continuity between all embedded steel components on designated prestressed piles, wire connection to the steel reinforcement, installation of integral zinc mesh anode factory installed in fiberglass CP jackets, and installation of bulk zinc anodes at an elevation below the CP jacket in accordance with the Contract Documents.

Piles identified in contract plans as anticipated structural pile jackets are based on previous Bridge Inspection Reports.

The Contractor shall coordinate the installation of anode jackets with other construction operations. Special caution on scheduling may be required to prevent damage to any installed components by subsequent operations. Any damage to already installed CP systems shall be promptly repaired by the Contractor at no additional cost to the Department.

At some shallow water locations minor hand excavation (up to 2ft) may be required to place the bulk zinc anode below the jacket as detailed on plans. No jetting is permitted, only hand excavation will be allowed. The mudline must be returned to original condition. Cost of these operations shall be considered incidental to the CP system installation.

The Contractor shall be mindful of the coordination required between the CP Specialist schedule to accomplish the required testing, and obtaining Engineer's approval to adhere to the overall project schedule. No additional time will be granted. The Engineer will stop work at any time without consequence to the Department due to poor workmanship, use of unapproved materials, or unapproved work procedure. The Contractor is ultimately responsible for the integrity and performance of all repairs and CP systems.

MATERIALS AND EQUIPMENT REQUIREMENTS

Work Vessels

Refer to the Securing of Vessels project special provision if utilizing barges or other vessels.

Provide an emergency boat with communication equipment (phone or radio) at the job site at all times when work is being performed. Assure that at any time any worker is present at the job site, there is immediate transportation to shore in the event of an emergency. The emergency boat shall be in addition to the boat provided for CP Specialist or NCDOT inspectors. Do not use the emergency boat as a work platform.

Materials

Fiberglass Jacket

Use fiberglass jacket forms composed of a durable, inert, corrosion resistant material with an interlocking joint along two sides that permits the form to be assembled and sealed in place around the pile. Fabricate the forms from fiberglass and polyester resins. The jacket forms shall have a minimum thickness of 1/8 inch. Ensure the form is capable of maintaining its original shape without additional support or damage when placed around a pile. Ensure the inside face of the form has no bond inhibiting agents in contact with the jacket concrete material. Provide the forms with bonded or bolted-on, non-metallic standoffs to maintain the forms in the required positions. Sandblast or score the inside surface of the forms with an abrasive material to provide a rough surface texture to ensure bond with the jacket concrete. Equip the forms with a compressible sealing strip at the bottom which will effectively seal the annular space between the pile and the form. Use non-metallic hardware for pumping ports. Fabricate the pile jacket form and have it inspected and approved by the Engineer prior to placement on piles. Promptly remove any pile jacket form that is rejected by the Engineer from the project.

The forms shall meet the following physical property requirements of Table 1:

Table 1: Physical Requirements of Stay-In-Place Forms	
Water Absorption (ASTM D 570)	1% maximum
Ultimate Tensile Strength (ASTM D 638)*	9,000 psi minimum
Flexural Strength (ASTM D 790)*	16,000 psi minimum
Modulus of Elasticity (ASTM D 790)	700,000 psi minimum
IZOD Impact (ASTM D 256)	15 lb/ inch minimum (unnotched specimen)
Barcol Hardness (ASTM D 2583)	45 minimum
Color: Similar to Federal Color Standard No. 595, Table VII, Shade No. 36622. The color must be integral in the form gel coat.	
* On original specimens, whose flat surfaces are not machined to disturb the fiberglass.	

Zinc Mesh Anode

Place the zinc mesh anodes in direct contact with the inside face of the fiberglass jacket form. The zinc mesh anode shall be suitable for encapsulation in jacket concrete. The zinc mesh shall conform to ASTM B-69 with the following composition:

Lead (Pb)	0.003% weight max
Iron (Fe)	0.001% weight max
Cadmium (Cd)	0.001% weight max
Copper (Cu)	0.7-0.9% weight max
Aluminum (Al)	0.001% weight max
Titanium (Ti)	0.001% weight max
Magnesium (Mg)	0.0005% weight max
Manganese (Mn)	0.001% weight max
Nickel (Ni)	0.001% weight max
Tin (Sn)	0.001% weight max
Zinc (Zn)	Balance

The zinc mesh shall have the following physical properties:

Electrical conductivity	28% min
Solid zinc density	0.26 PCI
Weight of expanded mesh	1.6 PSF
Open area of expanded mesh	53% (density)
Solid zinc sheet thickness	3/32"

The zinc mesh shall have the following geometrics:

0.500" hex pattern
0.125" strand width in short direction
0.500" strand width in long direction
0.320" short opening
0.750" long opening

Bulk Zinc Anode

One 48 lb bulk zinc anode is required for the CP system to complement the CP jacket. The bulk zinc anode shall conform to ASTM B-418 for a Type I anode and shall be 99% pure zinc with a steel strap core. The steel strap shall be hot dip galvanized with a minimum zinc thickness of 0.005 inch. A 3/4-inch diameter hole shall be predrilled at each end of the steel strap prior to galvanizing.

Grout Material

Grout shall only be used for backfilling of holes for continuity checking or electrode installation. Grout shall be on the NCDOT Approved Product List (APL) and shall have 15,000 ohm-cm resistivity or less. Use of any admixtures that increase electrical resistivity such as flash, silica fume, or slag is not allowed.

Jacket Concrete

Use concrete material for both non-structural and structural jackets unless otherwise specified in the Contract Documents.

For jacket concrete, use “Drilled Pier Concrete” in accordance with the requirements of NCDOT Standard Specifications Sections 1000 and 1024 with an adjusted slump of 7 to 9 inches. Reduced size coarse aggregate may be used as approved by the Engineer. Fly ash, slag, or silica fume is not allowed for cathodic

protection jackets. Perform sampling and testing in accordance with NCDOT Standard Specifications Section 1000. Hardened concrete will be accepted on the basis of strength test results.

Total amount of chlorides for jacket concrete shall not exceed 0.4 pounds per cubic yard of jacket concrete. Total amount of chloride will be tested at a random basis as directed by the Engineer.

Water

Use water that is in accordance with the requirements of NCDOT Specifications Section 1024-4 & 1026-4 for all jacket concrete mixing. Use potable water for cleaning, rinsing, or any other application that requires direct contact with the piles.

Reinforcing Steel

Use bare deformed reinforcing steel in accordance with the requirements of NCDOT Standard Specifications Section 1070 for all structural and non-structural jackets

Conduit, Junction Box, and Hardware

All conduit shall be schedule 80 PVC (unless noted otherwise in the Contract Plans) and sunlight resistant. All junction boxes, conduit outlet bodies, and fittings shall be sunlight resistant PVC, rated NEMA 4X, rated for use with schedule 80 conduits, have a cover with gasket and Type 316 Stainless Steel screws. Conduit fasteners, hangers, access fittings, junction boxes and any other conduit accessories shall be mounted to concrete surfaces using bolts and lock washers, which shall be threaded into structural drop-in anchors of at least 1/2" diameter inserted into holes drilled into the concrete. All conduit clamps shall have two support holes.

All wire terminations shall be housed in junction boxes which shall be encapsulated in a liquid insulation spray to prevent any moisture intrusion and to provide electrical insulation from other nearby connections or wires. A weep hole shall be provided in the base of each junction box.

One link bar or shunt shall be furnished inside the junction box. Shunts (for monitoring sites) shall have a calibrated resistor with resistance of 0.1 ohm, rated to 2 amperes.

All hardware, including junction box lock rings for the installation of the PVC conduits, junction boxes, and electrical connections shall be Type 316 Stainless Steel, unless otherwise specified.

Wires

Positive (zinc mesh) and negative (rebar) lead wires shall be No. 10 AWG copper strand wire, with HMWPE, color coded red for positive DC voltage supplied and black for the negative DC return.

All wires shall be pre-tinned and uniquely color coded.

Reference Electrodes (for Monitoring Piles)

One reference electrode shall be installed in each pile designated as a monitoring pile. Reference electrodes shall be silver/silver chloride reference electrodes suitable for permanent embedment in concrete. The electrodes shall be supplied with a #14 AWG stranded copper lead wire with HMWPE blue insulation to reach and enter the junction box without splicing. The lead wire to reference electrode connection shall be completely sealed to prevent moisture penetration into the connection. All silver/silver chloride reference electrodes shall be individually packaged in a sealed plastic container and delivered to the job site.

A #14 AWG stranded copper lead wire with HMWPE black insulation shall be connected to the rebar/strand as the ground wire for each reference electrode.

All silver/silver chloride reference electrodes shall be calibrated against a calomel electrode in a saturated calcium hydroxide solution. A digital multimeter with a high internal resistance (≥10 MΩ) and with a resolution of at least 1mV shall be used. The negative (black) lead shall be connected to the reference cell, and the positive (red) lead shall be connected to the calomel reference electrode. Acceptable reference electrodes shall have stable reading of ±5 mV compared to the theoretical value at the typical room temperature of 73˚F. The data shall be tabulated along with the date and temperature of the calcium hydroxide solution and submitted to the Engineer. All reference cells shall be tested and approved by CP Specialist for use on this project prior to installation. The CP Specialist shall submit the reference electrode test data to the Engineer within 2 days of the test date. Any reference electrode that fail the test shall be rejected by the CP Specialist and shall not be used in this project. All rejected reference electrodes shall be promptly removed from the project site.

QUALITY CONTROL

Personnel Qualifications - CP Specialist Qualifications

Secure the services of a CP Specialist with the following qualifications:

1. A National Association of Corrosion Engineers (NACE) certification in cathodic protection of level CP-4 or a P.E. License.
2. A minimum of 5 years of experience in the installation and testing of CP systems to protect reinforced concrete structures.
3. Performed QC and performance testing of CP systems for concrete structures in a minimum of 3 projects in the past 5 years.
4. The CP Specialist shall be an independent subcontractor, not otherwise associated with the Contractor, the CP systems manufacturer, distributor, or any other entities providing materials or services for this project. The CP Specialist may be one firm for multiple CP systems or one firm for each of the single CP systems. No CP work will be allowed if at any time an approved CP Specialist is not active or otherwise involved in the project.

CP Technician(s), who work under the CP Specialist's direction, shall have the following qualifications:

1. A minimum of 2 years of experience in the installation and testing of CP systems to protect reinforced concrete structures.

CP Specialist Responsibilities

CP Specialist shall provide the following services:

1. Review all Contractor documents related to the CP work prior to submittal to NCDOT for approval.
2. Conduct a minimum of one QC visit to the job site per month.
3. Directly update the Engineer in writing monthly on the quality of the work along with a list of rejections or recommended corrections.
4. Certify QC Plan in accordance with this special provision and submit to the Engineer for approval.
5. Test and certify strand/spiral continuity and continuity corrections.
6. Verify and certify wire connections to strand and supplemental steel.
7. Verify and certify wire connection to the anode.
8. Verify and certify the reference electrode is operational prior to installation and after installation.
9. Verify wire labels and inspect wires and splices after wiring is completed.
10. Certify overall installation of each CP pile jacket.
11. Energize each CP pile jacket.
12. Submit a final CP report along with all the test data in an electronic format.

CP Specialist Quality Control Plan

Provide a QC Plan certified by a CP Specialist for Engineer's approval. The Plan shall include all tasks to be performed by CP Specialist, or the technician under his direction. The Plan shall include but not be limited to: verification of material compositions, verification of shop drawings prior to submittal, method and frequency of the Contractor's QC testing, methods of measuring electrical continuity, anode installation, voltages/currents/potentials measurements, energizing procedure, and method of updating the Engineer.

CP Report

Provide a final report produced by the CP Specialist for the CP systems. The report shall describe the general characteristics of the systems, installation sequence, results of the continuity testing, location of continuity corrections (where applicable), electrical resistance measurements, reference electrode function, the required monthly updates sent to the Engineer describing the quality of work and CP energizing results.

In the final report, the CP Specialist shall document (written/photo documentation) any unapproved deviations from the Contract Documents that pertain to the CP system along with the Department approved Request(s) For Information, Request(s) For Modification, Submittals, etc. for the approved deviations. Include in the final report, as an addendum, the required monthly updates from the CP Specialist to the Engineer regarding the status of CP work. The report and all data shall be in typed form and a digital version of the report shall be provided along with 4 bound hard copies. Submit copies of the final report to the Engineer.

SUBMITTALS

The Contractor shall prepare and submit all required certifications, data sheets, shop drawings, materials and methods and submittals within 90 days after NTP. Work on piles shall not begin until submittals are approved by the Engineer.

Submit shop drawings of jacket and bulk anode installations detailing the location of standoff spacers, method of performing the surface preparation, method of fastening jacket form to pile, method of sealing the forms after installation, method of bracing during jacket concrete placement, method of and staging for jacket concrete placement, details of access holes for reference electrodes, and method of cutting and sealing pumping ports.

Submit shop drawings of electrical work for the CP system, including negative connections to the steel, continuity check and correction procedures, installation of reference electrodes, and installation of wires, conduit, and junction box.

Submit a Concrete Pumping Plan for review and approval by the Engineer. Include in the Plan as a minimum: 1) equipment and positioning (along with any required road/lane/bridge closures), 2) estimated time of placement per jacket, 3) port pumping sequence, 4) method of sealing ports, 5) concrete test protocol at discharge point and, 6) method of collecting flushed material.

Submit certified laboratory test results for the fiberglass jacket form.

Submit certified test results (dated within six months for the particular heat) of the chemical composition of the anodes (both mesh anode and bulk zinc anode). Submit manufacturer certification stating that the dimensions and physical characteristics of the anode meet the requirements of the Contract Documents.

Submit reference electrodes' catalog cut and installation diagram with recommendation by CP Specialist. Demonstrate the reference electrodes submitted meet the requirements of this Special Provision. Include operations and maintenance data sheets for reference electrodes.

Submit technical sheet and MSDS for the blasting media.

Submit technical specifications or manufacturers' certifications for wires, conduits, dowel bars, junction boxes, marine grade epoxy, and epoxy mastic in accordance with NCDOT Standard Specifications Section 106.

Submit a concrete mix design of the jacket concrete.

Submit manufacturer's technical specifications, method of application, formulation (if applicable), and pot and curing times for proposed cement grout material to backfill holes or excavations during continuity checking/correction and reference electrode installation.

Submit calibration certificate for all test equipment to be used in testing all CP related systems.

Submit qualifications of the CP specialist(s) and CP Technician(s) with experience records.

Submit a CP Specialist QC Plan.

CONSTRUCTION

Initial Water Level Survey

The Contractor shall survey mean low water (MLW) level and mean high water (MHW) level and Submit to the Engineer prior to starting any concrete repair work or ordering CP jackets. The Contractor shall review the contract plans provided by NCDOT and submit a list which shall include the length of jacket and positioning of the bottom of the jacket (in relation to the MLW) for each pile and obtain approval from the engineer before starting any concrete removal work or placing orders for the jacket.

Concrete Removal & Surface Preparation

Remove all cracked or delaminated concrete and excavate to a depth of 3/4 to 1 inch behind the exposed reinforcement. Limit the size of chipping hammers to 20 pounds unless otherwise approved by the Engineer. The Contractor shall exercise extreme caution not to damage the existing prestressed strand and spiral ties during removal/repair operations.

Thoroughly clean all pile surfaces that the jacket will cover. Remove all oil, grease, dirt, delaminated/damaged concrete, marine growth and any other deleterious material that would prevent proper bonding of the jacket concrete material. Sandblast all exposed reinforcing steel to the Society of Protective Coatings (SSPC)-SP10, near white, to remove all rust and scale before installing the pile jacket. Water blast or mechanically clean reinforcing steel exposed under water by methods and with equipment approved by the Engineer. Clean existing concrete surfaces by sandblasting, wet blasting, wire brushing, water laser, or other methods approved by the Engineer which will provide a clean surface for proper bonding of the jacket concrete. Do not place the jacket until the surface preparation is approved by the Engineer.

Positive (Anode) and Negative (Rebar) Connections

Braze or resistance weld one end of each of the two negative lead wires to the spiral tie (that was exposed during the continuity test) and route them to the junction box. The brazed/welded connections shall be coated with two coats of 100% solids non-conductive epoxy such that no copper wire or weld will be in contact with concrete or patching material.

Braze a No. 8 AWG copper strand wire with HMWPE insulation to the steel bar at the bulk zinc anode. Brazing of the connection wire to the bulk anode should be performed prior to anode installation. Route the copper wire in conduit, terminate the wire inside the junction box, as described in Section 5.8.

The free ends of the copper wires shall be connected in the junction box as shown in the Plans. Soldered marine grade, tin coated electrical ring connectors or other approved weatherproof permanent connections shall be used as wire terminations. Connect the negative leads to the anode wires from the CP jacket mesh anode and the bulk anodes only inside the junction box, as shown in the Plans.

The following wires shall be present:

1. Two spiral tie (negative) (cathode)
2. Two additional steel reinforcement (negative) (cathode)
3. Two bulk anode (positive) (anode)
4. Two zinc mesh (positive) (anode)

For monitoring piles, one additional reference electrode wire and one additional reference electrode ground wire shall be present, as shown in the Contract Plans.

Establishing Continuity

Prior to installing the jackets, perform electrical continuity testing between all existing strands, spiral ties & vertical reinforcing steel and the new steel, and any other steel components to receive cathodic protection. Strands and other metals in the piles that are found to be discontinuous shall be made continuous with each other. Strands for continuity test shall be exposed by drilling a 0.75" diameter hole to each strand in the concrete and measuring inter-strand voltage using a high impedance voltmeter. Holes to access the strands shall be staggered at 1' intervals within the top 1' of the CP jacket.

Continuity shall be provided by resistance welding two continuous solid steel wires to each strand requiring continuity correction inside the excavation.

Continuity shall be performed by the CP specialist prior to coating with epoxy. Any discontinuity found shall be repaired by the Contractor. Where continuity corrections are required, additional concrete excavation may be necessary. All excavations required for continuity corrections shall be kept minimal. Continuity corrections shall be verified by CP specialist on all strands after continuity corrections are completed by the Contractor. Continuity welds shall receive a coat of 100% solids, non-conductive epoxy such that no weld comes in contact with the concrete.

Special care shall be observed to avoid cutting any of the strands or spiral ties during drilling, saw cutting, and/or grooving operation. The strand and the weld in excavations shall not be left exposed for more than 7 days. Any hole or excavation for continuity testing/correction performed inside and outside the jacket limits shall be filled with an approved grout/patch material prior to installing the jacket.

Reference Electrode Installation (for Monitoring Piles)

One Silver-Silver Chloride reference electrode shall be installed in each monitoring pile. Reference electrodes shall be installed as per manufacturer recommendations at depth of steel and shall be installed at an elevation of 6 inches above MHW. The exact location of the reference electrode shall be determined by the CP Specialist and submitted to the Engineer for approval.

The reference electrodes shall be located and installed in accordance with the Plans. Once the reference electrode is installed, AC resistance between reference electrode lead wire and ground wire shall be measured and documented. The AC resistance shall be no greater than 15,000 ohms. The half-cell potential of the rebar shall be measured to check the stability of reference cells. The potentials obtained using a high-impedance multimeter shall not be unstable. Any reference electrode that is not stable shall be replaced by the

Contractor with a new reference electrode. The potential readings of stable reference electrodes shall not vary by more than 20mV in 10 minutes.

Jacket Placement

The zinc mesh/fiberglass jacket halves shall be placed around the pile within 24 hours after the concrete surface preparation is approved by the Engineer. Place the jacket in position around the pile; secure and seal the interlocking joint(s), and seal the bottom of the form against the pile surface with the compressible seal and an epoxy mastic suitable for underwater application. Adjust stand-offs as necessary to prevent misalignment and install temporary hard backing to prevent deformation. Place a temporary plastic wrap around the form prior to placement of the hard backing to protect the gel coat. After jacket halves have been placed, route the two anode mesh wires coming out of the jacket in conduit so that the free end of the wire terminates inside the junction box for fastening later. At no time shall any system wires be allowed to touch/enter the water.

Bulk Zinc Anode Installation

Attach the bulk zinc anodes to the pile in accordance with the Contract Plans. Route the bulk zinc anode wires to the junction box through the CP jacket form as shown in the Contract Plans.

Jacket Concrete Placement

Wet to saturation the surface of the pile immediately prior to placing the jacket concrete. Place the jacket concrete in one continuous pour at no more than 72 hours after surface preparation. Fill the annulus between the pile and pile jacket form following the jacket manufacturer’s instructions and the Contract Documents. Do not drop jacket concrete material into forms higher than five feet or into forms containing water. Prevent contamination of the jacket concrete during placement and provide internal or external vibration to ensure proper consolidation. Cure jacket concrete for a minimum of 96 hours before removing any external bracing. Remove any jacket concrete or other extraneous material from the exterior surface of the form (on the same day) and clean the form without damaging the fiberglass or gel coat resin. Cut pumping ports flush with the surface of the jacket and seal opening with marine grade epoxy.

Installation of Monitoring Port

After the jacket concrete has cured, a 1-1/2-inch diameter access hole shall be cored (no hammer drilling) through the fiberglass jacket and the mesh anode to the original concrete surface at an elevation of 6" above MHW. Care shall be exercised to not core through the reinforcement or the strand. For the monitoring piles, the access hole shall be located on the opposite face of the pile where the reference electrode is located.

The sides of the monitoring port (except for the pile surface) shall be shielded using a PVC stub that fits into the hole or coated with Type 2 marine grade epoxy after the coring is completed. Unreasonable spread of epoxy on the concrete surface is not permitted. The bottom of the access hole shall be clear of any epoxy. Seal the monitoring port (when not in use) with a rubber seal.

ENERGIZING

The CP Specialist, or the technician under his direction, shall measure and document the following: anode to steel resistance, static reinforcement/anode potentials, energizing current, energized "on" and "off" potentials, and depolarization of the old and new reinforcement for each pile per NACE International Standard Practice SP 0290-2007. Potentials shall be measured with a portable copper-copper sulfate reference electrode and the embedded permanent reference electrode (where applicable). Static potential shall be measured both in the water and in the monitoring access port. Submit test results and energizing data to the Engineer for approval. Once a jacket is filled with concrete, it shall be energized within 14 days.

MEASUREMENT AND PAYMENT

Basis of Payment

Payment shall provide full compensation for all required surveys, submittals, materials, equipment, and labor for: concrete removal, negative connections, continuity testing and corrections, reinforcing steel, jacket concrete, conduits, wiring, junction boxes, and any incidental items necessary to complete this work. Cost of QC/quality assurance and the CP Specialist services as described herein are considered incidental items, and are thereby included in the cost of the cathodic protection pile jacket.

Partial monthly payments for cathodic protection jackets installed will require certification from the CP Specialist indicating that the jackets are installed and functioning in complete accordance with the Contract Documents. Any galvanic CP jacket that exhibits electrical shortage or has misalignments exceeding ½" will be rejected and the Contractor shall replace at no additional cost. Time extension will not be granted for correcting rejected materials, parts, CP jackets, or CP systems. Payment for all fully installed and functioning CP jacket and bulk anode system will be made under:

Pay Item	Pay Unit
Galvanic Cathodic Protection Integral Pile Jacket (Monitoring)	Linear Feet
Galvanic Cathodic Protection Integral Pile Jacket (Non-monitoring)	Linear Feet
Bulk Anode	Each

PILE CAP HYBRID (POWERED) GALVANIC ANODES (SPECIAL)

1) GENERAL

a) Introduction

i) Hybrid galvanic anodes are designed to mitigate corrosion in chloride-contaminated or carbonated concrete. When placed in drilled holes at the appropriate spacing and activated, the anodes will mitigate future corrosion of rebars and extend the service life of the concrete structure.

ii) The powered hybrid anode mentioned in this specification refers to hybrid anodes that can be powered initially and at intervals thereafter, as necessary, to achieve polarization of embedded steel to mitigate future corrosion related damage.

iii) The hybrid anode shall be capable of maintaining corrosion protection after the initial activation/energization and shall continue to maintain corrosion protection. If at any point full protection of embedded reinforcing is not achieved, the contractor shall reenergize the system to achieve full protection.

iv) The contractor shall provide all labor, tools, materials, equipment and services necessary to properly install embedded anodes.

b) References

i) NACE Item No. 24224 – Sacrificial Cathodic Protection of Reinforced Concrete Elements – A State-of-the-Art Report.

ii) NACE SP0216-2016, Item No. 21403 “Sacrificial Cathodic Protection of Reinforcing Steel in Atmospherically Exposed Concrete Structures.”

iii) ASTM B418 – Standard Specification for Cast and Wrought Galvanic Zinc Anodes.
iv) ASTM C 309 Curing Compounds for Concrete.

v) NACE SP0290 - Impressed Current Cathodic Protection of Reinforcing Steel in Atmospherically Exposed Concrete Structures.

c) Manufacturer Limited Warranty

i) Contractor shall provide a Limited Warranty with a notarized signature from a corporate officer of the original anode manufacturer and the reseller.

ii) The Limited Warranty shall state the following:

1. The Stage 1 powered phase has sufficient capacity to passivate actively corroding reinforcement by providing at least 10 kilocoulombs per square foot of rebar surface area (10 kC/ft^2 of steel). The Stage 2 galvanic phase will be electrochemically active and produce galvanic at least 0.02 mA/ft^2 of steel.

2. The galvanic anode does not include substances that may cause adverse effects to concrete or reinforcing steel and will not contribute to reinforcing steel corrosion damage over the life of the structure.

2) MATERIALS

a) Embedded Hybrid Anodes

i) Embedded anodes shall at a minimum, meet the following specification:

(1) Galvashield® Fusion T2 -100AC anode, 1 ¾" x 4" (46 x 100 mm) or approved equivalent.

(2) The anode unit shall be a single, pre-manufactured unit, capable of providing 2-stage protection. Stage 1 shall be characterised by a period of Impressed Current Cathodic Protection (ICCP). Stage 2 shall be delivered by an alkali-activated galvanic anode capable of providing Cathodic Prevention for the design life of the system.

(3) All steel within the treatment area shall receive a minimum charge of 10 kC/ft^2 of steel during stage 1.

(4) Each anode shall operate independently in stage 1 and be able to deliver a total charge of at least 50 kC, irrespective of the variability in concrete resistance.

(5) The impressed current treatment shall last for a minimum period of 90 days to maximize the durability of the passive film.

(6) The current provided by the galvanic anode shall meet or exceed the cathodic prevention requirements (0.02 - 0.20 mA/ft^2 of steel) for the design life of the system.

(7) The zinc core of the galvanic anode shall be in compliance with ASTM B418 Type II and be encased in an activating cementitious mortar. The activating mortar shall contain no intentionally added chloride, bromide, sulphate or other constituents that are corrosive to reinforcing steel.

(8) Both stages of the treatment shall be conformant to the performance characteristics as outlined in NACE SP0290 for cathodic protection and cathodic prevention.

ii) All anodes shall be installed such that the resistance between the first and last anode of a zone is 1 Ohm or less.

iii) The anode unit shall have the capability to be installed so that stage 1 can be repeated once the galvanic anode has reached the end of its design life.

iv) Approved equals shall be requested in writing two weeks before submission of project bids. The application shall include verification of the following:

(1) A single, pre-manufacture anode capable of delivering 2-stage protection.

(2) Anode units shall be supplied with solid zinc core (ASTM B418).

(3) ICCP anode capable of delivering a steel charge density of between at least 10kC/ft^2 of steel during stage 1 without developing oxide/corrosion layer on the surface (inert anode).

(4) Cathodic Prevention anode capable of delivering a continuous current density of between 0.02-0.20mA/ft^2 of steel for the design life of the system (Stage 2).

(5) Provide warranty indicating galvanic stage will provide cathodic prevention level of current for a minimum of 10 years from the date of anode installation independent of the level of chloride in the concrete.

(6) The stage II anode will not passivate or develop oxide layer that will reduce or minimize its effectiveness during the life of the anode.

(7) Minimum 20 years of service life.

(8) Assured charge density and uniform current distribution per square foot of concrete.

(9) Contain no added constituent's corrosive to reinforcing steel or detrimental to concrete, e.g. chloride, bromide, sulfates, etc.

(10) Proven activation track record showing successful performance in three other similar projects.

b) Anode Connectors

i) For anode connections, use anode manufacturer recommended connection kit or approved equal.

c) Conduit, Junction Box, and Hardware

i) All conduit shall be schedule 80 PVC (unless noted otherwise in the Contract Plans) and sunlight resistant.

ii) All junction boxes, conduit outlet bodies, and fittings shall be sunlight resistant PVC, rated NEMA 4X, rated for use with schedule 80 conduits, have a cover with gasket and Type 316 Stainless Steel screws.

iii) Junction boxes for monitoring pile caps shall be 10x10x3 inches (or sized appropriately to house all wiring and shunts). Junction boxes for non-monitoring piles caps shall be 6x6x3 inches (or sized appropriately to house all wiring and link bar).

iv) Conduit fasteners, hangers, access fittings, junction boxes and any other conduit accessories shall be mounted to concrete surfaces using bolts and lock washers, which shall be threaded into structural drop-in anchors of at least 1/2" diameter inserted into holes drilled into the concrete. All conduit clamps shall have two support holes.

v) Junction boxes which shall be encapsulated in a liquid insulation spray to prevent any moisture intrusion and to provide electrical insulation from other nearby connections or wires. A weep hole shall be provided in the base of each junction box.

vi) One link bar or 4 to 5 shunts (for monitoring bents) shall be furnished inside the junction box. Shunts shall have a calibrated resistor with resistance of 0.1 ohm, rated to 2 amperes.

vii) All hardware, including junction box lock rings for the installation of the PVC conduits, junction boxes, and electrical connections shall be Type 316 Stainless Steel, unless otherwise specified.

d) Wires

i) Negative (rebar) lead wires shall be No. 14 AWG copper strand wire, with HMWPE, color coded black.

ii) Positive (anode) wires shall be No. 17 AWG (1.15 mm diameter) copper strand wire, with polyalkene insulation and PVDF jacket, color coded red.

iii) All wires shall be pre-tinned and uniquely color coded.

e) Reference Electrode (for Monitoring Sites)

i. One reference electrode shall be installed in each pile cap designated as a monitoring cap.

ii. Reference electrodes shall be silver/silver chloride reference electrodes suitable for permanent embedment in concrete.

iii. The electrodes shall be supplied with a #14 AWG stranded copper lead wire with HMWPE blue insulation to reach and enter the junction box without splicing. The lead wire to reference electrode connection shall be completely sealed to prevent moisture penetration into the connection.

iv. A #14 AWG stranded copper lead wire with HMWPE black insulation shall be connected to the rebar/strand as the ground wire for each reference electrode

v. All silver/silver chloride reference electrodes shall be individually packaged in a sealed plastic container and delivered to the job site.

vi. All silver/silver chloride reference electrodes shall be calibrated against a calomel electrode in a saturated calcium hydroxide solution. A digital multimeter with a high internal resistance (≥10 MΩ) and with a resolution of at least 1mV shall be used. The negative (black) lead shall be connected to the reference cell, and the positive (red) lead shall be connected to the calomel reference electrode. Acceptable reference electrodes shall have stable reading of ±5 mV compared to the theoretical value at the typical room temperature of 73˚F. The data shall be tabulated along with the date and temperature of the calcium hydroxide solution and submitted to the Engineer.

vii. All reference cells shall be tested and approved by CP Specialist for use on this project prior to installation. The CP Specialist shall submit the reference electrode test data to the Engineer within 2 days of the test date. Any reference electrode that fail the test shall be rejected by the CP Specialist and shall not be used in this project. All rejected reference electrodes shall be promptly removed from the project site.

f) Grout

i) Grouting material shall be compatible with anode (low resistivity) and shall be approved by the anode manufacturer.

g) Storage

i) Deliver, store, and handle all materials in accordance with manufacturer's instructions. Anode units shall be stored in dry conditions in the original unopened containers in a manner to avoid exposure to extremes of temperature and humidity.

3) QUALITY CONTROL

a) Personnel Qualifications - CP Specialist Qualifications

i) Secure the services of a Cathodic Protection Specialist (CPS) with the following qualifications:

(1) A National Association of Corrosion Engineers (NACE) certification in cathodic protection of level CP-4 or a P.E. License.

(2) A minimum of 5 years of experience in the installation and testing of CP systems to protect reinforced concrete structures.

(3) Performed QC and performance testing of CP systems for concrete structures in a minimum of 3 projects in the past 5 years.

(4) The CP Specialist shall be an independent subcontractor, not otherwise associated with the Contractor, the CP systems manufacturer, distributor, or any other entities providing materials or services for this project.

(5) The CP Specialist may be one firm for multiple CP systems or one firm for each of the single CP systems. No CP work will be allowed if at any time an approved CP Specialist is not active or otherwise involved in the project.

ii) CP Technician(s), who work under the CP Specialist's direction, shall have the following qualifications:

(1) A minimum of 2 years of experience in the installation and testing of CP systems to protect reinforced concrete structures.

b) CP Specialist shall provide the following services:

i) Review all Contractor documents related to the CP work prior to submittal to NCDOT for approval.

ii) Conduct a minimum of one QC visit to the job site per month.

iii) Directly update the Engineer in writing monthly on the quality of the work along with a list of rejections or recommended corrections.

iv) Certify QC Plan in accordance with this special provision and submit to the Engineer for approval.

v) Test and certify rebar continuity and continuity corrections.

vi) Verify and certify wire connections to rebars and supplemental steel.

vii) Verify and certify wire connections to the anodes.

viii) Verify and certify the reference electrode is operational prior to installation and after installation.

ix) Verify wire labels and inspect wires and splices after wiring is completed.

x) Certify overall installation of each CP system.

xi) Energize each Pile Cap and document polarization achieved.

xii) Submit a final CP report along with all the test data in an electronic format.

c) CP Specialist Quality Control Plan

i) Provide a QC Plan certified by a CP Specialist for Engineer's approval. The Plan shall include all tasks to be performed by CP Specialist, or the technician under his direction.

ii) The Plan shall include but not be limited to: verification of material compositions, verification of shop drawings prior to submittal, method and frequency of the Contractor's QC testing, methods of measuring electrical continuity, anode installation, voltages/currents/potentials measurements, energizing procedure, and method of updating the Engineer.

d) CP Report

i) Provide a final report produced by the CP Specialist for the CP systems. The report shall describe the general characteristics of the systems, installation sequence, results of the continuity testing, location of continuity corrections (where applicable), electrical resistance measurements, reference electrode function, the required monthly updates sent to the Engineer describing the quality of work and CP energizing results.

ii) In the final report, the CP Specialist shall document (written/photo documentation) any unapproved deviations from the Contract Documents that pertain to the CP system along with the Department approved Request(s) For Information, Request(s) For Modification, Submittals, etc. for the approved deviations. Include in the final report, as an addendum, the required monthly updates from the CP Specialist to the Engineer regarding the status of CP work. The report and all data shall be in typed form and a digital version of the report shall be provided along with 4 bound hard copies. Submit copies of the final report to the Engineer.

4) CONSTRUCTION

a) Anode and Rebar Connection Layout

i) Using a suitable rebar locator, the location of the reinforcing grid should be determined and marked out in areas where anodes are to be installed.

ii) Mark out locations for anode installation. The anodes shall be installed in a grid pattern as shown in contract plans. Anodes are to be installed to a common header wire; top and bottom rows shall be kept separate.

iii) Mark out location of rebar connections.

b) Drill Holes and Saw Cuts

i) Rebar Connection – Electrical connections shall be established using a method recommended by the anode manufacturer. At the location of the rebar connections, drill ½ inch (12 mm) diameter holes from the concrete surface until contact is established with the top surface of the rebar. Let the drill bit spin on top of the bar to provide a clean contact area.

ii) Anode Location - Drill a hole in close proximity to marked out location to accommodate the anode. Do not damage rebar when drilling holes.

iii) Saw cuts – All saw cuts into the concrete surface between the anode installation holes the main feeder saw cut shall be approximately ¼ inch (6 mm) wide by ½ inch (12.5 mm) deep. These cuts contain a single anode wire. The main feeder saw cut (containing multiple anode wires, rebar wires, and reference cell wires) shall be ¾ inch (19 mm) wide by ¾ inch (19 mm) deep (or sized appropriately to completely encapsulate all anode, rebar, and reference electrode wires).

iv) All holes and saw cuts shall be cleaned of debris and concrete dust.

c) Rebar Connections

i) 2 in (50 mm) diameter holes shall be cored to the reinforcing steel taking care to avoid cutting steel.

ii) Electrical connection to the steel can shall be established by drilling a 5-7 mm deep hole using the 3.5 mm drill bit provided.

iii) 3.2 mm stainless steel pop rivet are used to connect the connecting wire to the steel.

iv) The connection shall be insulated by a neutral cure sealant or epoxy.

v) Proper connection and rebar continuity for each rebar connection shall be verified between two installed rebar connectors using a multi-meter. Maximum resistance between the two locations shall be less than 1 ohm (in both forward and reverse directions) and less than 1 mV potential difference.

vi) Special care shall be taken to ensure that reinforcement around battered pile “blocks” is continuous with all reinforcement within the pile cap.

d) Continuity Corrections

i) Rebars and other metals in the pile caps that are found to be discontinuous shall be made continuous with each other. Holes to access the rebars shall be appropriately distributed throughout the pile caps.

ii) Where continuity corrections are required, additional concrete excavation may be necessary. All excavations required for continuity corrections shall be kept minimal. Continuity shall be provided by resistance welding two continuous solid steel wires to each rebar requiring continuity correction inside the excavation. Any discontinuity found shall be repaired by the Contractor.

iii) Continuity corrections shall be verified by CP specialist after continuity corrections are completed by the Contractor. Continuity welds shall receive a coat of 100% solids, non-conductive epoxy such that no weld comes in contact with the concrete.

e) Anode Installation

i) Holes shall be in a saturated-surface dry condition prior to anode placement.

ii) Complete wiring between the anodes and the rebar connections.

(1) Connect the anodes in series as specified in the drawings.

(2) Insert the interconnecting coated wire (i.e. anode header wire) through the open side of the button-type wire connectors (supplied by the anode manufacturer along with the anode) and the coated anode wire into the terminated side. With the anode alongside of the installation hole, crimp the button connector to cut through the wire coating until the connector is flush with its casing.

(3) After all anodes along the string are connected to the interconnecting cable, verify continuity between anodes and rebar connections with a multi-meter. Resistivity measured between anodes (after connecting in series but before installing) shall be 1 ohm or less.

(4) The header wire shall be of sufficient length to connect a maximum of 12 anodes in series and both ends of the header loop back to the junction box to be terminated to one anode lug. The ends of the anode wire loop shall have ring tongue installed (and the wires sealed with electrical tape and liquid electrical tape) before connecting to the lug.

iii) Mix anode embedding mortar per anode manufacturer's recommendation and fill each anode installation hole to approximately 2/3 full of mixed embedding mortar.

iv) Insert an anode into each hole, forcing the embedding mortar to fill the annular space from the bottom up. Top off the hole with embedding mortar or other approved mortar

and strike off excess flush with the concrete surface. Minimum cover over the top of the anode shall be 1 in.

v) Bury all wiring into the saw cuts (to the main feeder slot) and drilled holes with embedding mortar and strike off flush with the concrete surface. The main feeder slot is to be filled with embedding mortar after all anode, rebar, and reference electrode wires have been routed to the junction box(es).

vi) Wet cure cement-based mortar or cure with two coats of a membrane-forming concrete curing compound meeting the requirements of ASTM C309.

vii) Protect area from any disturbance for 24 hours.

f) Anode Manufacturer Technical Representative

i) The contractor will enlist and pay for a technical representative employed by the galvanic anode manufacturer to provide training and on-site technical assistance during the initial installation of the galvanic anodes. The technical representative shall be a NACE-qualified corrosion technician (Cathodic Protection Technician–CP2 or higher).

ii) The qualified manufacturer's representative shall have verifiable experience in the installation and testing of embedded galvanic protection systems for reinforced concrete structures.

iii) The contractor shall coordinate its work with the designated manufacturer's representative to allow for site support during project startup and initial anode installation, including contractor training and support for development of anode installation/application procedures, and verification of electrical continuity.

g) Installation of Reference Electrodes for Monitoring Sites

i) The CP specialist shall mark the exact location of the reference electrodes in the field based on the half-cell potential data obtained prior to anode installation.

ii) Installation procedures: Reference electrodes shall be installed in areas of sound concrete having high active half-cell potential readings or as approved by the CP specialist.

iii) Prior to excavating, locate the reinforcement in the area of the excavation. Cut a slot for placement of the reference electrode. The Contractor shall not expose any reinforcement in the reference electrode excavation. The depth of the slot shall be such that the reference electrode is situated at the same depth as the rebar/strand. Reference electrode excavations shall be visibly free of dirt, grease and other foreign material prior to placing the reference electrode and the backfill material.

iv) The reference electrode shall be placed in the excavation and the lead and ground wires routed through the main feeder slot into the junction box. An identification tag shall be affixed to the end of the wire indicating the reference electrode location and number.

v) The reference electrode excavation shall be patched with approved cement grout. Just prior to backfilling, the plastic cap on the reference electrode plug shall be removed and discarded.

vi) The reference electrode shall be fully encapsulated with cementitious backfill material. The backfill material shall completely fill the excavation, and no voids shall be permitted.

h) Installation of Junction Boxes

i) There are two types of junction boxes, one for monitoring caps and one for non-monitoring caps, as shown in the Contract Plans. The Contactor shall install junction boxes as shown on the Plans

(1) Anode wire connection: Securely attach each anode (red) wire routed through the main feeder slot to the stainless steel washer and nut inside the junction box – making sure that the nut is firmly tightened.

(2) Rebar wire connection: Securely attach a rebar (black) wire to the reinforcement as shown on the Contract Plans and route this wire to the junction box through the main feeder slot. Provide a connection between the anode and rebar wires through a link bar (for non-monitoring caps), or a precision 0.1 ohm shunt for each anode wire (for monitoring caps), rated to 2 amperes, inside the junction box.

(3) Fastening: The junction boxes concrete surface using durable 316 stainless steel fasteners.

(4) Sealing: All wire terminations shall be housed in junction boxes which shall be encapsulated in a liquid insulation spray to prevent any moisture intrusion and to provide electrical insulation from other nearby connections or wires. A weep hole shall be provided in the base of each junction box.

(5) Caulking: The perimeter of the junction boxes shall be caulked with outdoor all weather caulk material manufactured by GE or approved equal. The caulking shall achieve water tightness to shelter the wires, shunts, and other metals housed inside.

(6) Identification: All CP wires shall be identified in the junction boxes using durable identification tags. Each wire shall be clearly marked as to its function and shall be identified correctly.

i) Energizing

i) The CP Specialist, or the technician under his direction, shall measure and document the following: anode to steel resistance, static reinforcement/anode potentials, energizing current, energized "on" and "off" potentials, and depolarization of reinforcement for each pile cap per NACE International Standard Practice SP 0290-2007.

ii) Potentials shall be measured with a portable copper-copper sulfate reference electrode (for non-monitoring caps) and the embedded permanent reference electrode (for monitoring caps).

iii) Static potentials shall be measured before energization. Submit test results and energizing data to the Engineer for approval.

5) FUTURE MONITORING

a) Galvanic Operation

i) During galvanic operation (after the batteries have been consumed), the galvanic current output may be very small. In order to measure such small currents, the CPS shall measure galvanic current outputs using a zero resistance ammeter.

b) Recharging

i) Recharging of the anodes shall be performed when needed, approximately at 5-year intervals. Please note: No more than 13 anodes will be connected per battery. Approximately eight batteries per pile cap is required. Each battery shall have 220 amp-hour capacity and shall provide 180 mA of current output during charging for approximately 40 days. The voltage of the batteries depends on the resistance between the anode and the steel at the time of charging. The size of the battery and duration of charging required is to be determined by a CPS.

6) SUBMITTAL CHECKLIST

This section serves as a checklist of documents that need to be provided to and approved by NCDOT before construction activities can be conducted.

Document Title	Information Included	
Anode Specification	- Materials composition - Service life - Suitable service environment - Anode weight and dimensions	- Anode charge capacity - Installation instructions - Wiring instructions - Period of warranty
Conduit Specification	- Conduit materials - Conduit dimensions - Waterproofing capability - Fastener dimensions	- Fastener materials - Installation instructions
Junction Box Specification	- Junction box materials - Junction box dimensions - Type of lock and seal - Waterproofing capability	- Fastener materials - Installation instructions
Wire/Cable Specification	- Wire gauge size - Conductor materials - Jacket materials - Insulation materials	- Rated resistance - Rated ampere
Reference Electrode Specification	- Electrode material - Type of electrolyte - Calibration instructions - Operating temperature range	- Wiring information - Warranted service life - Installation instructions
Patch Materials Specifications	- Curing strength test results - Slump test results - NCDOT Compliance Certification	
Quality Control Plan	- CP specialist information - Planned QC activities - Examples of field data sheets	
Construction Procedures/Drawings	- Anode numbers and locations - Wiring diagram - Junction box and conduit details - Written installation instructions	- RC/RCG detail - Saw cut details - Rebar connection detail - Wire splice detail

7) MEASUREMENT AND PAYMENT

i) Pile Cap cathodic protection will be measured and paid for at the contract unit price bid per square foot of protected pile cap and will be full compensation for all work specified in the Technical Special Provision. Payment will be made under:

Pay Item	Pay Unit
Cathodic Protection of Pile Cap (Monitoring)	Square Foot
Cathodic Protection of Pile Cap (Non-Monitoring)	Square Foot

EPOXY RESIN INJECTION (SPECIAL)

GENERAL

For repairing cracks, an applicator certified by the manufacturer of epoxy injection system to be used is required to perform the epoxy resin injection. The Contractor shall submit documentation that indicates the firm, supervisor and the workmen have completed an instruction program in the methods of restoring concrete structures utilizing the epoxy injection process and have five (5) years of relative experience with a record of satisfactory performance on similar projects.

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

SCOPE OF WORK

Using Epoxy Resin Injection, repair all cracks 5 mils (125 μm) wide or greater on the interior bent caps and piles, and in the end of the girders.

Perform the underwater repairs when the water surface elevation is low and the water is still during tidal change. For underwater repairs, use manufacturer recommended materials.

Repair any crack, void, honeycomb, delaminated or spalled area unsuitable for repair by injection with epoxy mortar, or otherwise approved by the Engineer.

SUBMITTALS

Prior to Construction, the Contractor shall submit the following to the Engineer for review and approval:

(A) Information covering the materials and their properties, storage and handling requirements, and Material Safety Data Sheets.

(B) Preparation and epoxy injection installation procedures, including written instructions from the manufacturer of the proportioning dispenser as to the procedures recommended to monitor and assure its proportioning accuracy of the unit.

(C) Proposed injection repair procedures in the event that during testing it is found that the injection installation procedure did not completely fill cracks with epoxy.

(D) The resumes of the Contractor's staff and/or the epoxy resin manufacturer's Technical Representative that will be on site performing the epoxy injection. The resumes shall detail the epoxy injection installation experience and any manufacturer installation certifications the installer has.

(E) The names and telephone numbers of contact persons for recent projects where they have performed epoxy injection.

(F) Material certifications and sampling shall be as required as per the NCDOT *Standard Specifications* Section 106.

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 epoxy resin injection process begins and until the Engineer is assured that their 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.

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	6,000 – 8,000
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 seven (7) days at 77 ± 3°F unless otherwise specified, has the following properties:

	Test Method	Specification Requirements
Ultimate Tensile Strength	ASTM D638	7,000 psi (min.)
Tensile Elongation at Break	ASTM D638	4% max.
Flexural Strength	ASTM D790	10,000 psi (min.)
Flexural Modulus	ASTM D790	3.5×10^5 psi
Compressive Yield Strength	ASTM D695	11,000 psi (min.)
Compressive Modulus	ASTM D695	$2.0 - 3.5 \times 10^5$ psi
Heat Deflection Temperature Cured 28 days @ 77 ± 3°F	ASTM D648*	125°F min. 135°F min.
Slant Shear Strength, 5,000 psi (34.5 MPa) compressive strength concrete	AASHTO T237	
Cured 3 days @ 40°F wet concrete		3,500 psi (min.)
Cured 7 days @ 40°F wet concrete		4,000 psi (min.)
Cured 1 day @ 77°F dry concrete		5,000 psi (min.)
* Cure test specimens so the peak exothermic temperature 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).

EQUIPMENT FOR INJECTION

Use portable positive displacement type pumps with interlock to provide positive ratio control of exact proportions of the two (2) components at the nozzle to meter and mix the two (2) 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.

PREPARATION

Follow these steps prior to injecting the epoxy resin:

(A) 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.

(B) Provide entry ports along the crack at intervals as determined by the Contractor to ensure full penetration of the crack.

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

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

(E) Perform an air pressure check of the surface seal to ensure the system is airtight prior to proceeding with the injection.

EPOXY INJECTION

Before epoxy adhesive injection occurs, the Contractor shall test discharge one pint of epoxy to calibrate the equipment and to demonstrate that the workmen and equipment are working properly.

Follow approved preparation and installation procedures submitted by the Contractor. It is the Contractor's responsibility to achieve full penetration of cracks being injected.

Perform epoxy adhesive injection continuously until cracks are completely filled. Pressure shall be maintained until complete refusal of material is achieved. Any stoppage of injection for more

than 15 minutes shall result in the injection equipment being cleaned, at no additional cost to the Department, before resuming injection.

If port to port travel of epoxy adhesive is not indicated, or the surface seal and/or ports become dislodged, immediately stop the work and notify the Engineer.

TESTING

The Contractor shall drill 3" diameter cored holes of the cured epoxy to a depth of 6" to verify the cracks have been completely filled with epoxy. When drilling cores, care shall be taken to avoid existing steel reinforcement, where possible. Injection will not proceed beyond the initial 50 feet until three (3) cores have been submitted to, and approved by, the Engineer. If the epoxy does not penetrate a minimum of 6" or the full depth of the crack, whichever is less, the repair will be rejected, and the contractor shall follow their proposed repair procedure that has been approved by the Engineer. The presence of the technical representative will be required when repairs begin.

The Engineer will take possession of the cores from the repaired concrete for compressive testing. If the failure plane is located at the repaired crack, a minimum compressive strength of 3,000 psi is required of these cores. The cost of coring is incidental to the epoxy injection pay item. If the core fails, the contractor will be required to take corrective action before proceeding and another 50' test section will be required.

After the contractor demonstrates acceptable repairs, cores will be taken at a rate of one per 100 linear feet of repair until completion of the work or unacceptable cores are encountered.

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.

All cored holes will be filled with Type 3 grout in accordance with Section 1003 of the *Standard Specifications*.

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

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

BASIS OF PAYMENT

Epoxy Resin Injection will be paid at the contract unit price per linear foot. For full depth cracks, payment will be made for one side only. Such payment will be full compensation for all materials, tools, equipment, labor, coring and for all incidentals necessary to complete the work.

Pay Item	Pay Unit
Epoxy Resin Injection	Linear Foot

CONCRETE DECK REPAIR FOR EPOXY OVERLAY (12-12-13)

1.0 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.

2.0 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.

3.0 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. 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.

4.0 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.

5.0 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.

Payment will be made under:

Pay Item	Pay Unit
Concrete Deck Repair for Epoxy Overlay	Square Feet

FLOATING TURBIDITY CURTAIN (SPECIAL)

DESCRIPTION

This work consists of furnishing a *Floating Turbidity Curtain* to deter silt suspension and movement of silt particles during construction. The floating turbidity curtain shall be constructed at locations as directed.

MATERIALS

The curtain material shall be made of a tightly woven nylon, plastic or other nondeteriorating material meeting the following specifications:

Property	Value
Grab tensile strength	*md-370 lbs *cd-250 lbs
Mullen burst strength	480 psi
Trapezoid tear strength	*md-100 lbs *cd-60 lbs
Apparent opening size	70 US standard sieve
Percent open area	4% permittivity 0.28 sec-1

*md - machine direction
*cd - cross machine direction

In the event that more than one width of fabric is required, a 6" overlap of the material shall also be required.

The curtain material shall be supported by a flotation material having over 29 lbs/ft buoyancy. The floating curtain shall have a 5/16" galvanized chain as ballast and dual 5/16" galvanized wire ropes with a heavy vinyl coating as load lines.

CONSTRUCTION METHODS

The Contractor shall maintain the *Floating Turbidity Curtain* in a satisfactory condition until its removal is requested by the Engineer. The curtain shall extend to the bottom of the jurisdictional resource. Anchor the curtain according to manufacturer recommendations.

MEASUREMENT AND PAYMENT

Floating Turbidity Curtain will be measured and paid for as the actual number of square yards of curtain furnished as specified and accepted. Such price and payment will be full compensation for the work as described in this section including but not limited to furnishing all materials, tools, equipment, and all incidentals necessary to complete the work.

Payment will be made under:

Pay Item	Pay Unit
Floating Turbidity Curtain	Square Yard

County : New Hanover

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
			ROADWAY ITEMS			
0001	0000100000-N	800	MOBILIZATION	Lump Sum	L.S.	
0002	4400000000-E	1110	WORK ZONE SIGNS (STATIONARY)	200 SF		
0003	4405000000-E	1110	WORK ZONE SIGNS (PORTABLE)	192 SF		
0004	4410000000-E	1110	WORK ZONE SIGNS (BARRICADE MOUNTED)	18 SF		
0005	4415000000-N	1115	FLASHING ARROW BOARD	3 EA		
0006	4420000000-N	1120	PORTABLE CHANGEABLE MESSAGE SIGN	3 EA		
0007	4430000000-N	1130	DRUMS	272 EA		
0008	4445000000-E	1145	BARRICADES (TYPE III)	5 LF		
0009	4447000000-E	SP	PEDESTRIAN CHANNELIZING DE-VICES	1,000 LF		
0010	4510000000-N	1190	LAW ENFORCEMENT	80 HR		
0011	4770000000-E	1205	COLD APPLIED PLASTIC PAVEMENT MARKING LINES, TYPE ** (4") (II)	72 LF		
0012	4800000000-N	1205	COLD APPLIED PLASTIC PAVEMENT MARKING CHARACTER, TYPE ** (II)	14 EA		
0013	4805000000-N	1205	COLD APPLIED PLASTIC PAVEMENT MARKING SYMBOL, TYPE ** (II)	7 EA		
0014	4850000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (4")	2,400 LF		
0015	4870000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (24")	72 LF		
0016	4875000000-N	1205	REMOVAL OF PAVEMENT MARKING SYMBOLS & CHARACTERS	21 EA		
0017	4890000000-E	SP	GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 4", 20 MILS (STANDARD GLASS BEADS)	200 LF		

County : New Hanover

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0018	4900000000-N	1251	PERMANENT RAISED PAVEMENT MARKERS	66 EA		
			STRUCTURE ITEMS			
0019	8296000000-N	442	POLLUTION CONTROL	Lump Sum	L.S.	
0020	8660000000-E	SP	CONCRETE REPAIRS	15 CF		
0021	8664000000-E	SP	SHOTCRETE REPAIRS	57.5 CF		
0022	8860000000-N	SP	GENERIC STRUCTURE ITEM PAINTING CONTAINMENT FOR BRIDGE #640021	Lump Sum	L.S.	
0023	8867000000-E	SP	GENERIC STRUCTURE ITEM FOAM JOINT SEALS FOR PRESERVATION	116 LF		
0024	8867000000-E	SP	GENERIC STRUCTURE ITEM GALVANIC CATHODIC PROTECTION INTEGRAL PILE JACKET (MONITORING)	40.5 LF		
0025	8867000000-E	SP	GENERIC STRUCTURE ITEM GALVANIC CATHODIC PROTECTION INTEGRAL PILE JACKET (NON-MONITORING)	67.25 LF		
0026	8867000000-E	SP	GENERIC STRUCTURE ITEM GALVANIZED PEDESTRIAN SAFETY RAIL	869.25 LF		
0027	8867000000-E	SP	GENERIC STRUCTURE ITEM POURABLE SILICONE JOINT SEALANT	58 LF		
0028	8882000000-E	SP	GENERIC STRUCTURE ITEM PRESTRESSED CONCRETE GIRDER REPAIR	136.5 CF		
0029	8892000000-E	SP	GENERIC STRUCTURE ITEM BEAM END EPOXY COATING	272.5 SF		
0030	8892000000-E	SP	GENERIC STRUCTURE ITEM CATHODIC PROTECTION OF PILE CAP (MONITORING)	888 SF		

County : New Hanover

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0031	8892000000-E	SP	GENERIC STRUCTURE ITEM CATHODIC PROTECTION OF PILE CAP (NON-MONITORING)	4,179 SF		
0032	8892000000-E	SP	GENERIC STRUCTURE ITEM EPOXY COATING	2,791 SF		
0033	8892000000-E	SP	GENERIC STRUCTURE ITEM EPOXY OVERLAY SYSTEM I	45 SF		
0034	8892000000-E	SP	GENERIC STRUCTURE ITEM PRESTRESSED CONC GIRDERS WITH THERMAL SPRAY ANODE (NON-MONITORING)	35,966 SF		
0035	8897000000-N	SP	GENERIC STRUCTURE ITEM BRIDGE JACKING TYPE I BRIDGE #640021	1 EA		
0036	8897000000-N	SP	GENERIC STRUCTURE ITEM BULK ANODE	8 EA		
0037	8897000000-N	SP	GENERIC STRUCTURE ITEM CLEANING & PAINTING OF EXT BEARINGS WITH HIGH RATIO CALCIUM SULFONATE	196 EA		
0038	8897000000-N	SP	GENERIC STRUCTURE ITEM REMOVE AND RESET BEARINGS	1 EA		