

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

PROPOSAL

INCLUDES ADDENDUM No. 1 DATED 1-6-2022

DATE AND TIME OF BID OPENING: **JANUARY 18, 2022 AT 2:00 PM**

CONTRACT ID C204568
WBS 15BPR.46

FEDERAL-AID NO. STATE FUNDED
COUNTY DARE
T.I.P. NO.
MILES 1.050
ROUTE NO. US 64
LOCATION BRIDGE #270012 OVER ROANOKE SOUND ON US-64.

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. C204568 IN DARE 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. **C204568** 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. **C204568 in Dare 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.

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01/06/2022

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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 **February 28, 2022**.

The completion date for this contract is **September 15, 2025**.

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 **Two Thousand Dollars (\$ 2,000.00)** 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 64 (Virginia Dare Trail)** during the following time restrictions:

DAY AND TIME RESTRICTIONS

May 15th thru September 15th (of any year)
Monday thru Thursday, 7:00 A.M. to 7:00 P.M. and
from Friday at 7:00 A.M. to Sunday at 9:00 P.M.

In addition, the Contractor shall not close or narrow a lane of traffic on **US 64 (Virginia Dare Trail)**, 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. Except as permitted by Intermediate Contract Time Number 2, for **Spring Break**, between the hours of **6:00 A.M.** two (2) Thursdays before Easter and **9:00 P.M.** the second Monday after Easter.
3. For **Memorial Day**, between the hours of **6:00 A.M.** the Friday before Memorial Day and **9:00 P.M.** the Tuesday after Memorial Day.

4. For **Independence Day**, between the hours of **6:00 A.M.** the day before Independence Day and **9:00 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 **9:00 P.M.** the Tuesday after Independence Day.

5. For **Labor Day**, between the hours of **6:00 A.M.** the Friday before Labor Day and **9:00 P.M.** the Tuesday after Labor Day.
6. For **OBX Marathon**, between the hours of **6:00 A.M.** the **Friday** before the **OBX Marathon** and **9:00 P.M.** the following **Monday** after the **OBX Marathon**.

Holidays and holiday weekends shall include Spring Break, Easter, Memorial Day, Independence Day, and Labor Day. 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 hour.

INTERMEDIATE CONTRACT TIME NUMBER 2 AND LIQUIDATED DAMAGES:

(6-18-13)

108

SP1 G14 L

The Contractor shall complete the work required of **Phase 1, Step #2 thru Phase 4, Step #2** as shown on Sheet **TMP-1C**.

The date of availability for **each individual** intermediate contract time is **September 15th of the calendar year the Contractor elects to begin the work.**

The completion date for **each individual** intermediate contract time is **the following May 15th after the date of availability.**

The liquidated damages for **each individual intermediate contract time** are **One Thousand Five Hundred Dollars (\$ 1,500.00)** per calendar day. **The work required of Intermediate Contract Time Number 2 may be completed over the course of three (3) off-seasons (from September 15, 2022 to May 15, 2023, from September 15, 2023 to May 15, 2024, and from September 15, 2024 to May 15, 2025), as elected by the Contractor. All work required of Intermediate Contract Time Number 2 shall be completed by May 15, 2025.**

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 |
|---------------|--------------------------------------|
| 50 | Polyester Polymer Concrete Materials |
| or | |
| 51 | Epoxy Polymer Concrete Materials |

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 |
|---------------|-----------------------------|
| 8 | Guardrail |
| 17-18, 22-23 | Long-Life Pavement Markings |
| 24 | Permanent Pavement Markers |
| 25 | Erosion Control |
| 44, 50 or 51 | Polymer Concrete Overlay |

FUEL PRICE ADJUSTMENT:

(11-15-05) (Rev. 7-20-21)

109-8

SP1 G43

Revise the *2018 Standard Specifications* as follows:

Page 1-87, Article 109-8, Fuel Price Adjustments, add the following:

The base index price for DIESEL #2 FUEL is \$ **2.6786** per gallon. Where any of the following are included as pay items in the contract, they will be eligible for fuel price adjustment.

The pay items and the fuel factor used in calculating adjustments to be made will be as follows:

| Description | Units | Fuel Usage Factor Diesel |
|--|--------------|---------------------------------|
| Unclassified Excavation | Gal/CY | 0.29 |
| Borrow Excavation | Gal/CY | 0.29 |
| Class IV Subgrade Stabilization | Gal/Ton | 0.55 |
| Aggregate Base Course | Gal/Ton | 0.55 |
| Sub-Ballast | Gal/Ton | 0.55 |
| Asphalt Concrete Base Course, Type _____ | Gal/Ton | 0.90 or 2.90 |
| Asphalt Concrete Intermediate Course, Type _____ | Gal/Ton | 0.90 or 2.90 |
| Asphalt Concrete Surface Course, Type _____ | Gal/Ton | 0.90 or 2.90 |
| Open-Graded Asphalt Friction Course | Gal/Ton | 0.90 or 2.90 |
| Permeable Asphalt Drainage Course, Type _____ | Gal/Ton | 0.90 or 2.90 |
| Sand Asphalt Surface Course, Type _____ | Gal/Ton | 0.90 or 2.90 |
| Aggregate for Cement Treated Base Course | Gal/Ton | 0.55 |

| | | |
|--|---------|-------|
| Portland Cement for Cement Treated Base Course | Gal/Ton | 0.55 |
| " Portland Cement Concrete Pavement | Gal/SY | 0.245 |
| Concrete Shoulders Adjacent to " Pavement | Gal/SY | 0.245 |

For the asphalt items noted in the chart as eligible for fuel adjustments, the bidder may include the *Fuel Usage Factor Adjustment Form* with their bid submission if they elect to use the fuel usage factor. The *Fuel Usage Factor Adjustment Form* is found at the following link:

<https://connect.ncdot.gov/letting/LetCentral/Fuel%20Usage%20Factor%20Adjustment%20Form.pdf>

Select either 2.90 Gal/Ton fuel factor or 0.90 Gal/Ton fuel factor for each asphalt line item on the *Fuel Usage Factor Adjustment Form*. The selected fuel factor for each asphalt item will remain in effect for the duration of the contract.

Failure to complete the *Fuel Usage Factor Adjustment Form* will result in using 2.90 gallons per ton as the Fuel Usage Factor for Diesel for the asphalt items noted above. The contractor will not be permitted to change the Fuel Usage Factor after the bids are submitted.

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:

| <u>Fiscal Year</u> | | <u>Progress (% of Dollar Value)</u> |
|---------------------------|---------------------|--|
| 2022 | (7/01/21 - 6/30/22) | 13% of Total Amount Bid |
| 2023 | (7/01/22 - 6/30/23) | 37% of Total Amount Bid |
| 2024 | (7/01/23 - 6/30/24) | 30% of Total Amount Bid |
| 2025 | (7/01/24 - 6/30/25) | 18% of Total Amount Bid |
| 2026 | (7/01/25 - 6/30/26) | 2% 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. 8-17-21)

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](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 **1.0 %**

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 **1.0 %**

- (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 not 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).
- (3) Exception: If the MBE/WBE's ineligibility is caused solely by its having exceeded the size standard during the performance of the contract, 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 and overall goal.

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.

CONTRACTOR'S LICENSE REQUIREMENTS:

(7-1-95)

102-14

SP1 G88

If the successful bidder does not hold the proper license to perform any plumbing, heating, air conditioning, or electrical work in this contract, he will be required to sublet such work to a contractor properly licensed in accordance with *Article 2 of Chapter 87 of the General Statutes* (licensing of heating, plumbing, and air conditioning contractors) and *Article 4 of Chapter 87 of the General Statutes* (licensing of electrical contractors).

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.

PROCEDURE FOR MONITORING BORROW PIT DISCHARGE:

(2-20-07) (Rev. 4-5-19)

105-16, 230, 801

SP1 G181

Water discharge from borrow pit sites shall not cause surface waters to exceed 50 NTUs (nephelometric turbidity unit) in streams not designated as trout waters and 10 NTUs in streams, lakes or reservoirs designated as trout waters. For lakes and reservoirs not designated as trout waters, the turbidity shall not exceed 25 NTUs. If the turbidity exceeds these levels due to natural background conditions, the existing turbidity level shall not be increased.

If during any operating day, the downstream water quality exceeds the standard, the Contractor shall do all of the following:

- (A) Either cease discharge or modify the discharge volume or turbidity levels to bring the downstream turbidity levels into compliance, or
- (B) Evaluate the upstream conditions to determine if the exceedance of the standard is due to natural background conditions. If the background turbidity measurements exceed the standard, operation of the pit and discharge can continue as long as the stream turbidity levels are not increased due to the discharge.
- (C) Measure and record the turbidity test results (time, date and sampler) at all defined sampling locations 30 minutes after startup and at a minimum, one additional sampling of all sampling locations during that 24-hour period in which the borrow pit is discharging.
- (D) Notify DWQ within 24 hours of any stream turbidity standard exceedances that are not brought into compliance.

During the Environmental Assessment required by Article 230-4 of the *2018 Standard Specifications*, the Contractor shall define the point at which the discharge enters into the State's surface waters and the appropriate sampling locations. Sampling locations shall include points upstream and downstream from the point at which the discharge enters these waters. Upstream sampling location shall be located so that it is not influenced by backwater conditions and represents natural background conditions. Downstream sampling location shall be located at the point where complete mixing of the discharge and receiving water has occurred.

The discharge shall be closely monitored when water from the dewatering activities is introduced into jurisdictional wetlands. Any time visible sedimentation (deposition of sediment) on the wetland surface is observed, the dewatering activity will be suspended until turbidity levels in the stilling basin can be reduced to a level where sediment deposition does not occur. Staining of wetland surfaces from suspended clay particles, occurring after evaporation or infiltration, does not constitute sedimentation. No activities shall occur in wetlands that adversely affect the functioning of a wetland. Visible sedimentation will be considered an indication of possible adverse impacts on wetland use.

The Engineer will perform independent turbidity tests on a random basis. These results will be maintained in a log within the project records. Records will include, at a minimum, turbidity test results, time, date and name of sampler. Should the Department's test results exceed those of the Contractor's test results, an immediate test shall be performed jointly with the results superseding the previous test results of both the Department and the Contractor.

The Contractor shall use the *NCDOT Turbidity Reduction Options for Borrow Pits Matrix*, available at <https://connect.ncdot.gov/resources/roadside/FieldOperationsDocuments/TurbidityReductionOptionSheet.pdf> to plan, design, construct, and maintain BMPs to address water quality standards. Tier I Methods include stilling basins which are standard compensatory BMPs. Other Tier I methods are noncompensatory and shall be used when needed to meet the stream turbidity standards. Tier II Methods are also noncompensatory and are options that may be needed for protection of rare or unique resources or where special environmental conditions exist at the site which have led to additional requirements being placed in the DWQ's 401 Certifications and approval letters, Isolated Wetland Permits, Riparian Buffer Authorization or a DOT Reclamation Plan's Environmental Assessment for the specific site. Should the Contractor exhaust all Tier I Methods on a site exclusive of rare or unique resources or special environmental conditions, Tier II Methods may be required by regulators on a case by case basis per supplemental agreement.

The Contractor may use cation exchange capacity (CEC) values from proposed site borings to plan and develop the bid for the project. CEC values exceeding 15 milliequivalents per 100 grams of soil may indicate a high potential for turbidity and should be avoided when dewatering into surface water is proposed.

No additional compensation for monitoring borrow pit discharge will be paid.

NOTE TO CONTRACTOR:

No closure of any parking spaces shall be allowed on the west end of the Washington Baum Bridge from the week before Memorial Day to a week after Labor Day. From the week after Labor Day to the week before Memorial Day, the contractor may close two adjacent bays under the bridge for repairs only. The storage of materials or equipment shall not be allowed on the west end of the Washington Baum Bridge. Storage of material and lay down yard will be allowed within NCDOT right of way on the northeast corner of the bridge. The Contractor must maintain access for property owners at all times.

PROJECT SPECIAL PROVISIONS

ROADWAY

BORROW EXCAVATION (Truck Measurement):

(7-1-95)

230

SP2 R57

The borrow material used on this project will be measured for payment by truck measurement as provided in Article 230-5 of the *2018 Standard Specifications*.

FLOWABLE FILL:

(9-17-02) (Rev 1-17-12)

300, 340, 1000, 1530, 1540, 1550

SP3 R30

Description

This work consists of all work necessary to place flowable fill in accordance with these provisions, the plans, and as directed.

Materials

Refer to Division 10 of the *2018 Standard Specifications*.

Item

Flowable Fill

Section

1000-6

Construction Methods

Discharge flowable fill material directly from the truck into the space to be filled, or by other approved methods. The mix may be placed full depth or in lifts as site conditions dictate. The Contractor shall provide a method to plug the ends of the existing pipe in order to contain the flowable fill.

Measurement and Payment

At locations where flowable fill is called for on the plans and a pay item for flowable fill is included in the contract, *Flowable Fill* will be measured in cubic yards and paid as the actual number of cubic yards that have been satisfactorily placed and accepted. Such price and payment will be full compensation for all work covered by this provision including, but not limited to, the mix design, furnishing, hauling, placing and containing the flowable fill.

Payment will be made under:

Pay Item

Flowable Fill

Pay Unit

Cubic Yard

PRICE ADJUSTMENT - ASPHALT BINDER FOR PLANT MIX:

(11-21-00)

620

SP6 R25

Price adjustments for asphalt binder for plant mix will be made in accordance with Section 620 of the *2018 Standard Specifications*.

The base price index for asphalt binder for plant mix is \$ **509.55** per ton.

This base price index represents an average of F.O.B. selling prices of asphalt binder at supplier's terminals on **November 1, 2021**.

FINAL SURFACE TESTING NOT REQUIRED:

(5-18-04) (Rev. 2-16-16)

610

SP6 R45

Final surface testing is not required on this project in accordance with Section 610-13, *Final Surface Testing and Acceptance*.

MILLING ASPHALT PAVEMENT:

(1-15-19)

607

SP6 R59

Revise the *2018 Standard Specifications* as follows:

Page 6-5, Article 607-2, EQUIPMENT, lines 14-16, delete the seventh sentence of this Article and replace with the following:

Use either a non-contacting laser or sonar type ski system with a minimum of three referencing stations mounted on the milling machine at a length of at least 24 feet.

ASPHALT CONCRETE PLANT MIX PAVEMENTS:

(2-20-18) (Rev.1-15-19)

610, 1012

SP6 R65

Revise the *2018 Standard Specifications* as follows:

Page 6-14, Table 609-3, LIMITS OF PRECISION FOR TEST RESULTS, replace with the following:

| Mix Property | Limits of Precision |
|---|----------------------------|
| 25.0 mm sieve (Base Mix) | ± 10.0% |
| 19.0 mm sieve (Base Mix) | ± 10.0% |
| 12.5 mm sieve (Intermediate & Type P-57) | ± 6.0% |
| 9.5 mm sieve (Surface Mix) | ± 5.0% |
| 4.75 mm sieve (Surface Mix) | ± 5.0% |
| 2.36 mm sieve (All Mixes, except S4.75A) | ± 5.0% |
| 1.18 mm sieve (S4.75A) | ± 5.0% |
| 0.075 mm sieve (All Mixes) | ± 2.0% |
| Asphalt Binder Content | ± 0.5% |
| Maximum Specific Gravity (G _{mm}) | ± 0.020 |
| Bulk Specific Gravity (G _{mb}) | ± 0.030 |

| | |
|--|-----------------------|
| TSR | ± 15.0% |
| QA retest of prepared QC Gyratory Compacted Volumetric Specimens | ± 0.015 |
| Retest of QC Core Sample | ± 1.2% (% Compaction) |
| Comparison QA Core Sample | ± 2.0% (% Compaction) |
| QA Verification Core Sample | ± 2.0% (% Compaction) |
| Density Gauge Comparison of QC Test | ± 2.0% (% Compaction) |
| QA Density Gauge Verification Test | ± 2.0% (% Compaction) |

Page 6-17, Table 610-1, MIXING TEMPERATURE AT THE ASPHALT PLANT, replace with the following:

| Binder Grade | JMF Temperature |
|--------------------|-----------------|
| PG 58-28; PG 64-22 | 250 - 290°F |
| PG 76-22 | 300 - 325°F |

Page 6-17, Subarticle 610-3(C), Job Mix Formula (JMF), lines 38-39, delete the fourth paragraph.

Page 6-18, Subarticle 610-3(C), Job Mix Formula (JMF), line 12, replace “SF9.5A” with “S9.5B”.

Page 6-18, Table 610-3, MIX DESIGN CRITERIA, replace with the following:

| Mix Type | Design ESALs millions ^A | Binder PG Grade | Compaction Levels | | Max. Rut Depth (mm) | Volumetric Properties ^B | | | |
|-------------------------|--|-----------------|-------------------|------------------|---------------------|------------------------------------|-----------|------------------|--|
| | | | G _{mm} @ | | | VMA % Min. | VTM % | VFA Min.-Max. | %G _{mm} @ N _{ini} |
| | | | N _{ini} | N _{des} | | | | | |
| S4.75A | < 1 | 64 - 22 | 6 | 50 | 11.5 | 16.0 | 4.0 - 6.0 | 65 - 80 | ≤ 91.5 |
| S9.5B | 0 - 3 | 64 - 22 | 6 | 50 | 9.5 | 16.0 | 3.0 - 5.0 | 70 - 80 | ≤ 91.5 |
| S9.5C | 3 - 30 | 64 - 22 | 7 | 65 | 6.5 | 15.5 | 3.0 - 5.0 | 65 - 78 | ≤ 90.5 |
| S9.5D | > 30 | 76 - 22 | 8 | 100 | 4.5 | 15.5 | 3.0 - 5.0 | 65 - 78 | ≤ 90.0 |
| I19.0C | ALL | 64 - 22 | 7 | 65 | - | 13.5 | 3.0 - 5.0 | 65 - 78 | ≤ 90.5 |
| B25.0C | ALL | 64 - 22 | 7 | 65 | - | 12.5 | 3.0 - 5.0 | 65 - 78 | ≤ 90.5 |
| Design Parameter | | | | | | Design Criteria | | | |
| All Mix Types | Dust to Binder Ratio (P _{0.075} / P _{be}) | | | | | 0.6 - 1.4 ^C | | | |
| | Tensile Strength Ratio (TSR) ^D | | | | | 85% Min. ^E | | | |

A. Based on 20 year design traffic.

B. Volumetric Properties based on specimens compacted to N_{des} as modified by the Department.

C. Dust to Binder Ratio (P_{0.075} / P_{be}) for Type S4.75A is 1.0 - 2.0.

D. NCDOT-T-283 (No Freeze-Thaw cycle required).

E. TSR for Type S4.75A & B25.0C mixes is 80% minimum.

Page 6-19, Table 610-5, BINDER GRADE REQUIREMENTS (BASED ON RBR%), replace with the following:

**TABLE 610-5
BINDER GRADE REQUIREMENTS (BASED ON RBR%)**

| Mix Type | %RBR \leq 20% | 21% \leq %RBR \leq 30% | %RBR \geq 30% |
|--|-----------------------|----------------------------|-----------------|
| S4.75A, S9.5B, S9.5C, I19.0C, B25.0C | PG 64-22 | PG 64-22 ^A | PG-58-28 |
| S9.5D, OGFC | PG 76-22 ^B | n/a | n/a |

A. If the mix contains any amount of RAS, the virgin binder shall be PG 58-28.

B. Maximum Recycled Binder Replacement (%RBR) is 18% for mixes using PG 76-22 binder.

Page 6-20, Table 610-6, PLACEMENT TEMPERATURES FOR ASPHALT, replace with the following:

**TABLE 610-6
PLACEMENT TEMPERATURES FOR ASPHALT**

| Asphalt Concrete Mix Type | Minimum Surface and Air Temperature |
|---------------------------|-------------------------------------|
| B25.0C | 35°F |
| I19.0C | 35°F |
| S4.75A, S9.5B, S9.5C | 40°F ^A |
| S9.5D | 50°F |

A. For the final layer of surface mixes containing recycled asphalt shingles (RAS), the minimum surface and air temperature shall be 50°F.

Page 6-21, Article 610-8, SPREADING AND FINISHING, lines 34-35, delete the second sentence and replace with the following:

Use an MTV for all surface mix regardless of binder grade on Interstate, US Routes, and NC Routes (primary routes) that have 4 or more lanes and median divided.

Page 6-21, Article 610-8, SPREADING AND FINISHING, lines 36-38, delete the fourth sentence and replace with the following:

Use MTV for all ramps, loops, Y-line that have 4 or more lanes and are median divided, full width acceleration lanes, full width deceleration lanes, and full width turn lanes that are greater than 1000 feet in length.

Page 6-23, Table 610-7, DENSITY REQUIREMENTS, replace with the following:

**TABLE 610-7
DENSITY REQUIREMENTS**

| Mix Type | Minimum % G _{mm} (Maximum Specific Gravity) |
|------------------------------|---|
| S4.75A | 85.0 ^A |
| S9.5B | 90.0 |
| S9.5C, S9.5D, I19.0C, B25.0C | 92.0 |

A. Compaction to the above specified density will be required when the S4.75A mix is applied at a rate of 100 lbs/sy or higher.

Page 6-24, Article 610-13, FINAL SURFACE TESTING, lines 35-36, delete the second sentence and replace with the following:

Final surface testing is not required on ramps, loops and turn lanes.

Page 6-26, Subarticle 610-13(A)(1), Acceptance for New Construction, lines 29-30, delete the second sentence and replace with the following:

Areas excluded from testing by the profiler may be tested using a 10-foot straightedge in accordance with Article 610-12.

Page 6-27, Subarticle 610-13(B), Option 2- North Carolina Hearne Straightedge, lines 41-46, delete the eighth and ninth sentence of this paragraph and replace with the following:

Take profiles over the entire length of the final surface travel lane pavement exclusive of structures, approach slabs, paved shoulders, tapers, or other irregular shaped areas of pavement, unless otherwise approved by the Engineer. Test in accordance with this provision all mainline travel lanes, full width acceleration or deceleration lanes and collector lanes.

Page 6-28, Subarticle 610-13(B), Option 2- North Carolina Hearne Straightedge, lines 1-2, delete these two lines.

Page 6-32, Article 610-16 MEASUREMENT AND PAYMENT, replace with the following:

| Pay Item | Pay Unit |
|---|-----------------|
| Asphalt Concrete Base Course, Type B25.0C | Ton |
| Asphalt Concrete Intermediate Course, Type I19.0C | Ton |
| Asphalt Concrete Surface Course, Type S4.75A | Ton |
| Asphalt Concrete Surface Course, Type S9.5B | Ton |
| Asphalt Concrete Surface Course, Type S9.5C | Ton |
| Asphalt Concrete Surface Course, Type S9.5D | Ton |

Page 10-30, Table 1012-1, AGGREGATE CONSENSUS PROPERTIES, replace with the following:

**TABLE 1012-1
AGGREGATE CONSENSUS PROPERTIES^A**

| Mix Type | Coarse Aggregate Angularity^B | Fine Aggregate Angularity % Minimum | Sand Equivalent % Minimum | Flat and Elongated 5 : 1 Ratio % Maximum |
|-----------------------|--|--|----------------------------------|---|
| <i>Test Method</i> | <i>ASTM D5821</i> | <i>AASHTO T 304</i> | <i>AASHTO T 176</i> | <i>ASTM D4791</i> |
| S4.75A; S9.5B | 75 / - | 40 | 40 | - |
| S9.5C; I19.0C; B25.0C | 95 / 90 | 45 | 45 | 10 |
| S9.5D | 100 / 100 | 45 | 50 | 10 |

| | | | | |
|------|-----------|----|----|----|
| OGFC | 100 / 100 | 45 | 45 | 10 |
| UBWC | 100 / 85 | 45 | 45 | 10 |

- A. Requirements apply to the design aggregate blend.
- B. 95 / 90 denotes that 95% of the coarse aggregate has one fractured face and 90% has 2 or more fractured faces.

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:

| 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 |
| 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 | 0.559 | 0.559 | --- | --- | 1.5 slip form | --- | 526 | --- | --- | --- |
| | 650 flexural, design only | | | | | 3.0 hand placed | | | | | |
| 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.

THERMOPLASTIC PAVEMENT MARKING MATERIAL – COLOR TESTING:

3-19-19

1087

SP10 R05

Revise the 2018 Standard Specifications as follows:

Pages 10-183 and 10-184, Subarticle 1087-7(D)(1)(b) Yellow, lines 9-11, delete and replace with the following:

Obtain Color Values Y,x,y per ASTM E1349 using C/2° illuminant/observer. Results shall be Y ≥ 45%, and x,y shall fall within PR#1 chart chromaticity limits.

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.

MATERIAL AND EQUIPMENT STORAGE & PARKING OF PERSONAL VEHICLES:

11-17-21

1101

SP11 R03

Revise the *2018 Standard Specifications* as follows:

Page 11-2, Article 1101-8 MATERIAL AND EQUIPMENT STORAGE, line 35-38, delete and replace with the following:

When work is not in progress, keep all personnel, equipment, machinery, tools, construction debris, materials and supplies away from active travel lanes that meets Table 1101-1.

| TABLE 1101-1 | |
|--|---------------|
| MATERIAL AND EQUIPMENT STORAGE FROM ACTIVE TRAVEL LANES | |
| Posted Speed Limit (mph) | Distance (ft) |
| 40 or less | ≥ 18 |
| 45-50 | ≥ 28 |
| 55 | ≥ 32 |
| 60 or higher | ≥ 40 |

When vehicles, equipment and materials are protected by concrete barrier or guardrail, they shall be offset at least 5 feet from the barrier or guardrail.

Page 11-2, Article 1101-9 PARKING OF PERSONAL VEHICLES, line 40-41, delete and replace with the following:

Provide staging areas for personal vehicle parking in accordance with section 1101-8 or as directed by the Engineer before use.

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.

EXTRUDED THERMOPLASTIC PAVEMENT MARKING THICKNESS:

3-19-19

1205

SP12 R05

Revise the *2018 Standard Specifications* as follows:

Page 12-6, Subarticle 1205-4(A)(1) General, lines 5-8, delete the second sentence and replace with the following:

Use application equipment that provides multiple width settings ranging from 4 inches to 12 inches and multiple thickness settings to achieve a minimum pavement marking thickness of 0.090 inch above the surface of the pavement.

Page 12-7, Table 1205-3, THICKNESS REQUIREMENTS FOR THERMOPLASTIC, replace with the following:

| TABLE 1205-3 MINIMUM THICKNESS REQUIREMENTS FOR THERMOPLASTIC | |
|--|---|
| Thickness | Location |
| 240 mils | In-lane and shoulder-transverse pavement markings (rumble strips). May be placed in 2 passes. |
| 90 mils | Center lines, skip lines, transverse bands, mini-skip lines, characters, bike lane symbols, crosswalk lines, edge lines, gore lines, diagonals, and arrow symbols |

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
NCDOT GENERAL SEED SPECIFICATION FOR SEED QUALITY

(5-17-11)

Z-3

Seed shall be sampled and tested by the North Carolina Department of Agriculture and Consumer Services, Seed Testing Laboratory. When said samples are collected, the vendor shall supply an independent laboratory report for each lot to be tested. Results from seed so sampled shall be final. Seed not meeting the specifications shall be rejected by the Department of Transportation and shall not be delivered to North Carolina Department of Transportation warehouses. If seed has been delivered it shall be available for pickup and replacement at the supplier's expense.

Any re-labeling required by the North Carolina Department of Agriculture and Consumer Services, Seed Testing Laboratory, that would cause the label to reflect as otherwise specified herein shall be rejected by the North Carolina Department of Transportation.

Seed shall be free from seeds of the noxious weeds Johnsongrass, Balloonvine, Jimsonweed, Witchweed, Itchgrass, Serrated Tussock, Showy Crotalaria, Smooth Crotalaria, Sicklepod, Sandbur, Wild Onion, and Wild Garlic. Seed shall not be labeled with the above weed species on the seed analysis label. Tolerances as applied by the Association of Official Seed Analysts will NOT be allowed for the above noxious weeds except for Wild Onion and Wild Garlic.

Tolerances established by the Association of Official Seed Analysts will generally be recognized. However, for the purpose of figuring pure live seed, the found pure seed and found germination percentages as reported by the North Carolina Department of Agriculture and Consumer Services, Seed Testing Laboratory will be used. Allowances, as established by the NCDOT, will be recognized for minimum pure live seed as listed on the following pages.

The specifications for restricted noxious weed seed refers to the number per pound as follows:

| <u>Restricted Noxious Weed</u> | <u>Limitations per Lb. Of Seed</u> | <u>Restricted Noxious Weed</u> | <u>Limitations per Lb. of Seed</u> |
|---------------------------------------|---|---------------------------------------|---|
| Blessed Thistle | 4 seeds | Cornflower (Ragged Robin) | 27 seeds |
| Cocklebur | 4 seeds | Texas Panicum | 27 seeds |
| Spurred Anoda | 4 seeds | Bracted Plantain | 54 seeds |
| Velvetleaf | 4 seeds | Buckhorn Plantain | 54 seeds |
| Morning-glory | 8 seeds | Broadleaf Dock | 54 seeds |
| Corn Cockle | 10 seeds | Curly Dock | 54 seeds |
| Wild Radish | 12 seeds | Dodder | 54 seeds |
| Purple Nutsedge | 27 seeds | Giant Foxtail | 54 seeds |
| Yellow Nutsedge | 27 seeds | Horsenettle | 54 seeds |
| Canada Thistle | 27 seeds | Quackgrass | 54 seeds |
| Field Bindweed | 27 seeds | Wild Mustard | 54 seeds |
| Hedge Bindweed | 27 seeds | | |

Seed of Pensacola Bahiagrass shall not contain more than 7% inert matter, Kentucky Bluegrass, Centipede and Fine or Hard Fescue shall not contain more than 5% inert matter whereas a maximum of 2% inert matter will be allowed on all other kinds of seed. In addition, all seed shall

not contain more than 2% other crop seed nor more than 1% total weed seed. The germination rate as tested by the North Carolina Department of Agriculture shall not fall below 70%, which includes both dormant and hard seed. Seed shall be labeled with not more than 7%, 5% or 2% inert matter (according to above specifications), 2% other crop seed and 1% total weed seed.

Exceptions may be made for minimum pure live seed allowances when cases of seed variety shortages are verified. Pure live seed percentages will be applied in a verified shortage situation. Those purchase orders of deficient seed lots will be credited with the percentage that the seed is deficient.

FURTHER SPECIFICATIONS FOR EACH SEED GROUP ARE GIVEN BELOW:

Minimum 85% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 restricted noxious weed seed per pound. Seed less than 83% pure live seed will not be approved.

Sericea Lespedeza
Oats (seeds)

Minimum 80% pure live seed; maximum 1% total weed seed; maximum 2% total other crop; maximum 144 restricted noxious weed seed per pound. Seed less than 78% pure live seed will not be approved.

| | |
|--------------------------------------|----------------------------|
| Tall Fescue (all approved varieties) | Bermudagrass |
| Kobe Lespedeza | Browntop Millet |
| Korean Lespedeza | German Millet – Strain R |
| Weeping Lovegrass | Clover – Red/White/Crimson |
| Carpetgrass | |

Minimum 78% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 restricted noxious weed seed per pound. Seed less than 76% pure live seed will not be approved.

Common or Sweet Sundangrass

Minimum 76% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 restricted noxious weed seed per pound. Seed less than 74% pure live seed will not be approved.

Rye (grain; all varieties)
Kentucky Bluegrass (all approved varieties)
Hard Fescue (all approved varieties)
Shrub (bicolor) Lespedeza

Minimum 70% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 noxious weed seed per pound. Seed less than 70% pure live seed will not be approved.

| | |
|----------------------|-------------------|
| Centipedegrass | Japanese Millet |
| Crownvetch | Reed Canary Grass |
| Pensacola Bahiagrass | Zoysia |
| Creeping Red Fescue | |

Minimum 70% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 5% inert matter; maximum 144 restricted noxious weed seed per pound.

Barnyard Grass
Big Bluestem
Little Bluestem
Bristly Locust
Birdsfoot Trefoil
Indiangrass
Orchardgrass
Switchgrass
Yellow Blossom Sweet Clover

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 U.S.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. (<i>Executive Order 13166</i>) |
| Color | Color of skin, including shade of skin within a racial group | Black, White, brown, yellow, etc. | |
| National Origin (<i>Limited English Proficiency</i>) | Place of birth. Citizenship is not a factor. (<i>Discrimination based on language or a person's accent is also covered</i>) | Mexican, Cuban, Japanese, Vietnamese, Chinese | |
| Sex | Gender. The sex of an individual. <i>Note: Sex under this program does not include sexual orientation.</i> | 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 |

| | | | |
|--|---|---|---|
| <p>Religion (in the context of employment) <i>(Religion/ Creed in all aspects of any aviation or transit-related construction)</i></p> | <p>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.</p> | <p>Muslim, Christian, Sikh, Hindu, etc.</p> | <p>Title VII of the Civil Rights Act of 1964; 23 CFR 230; FHWA-1273 Required Contract Provisions. <i>(49 U.S.C. 5332(b); 49 U.S.C. 47123)</i></p> |
|--|---|---|---|

(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 |

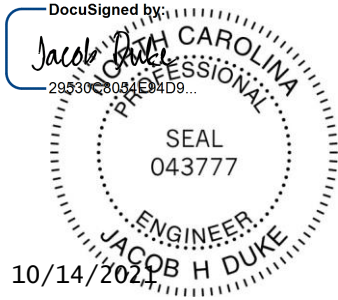
The installer may choose to use an AASHTO Type 4/Type 1 or AASHTO Type 3/Type 1 double drop system, but no price adjustment will be made, and these systems will be incidental to the polyurea pavement marking.

Pay Item

Pay Unit

Polyurea Pavement Marking Lines, _____", _____mils
 (Standard Glass Beads)

Linear Foot



THERMOPLASTIC RUMBLE BARS

(SPECIAL)

(10-8-2020)

1 General

The work under this Project Special Provision includes the furnishing and installation of the preformed thermoplastic rumble bars at locations and dimensions shown in the plans.

2 Materials

(A) General

Material shall be a resilient thermoplastic product. Yellow and white pavement marking materials shall be retroreflective. Black pavement marking materials shall be matte, non-reflective.

The material manufacturer has the option of formulating the pavement marking material according to his own specifications; however, the manufacturer shall meet all the minimum requirements specified herein and set forth by the Standard Specifications in section 1087 and 1205.

All materials, pigments, beads, highly reflective media, and resins shall be free from all skins, dirt, foreign objects and be resistant to the detrimental effects of motor fuels, lubricants, hydraulic fluids, antifreeze, etc.

Use materials capable of being fabricated into pavement markings of specified dimensions and conforming to pavement contours, breaks and faults through the action of traffic at normal pavement temperatures and capable of adhering to asphalt, Portland cement concrete pavements and concrete bridge deck overlays as specified in the plans and contract documents when applied in accordance with the manufacturers recommendation.

Pavement marking materials upon heating shall not exude fumes, which are toxic, or injurious to persons or property.

The materials must be able to be applied in temperatures down to 32°F (0°C) without any special storage, preheating or treatment of the material before application.

The material must be able to be applied without any preheating of the pavement to a specific temperature.

(B) Thermoplastic Materials

Thermoplastic materials shall meet the requirements of section 1087 of the Standard Specifications.

(C) Glass Beads

Glass bead material shall meet the requirements of section 1087 of the Standard Specifications.

(D) Base Material

Base material shall act as an adhesive layer for attaching the rumble bar to the riding surface. The material shall be yellow, white, and black and come from the same manufacturer as the rumble bar material.

The material shall be homogeneously composed of pigments, resins, polymers (adhesive constituent), glass beads, and other fillers. The material shall meet the following requirements:

Readily extrude at temperatures of 400°F to 425°F, not to exceed 450°F.

When cooled to normal pavement temperature, materials shall produce an adherent, reflective pavement marking capable of resisting deformation by traffic.

(1) Composition

| Component | Test Method | White | Yellow | Black |
|--------------------------------------|-------------|-----------|-----------|-----------|
| Glass Beads | ASTM D4797 | 48% Min. | 48% Min. | N/a |
| TiO ₂ , Type II Rutile | | 10% Min. | N/a | N/a |
| Organic Yellow | | N/a | | N/a |
| Resin Polymer Content | ASTM D4797 | 21% - 26% | 21% - 26% | 21% - 26% |
| Inert Fillers | | 16% - 21% | 26% - 31% | N/A |

(2) Physical Properties

Samples shall be tested in accordance with ASTM D7307 and ASTM D7308 and adhere to the following criteria.

| Property | Test Method | Max. | Min. |
|--------------------------------------|----------------------------|-------------|------|
| Specific Gravity | Water displacement | | 2.15 |
| Bond Strength | ASTM D4796 or ASTM C321 | 300 psi | |
| Low Temperature Stress (Cracking) | AASHTO T250 (1) | No cracking | |

| | | | |
|--|-------------------------------|-------------------|--------|
| Gardner Impact (Room Temperature) | ASTM D5420, Section 11 (2) | 60 inch pound | |
| Gardner Impact (Low Temperature) | ASTM D5420, Section 11 (3) | 10 inch pounds | |
| Tensile Elongation | ASTM D638 (4) | 30% | |
| Taber Abrasion | ASTM D4060 (5) | | 350 mg |
| Flash Point | ASTM D92 | 500°F | |
| <ol style="list-style-type: none"> 1. 72-hour freeze cycle at 15°F at an application thickness of 125 mils on concrete. 2. Tested at 73.4°F, plus or minus 3°F on a concrete substrate applied at 125 mils using a 2# weight and a 0.625-inch male indenter. 3. Tested at 32°F, plus or minus 3°F on a concrete substrate applied at 125 mils using a 2# weight and a 0.625-inch male indenter. 4. Type “dog bone” configuration of a width of approximately 0.45 inches and a thickness of 0.10 inches (100 mils) with a pull rate of 0.25 inches per minute. 5. At 1000 cycles using CS 17 wheels with a 1000-gram load. Test specimens shall be conditioned at room temperature for 72 hours before testing. | | | |

(E) Rumble Bar Material

The rumble bar material must be able to fuse to the base material with the use of additional fasteners or adhesives. The rumble bar shall be of sufficient height and width to perform as described previously. Material should be Thermoplastic and shall meet the requirements of section 1087 of the Standard Specifications.

(F) Primer Sealer

To be used in applications on Portland cement concrete pavements or concrete bridge deck overlays.

Provide a two-component epoxy-sealer to enhance the bond strength between the road surface and the thermoplastic pavement markings per manufacturer’s recommendation.

(G) Color

Colors shall meet the requirements of section 1087 of the Standard Specifications.

(H) Heating Indicators

The top surface of the material shall have regularly spaced indents. The closing of these indents during application shall act as a visual cue that the material has reached a molten state allowing for satisfactory adhesion and proper bead embedment, and as a post-application visual cue that the application procedures have been followed.

(I) Thickness

The base layer materials must be supplied at a minimum thickness of 125 mil (3.2 mm). Two base layers are required for application. The rumble bar material, as provided by the manufacturer, will provide a minimum pre-applied vertical height of 250 mil (6.4 mm). The combined pre-application height of the two base layers and the rumble bar shall be 500 mil (12.7mm).

- (J) **Surface Treatment**
Yellow and white rumble bar material shall have a surface treatment of glass beads.
- (K) **Dimensions**
The base material shall be provided in sections 4 inches (10 cm) in width. Rumble bar material shall be provided in sections 2 inches (5 cm) in width.
- (L) **Environmental Resistance**
The material must be resistant to deterioration due to exposure to sunlight, water, salt, and adverse weather conditions and impervious to oil and gasoline.
- (M) **Retroreflectivity**
All material shall meet all retroreflectivity requirements set forth by the Standard Specifications in section 1087 and 1205.
- All material, when applied in accordance with the manufacturer's guidelines, must demonstrate a uniform level of sufficient nighttime retroreflection when tested in accordance with ASTM E 1710.
- (N) **Material Certification**
Furnish all pavement marking materials in accordance with the material certification in section 1087 of the Standard Specifications.

3 Application

- (A) **General**
Install pavement marking materials in accordance with the minimum standards described in section 1205 of the Standard Specifications and the manufacturers recommendations.
- (B) **Bituminous Pavement**
The materials shall be applied using the propane torch or a method recommended by the manufacturer. The material must be able to be applied at ambient and road temperatures down to 32°F (0°C) without any preheating of the pavement to a specific temperature. The pavement shall be clean, dry, and free of debris. Two base layers of material shall be used for this application. The first base layer shall be heated until molten, the second base layer is then placed on the molten layer and heated until molten. The rumble bar shall immediately be positioned and pressed into the still molten base layers of preformed thermoplastic.
- (C) **Portland Cement Concrete and Concrete Bridge Deck Overlays**
The same application procedure shall be used as described for Bituminous Pavement. However, a compatible primer sealer shall be applied before application to assume proper adhesion.

Follow the manufacture's recommendations for surface preparation prior to application to exposed overlay surface aggregate with abrasive surface prep to aid in base material adhesion. Take care not to damage the integrity of the deck overlay during installation.

(1) Portland Cement Concrete and Concrete Bridge Deck Overlay sealer

The sealer shall be capable of being applied to the road surface either by brush, roller, sprayer, or from the sealer cartridges through the missing nozzle and then spread over the material with a roller to leave a thin, even, uniform coat. It shall be capable of being applied in a thin, even, uniform coat.

4 Packaging

All materials shall be packaged in accordance with the manufacturer's recommendations and section 1087 of the Standard Specifications.

5 Maintenance

Perform maintenance on all pavement markings and marking materials as specified by section 1205 of the Standard Specifications.

6 Measurement and Payment

Thermoplastic Rumble Bars will be measured and paid as the actual number of linear feet of pavement marking lines satisfactory placed and accepted by the Engineer. Payment at the contract unit price for the various items will be the full compensation for all the items covered by this provision. No separate payment will be for: the work involved in applying the lines, including surface preparation; reapplication of molten pavement markings crossed by a vehicle, removal of all pavement marking materials spilled on the roadway surface, and repair of markings tracked by a vehicle.

Payment will be made under:

Pay Item

Thermoplastic Rumble Bars

Unit

Linear Foot

STABILIZATION REQUIREMENTS:

(3-11-16)

S-2A

Stabilization for this project shall comply with the time frame guidelines as specified by the NCG-010000 general construction permit effective April 1, 2019 issued by the North Carolina Department of Environmental Quality Division of Water Resources. Temporary or permanent ground cover stabilization shall occur within 7 calendar days from the last land-disturbing activity, with the following exceptions in which temporary or permanent ground cover shall be provided in 14 calendar days from the last land-disturbing activity:

- Slopes between 2:1 and 3:1, with a slope length of 10 ft. or less
- Slopes 3:1 or flatter, with a slope of length of 50 ft. or less
- Slopes 4:1 or flatter

The stabilization timeframe for High Quality Water (HQW) Zones shall be 7 calendar days with no exceptions for slope grades or lengths. High Quality Water Zones (HQW) Zones are defined by North Carolina Administrative Code 15A NCAC 04A.0105 (25). Temporary and permanent ground cover stabilization shall be achieved in accordance with the provisions in this contract and as directed.

SEEDING AND MULCHING:**(East Crimp)**

The kinds of seed and fertilizer, and the rates of application of seed, fertilizer, and limestone, shall be as stated below. During periods of overlapping dates, the kind of seed to be used shall be determined. All rates are in pounds per acre.

All Roadway Areas

March 1 - August 31

50# Tall Fescue
 10# Centipede
 25# Bermudagrass (hulled)
 500# Fertilizer
 4000# Limestone
 10# Millet

September 1 - February 28

50# Tall Fescue
 10# Centipede
 35# Bermudagrass (unhulled)
 500# Fertilizer
 4000# Limestone
 25# Choose ONE of the Following
 Rye Grain,
 Wheat FFR 555, or
 Roane Wheat

Waste and Borrow Locations

March 1 – August 31

75# Tall Fescue
 25# Bermudagrass (hulled)
 500# Fertilizer
 4000# Limestone

September 1 - February 28

75# Tall Fescue
 35# Bermudagrass (unhulled)
 500# Fertilizer
 4000# Limestone

Note: 50# of Bahiagrass may be substituted for either Centipede or Bermudagrass only upon Engineer's request.

Approved Tall Fescue Cultivars

| | | | |
|----------------------------|-----------------|-----------------|--------------------|
| 06 Dust | Escalade | Justice | Scorpion |
| 2 nd Millennium | Essential | Kalahari | Serengeti |
| 3 rd Millennium | Evergreen 2 | | Shelby |
| Apache III | Falcon IV | Kitty Hawk 2000 | Sheridan |
| Avenger | Falcon NG | Legitimate | Signia |
| Barlexas | Falcon V | Lexington | Silver Hawk |
| Barlexas II | Faith | LSD | Sliverstar |
| Bar Fa | Fat Cat | Magellan | Shenandoah Elite |
| Barrera | Festnova | Matador | Sidewinder |
| Barrington | Fidelity | Millennium SRP | Skyline |
| Barrobusto | Finelawn Elite | Monet | Solara |
| Barvado | Finelawn Xpress | Mustang 4 | Southern Choice II |
| Biltmore | Finesse II | Ninja 2 | Speedway |
| Bingo | Firebird | Ol' Glory | Spyder LS |
| Bizem | Firecracker LS | Olympic Gold | Sunset Gold |
| Blackwatch | Firenza | Padre | Taccoa |
| Blade Runner II | Five Point | Patagonia | Tanzania |
| Bonsai | Focus | Pedigree | Trio |
| Braveheart | Forte | Picasso | Tahoe II |
| Bravo | Garrison | Piedmont | Talladega |
| Bullseye | Gazelle II | Plantation | Tarheel |
| Cannavaro | Gold Medallion | Proseeds 5301 | Terrano |
| Catalyst | Grande 3 | Prospect | Titan ltd |
| Cayenne | Greenbrooks | Pure Gold | Titanium LS |
| Cessane Rz | Greenkeeper | Quest | Tracer |
| Chipper | Gremlin | Raptor II | Traverse SRP |
| Cochise IV | Greystone | Rebel Exeda | Tulsa Time |
| Constitution | Guardian 21 | Rebel Sentry | Turbo |
| Corgi | Guardian 41 | Rebel IV | Turbo RZ |
| Corona | Hemi | Regiment II | Tuxedo RZ |
| Coyote | Honky Tonk | Regenerate | Ultimate |
| Darlington | Hot Rod | Rendition | Venture |
| Davinci | Hunter | Rhambler 2 SRP | Umbrella |
| Desire | Inferno | Rembrandt | Van Gogh |
| Dominion | Innovator | Reunion | Watchdog |
| Dynamic | Integrity | Riverside | Wolfpack II |
| Dynasty | Jaguar 3 | RNP | Xtremegreen |
| Endeavor | Jamboree | Rocket | |

On cut and fill slopes 2:1 or steeper Centipede shall be applied at the rate of 5 pounds per acre and add 20# of Sericea Lespedeza from January 1 - December 31.

Fertilizer shall be 10-20-20 analysis. A different analysis of fertilizer may be used provided the 1-2-2 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as a 10-20-20 analysis and as directed.

All areas seeded and mulched shall be tacked with asphalt. Crimping of straw in lieu of asphalt tack shall not be allowed on this project.

CRIMPING STRAW MULCH:

Crimping shall be required on this project adjacent to any section of roadway where traffic is to be maintained or allowed during construction. In areas within six feet of the edge of pavement, straw is to be applied and then crimped. After the crimping operation is complete, an additional application of straw shall be applied and immediately tacked with a sufficient amount of undiluted emulsified asphalt.

Straw mulch shall be of sufficient length and quality to withstand the crimping operation.

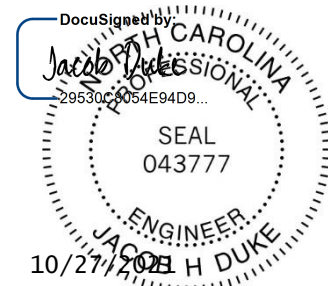
Crimping equipment including power source shall be subject to the approval of the Engineer providing that maximum spacing of crimper blades shall not exceed 8".

PROJECT SPECIAL PROVISION

STRUCTURE

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15BPR.46

BP-2

Dare County

SCOPE OF WORK

This work shall consist of furnishing all labor, equipment, and materials to: repair the existing bridge deck surface and improve rideability from gutter line-to-gutter line of all spans with a polymer concrete overlay; repair/replace joints; mill and resurface approach roadway; replace the shoulder berm gutter at the North West corner only; perform bearing replacement; complete superstructure and substructure concrete repairs and epoxy crack injection as directed in the plans; apply epoxy coating at beam ends; apply epoxy coating on top of bent caps; apply cathodic protection treatment including metalizing of beams, metalizing of bent caps, installation of bulk anodes, installation of cathodic protection integral pile jackets; apply erosion remediation measures at End Bent 2; clear debris from drains.

Work will be performed on the existing bridges at the following location in Dare County:

- Bridge # 270012 – US 64 BYP over The Intracoastal Waterway (Roanoke Sound)

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

Existing dimensions and bridge condition are from the best information available. The contractor shall field verify the information shown in the plans prior to commencing repairs or ordering material. Notify the engineer of any discrepancies.

The contractor shall be responsible for fulfilling all requirements of the NCDOT Standard Specifications for Roads and Structures dated January 2018, except as 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) 707 – 6408
(919) 250 – 4082 facsimile
jlbolden@ncdot.gov

15BPR.46

BP-5

Dare County

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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” |

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| | | | |
|--|---------------------------|---|---|
| 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 |

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| | | | |
|--|---------------------------|---|---|
| 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

- 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*.
- 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.
- 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.
- Electronic copy of submittal is required. See referenced provision.

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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.

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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.

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

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

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

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

2.0 MATERIALS

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

3.0 DESIGN REQUIREMENTS**A. Working Drawings**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

1. Wind Loads

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

Table 2.2 - Wind Pressure Values

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

2. Time of Removal

The following requirements replace those of Article 3.4.8.2.

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

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

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

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

B. Review and Approval

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

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

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

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

4.0 CONSTRUCTION REQUIREMENTS

All requirements of Section 420 of the Standard Specifications apply.

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

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

A. Maintenance and Inspection

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

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

B. Foundations

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

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

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

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

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

5.0 REMOVAL

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

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

6.0 METHOD OF MEASUREMENT

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

7.0 BASIS OF PAYMENT

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

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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.

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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 LT Derek Burrill at (910)-772-2230 or BM1 Poden Pedrus at (910) 772-2212 or email ncmarineevents@uscg.mil. The contractor must also contact 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.

Navigational lighting shall be maintained in accordance with the requirements set forth by the U.S. Coast Guard.

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

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

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

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

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

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

BRIDGE DECK RIDEABILITY AND GROOVING**(9-30-11)****1.0 GENERAL**

This Special Provision shall govern the testing, diamond grinding, transverse grooving and all other related work associated with obtaining satisfactory rideability and surface texture of the bridge deck surface. Provide a surface finish in accordance with Article 420-14(B) of the Standard Specifications.

2.0 TESTING REQUIREMENTS

Perform acceptance testing of the longitudinal profile of the finished bridge deck in each wheel path of each lane in the presence of the Engineer. It is the Contractor's responsibility to submit a proposed plan of action and schedule for profilograph testing. Use a certified independent provider, approved by the Engineer, to perform the profilograph test.

Prior to profilograph testing, placement of the bridge deck and barrier rail within the section to be tested shall be complete, with the exception of blockouts required for the installation of joints. Do not install joints until the Engineer determines that the rideability requirements herein have been met. Joint locations should be temporarily bridged sufficiently to facilitate operation of the profilograph and corrective equipment across the joint. Remove all obstructions from the bridge deck and sweep the surface clean of debris prior to testing. If automated profilograph equipment is used, there shall be no radio transmissions or other activities that might disrupt the automated profilograph equipment during the testing.

Ensure that the profilograph is in good operating condition per the manufacturer's recommendations. Maintain tires free of debris and buildup during each test run. Operate the profilograph at a maximum speed of 2 miles per hour. If a propulsion vehicle is used, it shall be approved, and the gross vehicle weight shall not exceed 1,000 pounds.

At the beginning and end of each day's testing, and at other times determined to be necessary by the Engineer, operate the profilograph over a calibration strip so the Engineer can verify correct operation of the profilograph. The calibration strip shall be a 100 foot section of pavement that is reasonably level and smooth. Submit each day's calibration graphs with that day's test section graphs to the Engineer. Calibrate the profilograph in accordance with the current NCDOT procedure entitled "Determination of Profile Index". Copies of this procedure may be obtained from the NCDOT Construction Unit.

Plot each profilogram on a continuous graph at a horizontal scale of 25 feet per inch with the vertical scale plotted at a true scale. Station numbers shall be recorded on the profilogram at distances not to exceed 200 feet. Note joint locations on the profilogram.

Take profiles with the recording wheel in each wheel path of each lane. The wheel paths of a lane are considered parallel to and approximately 3.5 feet inside both edges of the travel lane. Take profiles over the entire length of the travel lanes on the bridge deck including approach slabs. Upon completion of testing, submit the profilograms for each wheel path to the Engineer for analysis. The Engineer will retain the profilograms.

The Engineer will determine the Profile Index for each wheel path in accordance with the procedure entitled "Determination of Profile Index".

A test section is defined as a 600 foot length of each travel lane. The maximum allowable Profile Index per lane shall not exceed 25" per mile as determined with a 0.0" blanking band over any 600 foot test section. The Contractor will correct individual deviations in excess of 0.3" over any 25 foot length on the line tested by diamond grinding. Additionally, the entire deck surface shall meet a 0.125" in 10 feet straightedge check made atop the deck either transversely or longitudinally as deemed necessary by the Engineer.

3.0 DIAMOND GRINDING

If the deck does not meet the testing requirements, diamond grinding is required to make corrections. Diamond grind the full width of all lanes and shoulders in the direction of travel.

Diamond grinding shall be performed using a Boart Longyear PC 5000, a Target 3804 or an approved equal. Submit grinding equipment specifications to the Engineer for approval before any grinding is performed. Use a grinding machine capable of removing a minimum of 3 feet of width with each pass. Multiple passes may be needed to achieve the required depth of removal. In addition, hand grinding may be required to remove vertical steps between passes.

The ground surface shall consist of between 50 and 60 grooves per foot of width. The grooves shall be between 0.09" and 0.15" in width and 0.0625" in depth. The area between the grooves shall be between 0.06" and 0.13" in width. The final concrete texture shall be uniform.

Construct and operate the grinding machine such that it will not cause strain or damage to the deck surface, excessive ravels, aggregate fractures, spalls, or disturbance of transverse joints. Longitudinally grind the deck parallel to the roadway centerline.

Continuously remove all slurry or other debris resulting from the grinding operations by vacuum pick-up or other approved methods. Prevent the slurry from flowing into floor drains, onto the ground or into the body of water under the bridge. Dispose of all residues off the project.

In completing all corrective work on the deck surface to satisfy the rideability criteria stated herein, limit grinding such that the final reinforcement cover is not less than the plan cover minus ½ inch. In cases where this cannot be achieved, other corrective work may be required as directed by the Engineer.

Provide additional profilograph testing as necessary following grinding until the rideability requirements above are satisfied.

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4.0 GROOVING BRIDGE FLOORS

After the final concrete surface profile has been accepted by the Engineer, groove the bridge deck in accordance with Article 420-14(B) of the *Standard Specifications*.

Grooving will not be required if the entire bridge deck surface is diamond grinded. Payment for grooving in accordance with Section 420 of the *Standard Specifications* will be made when grooving has been performed, or when diamond grinding of the entire bridge deck surface is performed, either condition being an acceptable, final riding surface.

5.0 BASIS OF PAYMENT

No separate payment will be made for profilograph testing, retesting or corrective action work required to meet the requirements established herein. The cost of the testing procedure, equipment, grinding operation, and removal and disposal of slurry and debris resulting from the grinding operation or demolition is considered incidental to the contract bid price for "Placing and Finishing Polymer Concrete Overlay".

**OVERLAY SURFACE PREPARATION FOR
POLYMER CONCRETE****(SPECIAL)****DESCRIPTION**

This special provision addresses the surface preparation activities required prior to the placement of polymer concrete (PC). Unless specifically mentioned below, all requirements specified for the bridge deck are also required for the approach slabs.

Work includes: removal of unsound and sound bridge deck concrete and existing patches in deck repair areas; preparation of repair areas prior to placement of PC bridge deck repair material; bridge deck surface preparation prior to placement of PC overlay; and any incidentals necessary to prepare the bridge deck for placement of PC repair material or PC overlay, as specified or as shown on the plans.

DEFINITIONS

Scarification shall consist of the removal of any asphalt wearing surface and concrete surface to the uniform depth and limits shown on the plans.

Shotblasting shall consist of steel beads (or other materials as approved by the Engineer) “shot” out of a machine onto the bridge concrete deck concrete floor to remove soft or deteriorated concrete, and to clean the concrete deck surface for the application of the PC overlay. Contractor shall vary the speed of the shotblaster or make multiple passes, as necessary, to achieve the required surface preparation for the PC overlay. Areas inaccessible with shotblasting equipment may require surface preparation with sandblasting equipment and hand equipment.

EQUIPMENT

All equipment for cleaning the existing concrete surface and mixing and applying the overlay system shall be in accordance with the System Provider’s recommendations, as approved by the Engineer prior to commencement of any work:

- (A) Scarifying equipment that is a power-operated, mechanical grinder capable of removing a minimum depth of ¼” for each pass.
- (B) Shotblasting and sandblasting equipment to adequately prepare the bridge deck substrate, as required in this special provision. Provide equipment to supply oil-free and moisture-free compressed air for final surface preparation.
- (C) Equipment capable of sawing concrete to the specified plan depth.
- (D) Power driven hand tools for removal of unsound concrete are required that meet the following requirements:
 - (1) Pneumatic hammers weighing a nominal 15 lbs. or less.
 - (2) Pneumatic hammer chisel-type bits that do not exceed the diameter of the shaft in width.
- (E) Hand tools, such as hammers and chisels, for removal of final particles of unsound concrete.
- (F) Self-propelled vacuum capable of picking up dust and other loose material from prepared deck surface.
- (G) Equipment to supply oil-free and moisture-free compressed air for final surface preparation.

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The equipment must operate at a noise level less than 90 decibels at a distance of 50 feet.

MANAGEMENT AND DISPOSAL OF CONCRETE DEBRIS

All concrete debris shall become the property of the Contractor. The contractor shall be responsible for disposing of all debris generated by scarification, shotblasting, sandblasting, and any other surface preparation operations, in compliance with applicable regulations concerning such disposal.

All costs associated with management and disposal of all debris shall be included in the payment of other items.

OSP PLAN SUBMITTAL

Prior to beginning surface preparation activities, the Contractor shall submit for review and approval the Overlay Surface Preparation (OSP) Plan. The OSP Plan shall detail the type of equipment that is intended to be used and the means by which the Contractor will achieve the following requirements:

- (A) Estimate depth of reinforcing steel.
- (B) Scarification of deck to depth required.
- (C) Measure depth of scarification to show completed within limits.
- (D) Measure depth of shotblasting to show completed within limits.

The OSP Plan shall also include a schedule showing lane closures with estimated amount of bridge deck to be scarified, anticipated areas of Class II/III to be repaired and PC to be placed within that lane closure time. The Contractor should assume that any surface that is scarified shall be covered with the proper PC overlay before traffic is returned to the bridge deck, unless otherwise approved by the Engineer. The Contractor may propose traffic to be allowed on scarified bridge deck surfaces provided that the surface and joints are found to be structurally sound after scarification and a smooth transition is provided at the leading and trailing ends and throughout the bridge surface. The duration between bridge deck scarification and PC placement shall be specified by the Engineer. The number of bridges, if any, that can be scarified in advance of PC placement shall be specified by the Engineer. Any additional approach work required to provide a smooth transition to the scarified surface before opening to traffic is incidental to the other items of work. The OSP plan shall clearly show the Contractor's intended plan and order of scarifying and placing PC on all bridges with associated timeframes. The OSP plan and associated scarification timeframes must be approved by the Engineer prior to starting any surface preparation operations.

SURFACE PREPARATION

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

Remove all existing asphalt overlays and all loose, disintegrated, unsound or contaminated concrete to the limits shown on the plans with the following requirements.

During surface preparation, precaution shall be taken to assure that traffic is protected from rebound, dust, and construction activities. Appropriate shielding shall be provided as required and directed by the Engineer. During surface preparation, the Contractor shall provide suitable

coverings, as needed to protect all exposed areas not to receive overlay, such as curbs, sidewalks, parapets, etc. All damage or defacement resulting from surface preparation shall be repaired to the Engineer's satisfaction at no additional cost to the Department.

(A) Sealing of Bridge Deck: Seal all expansion joints subject to run-off water from the scarification, shotblasting, and PC placement process with material approved by the Engineer, prior to beginning any demolition. The expansion joints shall remain sealed until it has been determined that water and materials from the scarification, shotblasting, and PC placement operations cannot be discharged through them any longer. Take all steps necessary to eliminate the flow of water or materials through the expansion joints, and any other locations water or materials could leak from the deck.

All deck drains in the immediate work area and other sections of the bridge affected by the work being performed shall be sealed prior to beginning scarification. Drains shall remain sealed until it has been determined that water and materials from the scarification, shotblasting, and PC placement operations cannot be discharged through them any longer.

(B) Scarifying Bridge Deck: Remove any asphalt wearing surface from the bridge deck and scarify the concrete deck to remove the entire concrete surface of the deck to the uniform depth and limits shown on the plans.

It will be the Contractor's responsibility to determine amount of cover for the reinforcing steel. Use a pachometer or other approved device, as approved by Engineer, prior to scarification. Readings shall be read and recorded in the presence of the Engineer. Readings shall be recorded for each span at 1/5 points longitudinally and 1/3 points transversely. The cost for this work will be considered incidental to the cost of surface preparation of the bridge deck.

Estimated average cover to top mat:

Bridge Number: 270012 2 1/2" +/-1/2"

The above top mat cover dimensions are an estimate based on the best available information. Calibrate scarifying equipment in order to avoid damaging the reinforcing steel in the bridge floor or the approach slab. Care shall be taken not to cut, stretch, or damage any exposed reinforcing steel. If reinforcing bars or bridge drainage devices are pulled up or snagged during scarification operations, cease work and consult with the Engineer to determine any necessary adjustments to the roto-milling operation.

Remove and dispose of all concrete and asphalt, and thoroughly clean the scarified surface. In areas where reinforcing steel is located in the depth to be scarified, use another method with the Engineer's approval.

The Engineer will re-inspect after each removal and require additional removals until compliance with plans and specifications are met.

Regardless of the method of removal, the removal operation shall be stopped if it is determined that sound concrete is being removed to a depth greater than required by the plans.

(C) Class II Surface Preparation (Partial Depth): At locations specified on the plans or identified by the Engineer for Class II Surface Preparation, verify the depth of removal achieved by the scarification. Remove by additional scarification or chipping with hand tools all existing

patches and unsound concrete. No additional payment will be made for Class II Surface Preparation depths achieved by the initial scarification.

All patches shall be removed under Class II Surface Preparation. If any patch cannot be removed by means of scarification, the Contractor shall use hand tools to remove the patch. Areas indicated on the plans that require Class II Surface Preparation, including the locations of existing patches, are from the best information available. The Contractor shall verify prior to surface preparation the location of all existing patches.

Spalled or unsound areas of the deck not removed by scarification shall be removed to sound concrete at locations noted in the contract plans or as directed by the Engineer. Remove existing spalled or unsound areas of the bridge concrete deck by methods approved by the Engineer.

Provide a 1" deep saw cut around the perimeter of areas noted for bridge deck or patch removal. Remove, using the type of tools listed above, all concrete or patch material within the sawcut to a minimum depth of 1" and as necessary to remove unsound concrete. All loose and unsound concrete or patch material shall be removed.

Thoroughly clean the newly exposed surface to be free of all grease, oil, curing compounds, acids, dirt, or loose debris in accordance with this special provision.

Dispose of the removed concrete, clean, repair or replace rusted or loose reinforcing steel, and thoroughly clean the newly exposed surface. Care shall be taken not to cut, stretch, or damage any exposed reinforcing steel.

In overhangs, removing concrete areas of less than 0.60 ft²/ft length of bridge without overhang support is permitted unless the Engineer directs otherwise. Overhang support is required for areas removed greater than 0.60 ft²/ft length of bridge. Submit details of overhang support to the Engineer for approval prior to beginning the work.

- (D) Class III Surface Preparation (Full Depth): At locations specified on the plans or identified by the Engineer for Class III Surface Preparation, remove the concrete by chipping with hand tools the full depth of slab. Dispose of the removed concrete, clean, repair or replace damaged reinforcing steel and thoroughly clean the newly exposed surface. Care shall be taken not to cut, stretch, or damage any exposed reinforcing steel.

For areas of less than 3 ft², suspending forms from existing reinforcing steel using wire ties is permitted. For larger areas, support forms by blocking from the beam flanges, or other approved method.

Overhang support is required for full depth removal adjacent to bridge rails. Submit details of overhang support to the Engineer for approval prior to beginning the work.

- (E) Preparation of Reinforcing Steel: Remove concrete without cutting or damaging existing steel unless otherwise noted in the plans. Clean, repair, or replace rusted or loose reinforcing steel. Damaged reinforcing steel, such as bars with nicks deeper than 20% of the bar diameter, shall be repaired or replaced. Reinforcing steel which has a cross section reduced to 75% or less shall be replaced with new reinforcing steel of similar cross section area. Replacement bars shall be Grade 60 and meet the material requirements of Section 1070 of the *Standard Specifications*.

Replacement bars shall be spliced to existing bars using either minimum 30 bar diameter lap splices to existing steel with 100% cross sectional area or approved mechanical connectors.

For reinforcing steel left unsupported by the concrete removal process, support and protect the exposed reinforcing steel against displacement and damage from loads, such as those caused by removal equipment and delivery buggies. All reinforcing steel damaged or dislodged by these operations shall be replaced with bars of the same size at the contractor's expense.

Reinforcing steel exposed and satisfactorily cleaned and prepared will not require additional cleaning, if encased in concrete within seven (7) days. Rebar exposed for more than seven (7) days shall be satisfactorily cleaned and prepared, prior to placement of the new concrete. The satisfactory cleanliness and preparation of the reinforcing steel shall be determined by the Engineer.

When large areas of the deck on composite bridges are removed resulting in the debonding of the primary reinforcing bars, the removal shall be performed in stages to comply with the construction sequence shown on the plans or as directed by the Engineer.

(F) Concrete Deck Repair: Repair and fill the Class II Surface Preparation areas of the existing bridge concrete deck prior to the final surface preparation and application of the PC overlay, at locations shown in the plans, or as determined by the Engineer, if necessary. Materials other than PC may be used for concrete deck repairs, but shall be approved by the PC System Provider's Technical Representative and shall be applied and prepared as required by the PC System Provider. For concrete deck repairs with PC:

- (1) Removal and surface preparation of the repair area shall be in accordance with and shall be paid for under pay items in this special provision.
- (2) Materials, equipment, placement, and finishing of PC used for concrete deck repairs shall meet the requirements of and shall be paid for under pay items in the Polymer Concrete Bridge Deck Overlay special provision.

PC repair material may be placed up to one (1) hour prior to overlay placement.

All repairs shall be placed and finished to match substrate deck grade prior to PC placement, in order to provide a uniform overlay thickness.

Concrete deck repairs with PC may be utilized as a stand-alone item where required on structures not to receive a PC overlay.

(G) Surface Cleaning: The surface of concrete substrate and repaired areas shall be prepared for application of the overlay by shotblasting in order to remove all existing grease, slurry, oils, paint, dirt, striping, curing compound, rust, membrane, weak surface mortar, or any other contaminants that could interfere with the proper adhesion of the overlay system. The final prepared surface shall adhere to the following requirements:

- (1) If expansion joints are not being replaced or have been replaced prior to shotblasting they shall be protected from damage from the shotblasting operation. Deck drains and areas of curb or railing above the proposed surface shall be protected from the shotblasting operation.

- (2) The areas to receive overlay shall be cleaned by shotblasting, or abrasive sandblasting in the event that the shotblaster cannot access areas to be prepared. Do not begin shotblasting until all grinding or milling operations are completed. Cleaning shall not commence until all work involving the repair of the concrete deck surface has been completed and the deck is dry. All contaminants shall be picked up and stored in the vacuum unit and no dust shall be created during the blasting operation that will obstruct the view of motorists in adjacent roadways. The travel speed and/or number of passes of the shotblasting unit shall be adjusted, so as to result in all weak or loose surface mortar being removed, aggregates within the concrete being exposed, and open pores in the concrete exposed, as well as a visible change in the concrete color. Cleaned surfaces shall not be exposed to vehicular traffic unless approved by the Engineer. If the deck becomes contaminated before placing the overlay, the Contractor shall shotblast or abrasive sandblast the contaminated areas to the satisfaction of the Engineer at no additional cost to the Department.
 - (3) Prior to the overlay placement, any loose particles shall be removed by magnets, oil free compressed air, and vacuuming, such that no trapped particles remain. Power washing will not be allowed.
 - (4) The areas to be overlaid shall be blown off with oil and moisture free compressed air just prior to placement of the primer and shall be completely dry.
 - (5) Cleaning methods other than those detailed by specification may be suggested by the PC System Provider and approved by the Engineer.
 - (6) All steel surfaces that will be in contact with the PC overlay shall be cleaned in accordance with Structural Steel Paint Council (SSPC) Surface Preparation (SP) No. 10, Near-White Blast Cleaning, except that wet blasting methods shall not be allowed.
- (H) **Safety:** Provide a containment system for handling expected and unexpected blow through of the deck. The containment system shall retain runoff water and debris and protect the area under the bridge deck. The Contractor shall be responsible for any injury or damage caused by these operations. The containment system shall remain in place until the concrete has been cast and attained minimum strength.

Provide adequate lighting when performing deck preparation activities at night. Submit a lighting plan to the Engineer for approval prior to beginning work.

MEASUREMENT AND PAYMENT

Scarifying Bridge Deck will be measured and paid for at the contract unit price per square yard and will be full compensation for the milling of existing asphalt wearing surface from the bridge deck and approaches, milling of the entire concrete bridge deck, repairing or replacing any damaged reinforcing steel, and the cleaning and disposal of all waste material generated.

Shotblasting Bridge Deck will be measured and paid for at the contract unit price per square yard and will be full compensation for the shotblasting and necessary sandblasting and handwork to prepare the entire concrete bridge deck and approaches, and removal and disposal of all waste material generated.

Class II Surface Preparation will be measured and paid for at the contract unit price per square yard and will be full compensation for Class II (partial depth) deck preparation where required by the plans. The cost will also include removal and disposal of unsound and contaminated concrete,

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removal of all existing patches, cleaning, repairing, or replacing of reinforcing steel, and all materials, labor, tools, equipment and incidentals necessary to complete the work.

Class III Surface Preparation will be measured and paid for at the contract unit price per square yard and will be full compensation for Class III (full depth) deck preparation and repair where required by the plans. The cost will also include removal and disposal of unsound and contaminated concrete, cleaning, repairing or replacing of reinforcing steel, under deck containment, placing and finishing concrete for full depth repair, and all materials, labor, tools, equipment and incidentals necessary to complete the work.

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

Scarifying Bridge Deck
 Shotblasting Bridge Deck
 Class II Surface Preparation
 Class III Surface Preparation

Pay Unit

Square Yard
 Square Yard
 Square Yard
 Square Yard

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POLYMER CONCRETE BRIDGE DECK OVERLAY**(SPECIAL)****DESCRIPTION**

This work consists of furnishing and placing a Polymer Concrete (PC) overlay system with a resin primer on concrete surfaces. The surface of the concrete shall be prepared and the PC overlay system shall be applied in accordance with this special provision in conformity with the lines, grades, thickness, and typical cross-sections shown on the plans or as approved by the Engineer. Unless specifically mentioned below, all requirements specified for the bridge deck are also required for the approach slabs.

The Contractor shall select one of the PC overlay systems below:

- (A) Polyester Polymer Concrete (PPC) with a High Molecular Weight Methacrylate (HMWM) resin primer.
- (B) Epoxy Polymer Concrete (EPC) with an epoxy resin primer.

Work includes: placement of resin primer; placement of PC surface patching and/or overlay; and any incidentals necessary to complete the project as specified or as shown on the plans.

The System Provider is the manufacturer that will provide the PC system for the PC overlay. The System shall include the necessary and appropriate PC components, as well as the necessary and appropriate resin primer components. Contractor shall not change System Provider during project, without approval from the Engineer.

QUALIFICATIONS AND SUBMITTALS

The Contractor shall submit the following requested items and any other relevant documents at least two (2) weeks prior to the PC Overlay Pre-placement Conference. These submittals are for approval and shall be directed to the Engineer.

- (A) Overlay System: The Contractor shall submit two (2) copies of the System Provider's material information, written installation instructions, safety data sheets, and independent test results for approval.
- (B) System Provider Qualifications: The Contractor shall install an overlay system with all components provided through a single System Provider with documented experience successfully supplying at least five (5) PC overlay projects of similar size and scope installed within the past five (5) years. The Contractor shall submit documentation of the System Provider's project experience including the following:
 - (1) Project Location.
 - (2) Owner Agency.
 - (3) Project construction date.
 - (4) Overlay quantities.
 - (5) Reference name and contact information for owner representative.
- (C) Contractor Qualifications: The Contractor shall submit documentation of successful projects placing structural concrete bridge decks, modified concrete bridge deck overlays, or PC overlay systems to finished grade using similar equipment as specified herein within the past five (5) years. A minimum of two (2) employees on site must have the equivalent work experience qualifications of the Contractor. The documentation of Contractors qualifications shall include the following:

- (1) Project Location.
- (2) Owner Agency.
- (3) Project construction date.
- (4) Overlay quantities.
- (5) Reference name and contact information for owner representative.

(D) System Provider Technical Representative Qualifications: The System Provider Technical Representative shall be an employee of the PC overlay system manufacturer, have a minimum of five (5) successful PC overlay projects within the last five (5) years, and be completely competent in all aspects of the work, including surface preparation, mixing, placement, curing, and testing of the PC overlay system. The Technical Representative shall have experience on a minimum of five (5) successful projects of similar size and scope. The Contractor shall submit documentation of the System Provider Technical Representative's experience including the following:

- (1) Years of Experience with PC overlay systems
- (2) Project location
- (3) Project construction date
- (4) Overlay quantities
- (5) Reference name and contact information for owner representative

The Technical Representative shall be available on site, for a minimum of three (3) days per project, to give the installer advice and guidance on the installation of PC overlay systems. This includes, but is not limited to: deck concrete surface preparation, PC overlay materials, PC overlay application, PC overlay curing or any time there are questions or issues that may arise. The Technical Representative shall be on site for the first PC overlay placement and shall remain on site until the Engineer is satisfied with the PC overlay preparation, placement, and finishing operations.

(E) Overlay Placement Plan: The Contractor shall submit an Overlay Placement Plan that includes the following:

- (1) Schedule of overlay work and testing for each bridge.
- (2) Anticipated concrete deck repair locations and repair method.
- (3) Staging plan describing overlay placement sequence including:
 - (a) Construction joint locations. Longitudinal construction joints between passes shall be located along the centerline of travel lanes or edge of travel lanes.
 - (b) Sequence of placement.
 - (c) Placement widths.
 - (d) Anticipated placement lengths.
 - (e) Placement direction.
 - (f) Joint locations.
 - (g) Location of proposed trial overlay(s).
- (4) Description of equipment used for:
 - (a) Surface preparation including grinding and shotblasting.
 - (b) Applying resin primer.
 - (c) Measuring, mixing, placing, and finishing the PC overlay.
 - (d) Applying surface finish sand/fine aggregate.
- (5) Method of protecting and finishing inlets and bridge drains.

- (6) Method for isolating expansion joints.
- (7) Method for measuring and maintaining overlay thickness and profile.
- (8) Cure time for PC overlay.
- (9) Storage and handling of resin primer and PC overlay components.
- (10) Procedure for disposal of excess resin primer, PC overlay materials, and containers.
- (11) Procedure for cleanup of mixing and placement equipment.

(F) Equipment: The Contractor shall submit documentation of current certification that mixing equipment has been calibrated (Caltrans California test CT 109 or similar accepted). The Contractor shall submit a documented history of the use of the placement equipment to successfully place PC overlays on bridge projects for review and approval by the Engineer.

MATERIALS

The Polymer Concrete shall consist of a resin binder and aggregate as specified below. It shall also include a compatible primer which when mixed with other specified ingredients and applied as specified herein, is capable of producing a Polymer Concrete meeting the requirements of this specification.

- (1) Verification. The Contractor shall submit a Certified Test Report from independent labs for all of the materials associated with the PC overlay in accordance with this special provision.
- (2) Packaging and Shipment. 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.
- (3) Sampling. NCDOT reserves the right to retain and test samples of components of the PC overlay system. This includes requiring submittal of samples prior to the first installation or on-site sampling during construction.

Only use materials that are specified for the selected PC overlay system. Mixing materials from different PC overlay systems shall not be permitted.

(A) Polyester Polymer Concrete (PPC) materials shall consist of a polyester resin binder, a High Molecular Weight Methacrylate (HMWM) primer, and aggregate.

- (1) Polyester Resin Binder: Polyester resin binder shall have the following properties:
 - (a) Be an unsaturated isophthalic polyester-styrene co-polymer. The resin content shall be 12% +/-1% of the weight of the dry aggregate.
 - (b) Contain at least 1 percent by weight gamma-methacryloxypropyltrimethoxysilane, an organosilane ester silane coupler.
 - (c) Be used with a promoter that is compatible with suitable methyl ethyl ketone peroxide and cumene hydroperoxide initiators.
 - (d) Meet the required values for the material properties shown in Table 1, below.

Accelerators or inhibitors may be required to achieve proper setting time of PPC. They shall be used as recommended by the overlay System Provider.

Table 1
POLYESTER RESIN BINDER PROPERTIES (PPC ONLY)
(Each lot sent to job shall be tested)

| Property | Test Method | Requirement |
|--|-------------|---|
| Viscosity* | ASTM D 2196 | 75 – 200 cps (RVT No.1 Spindle, 20 RPM at 77 °F) |
| Specific Gravity* | ASTM D 1475 | 1.05 to 1.10 at 77 °F |
| Elongation | ASTM D 638 | 35 percent, minimum Type I specimen, thickness 0.25 ± 0.03” at Rate = 0.45 inch/minute. |
| | ASTM D 618 | Sample Conditioning: 18/25/50+5/70 |
| Tensile Strength | ASTM D 638 | 2,500 psi, minimum Type I specimen, thickness 0.25 ± 0.03” at Rate = 0.45 inch/minute. |
| | ASTM D 618 | Sample Conditioning: 18/25/50+5/70 |
| * Test shall be performed before adding initiator. | | |

- (2) High Molecular Weight Methacrylate (HMWM) Primer: Primer for the substrate concrete surface shall be a wax-free, low odor, high molecular weight methacrylate primer, and consist of a resin, initiator, and promoter. The primer shall conform to requirements indicated in Table 2, below, and all components shall be supplied by the System Provider.

Initiator for the methacrylate resin shall consist of a metal drier and peroxide. If supplied separately from the resin, the metal drier shall not be mixed with the peroxide directly; a VIOLENT EXOTHERMIC REACTION will occur. The containers and measuring devices shall not be stored in a manner that allows leakage or spilling to contact the containers or materials of the other.

Table 2
HMWM PRIMER PROPERTIES (PPC ONLY)
(Tested yearly)

| Property | Test Method | Requirement |
|---|-----------------------------|--|
| Viscosity** | ASTM D 2196 | 25 cps maximum (Brookfield RVT with UL adapter, 50 RPM at 77 °F) |
| Volatile Content** | ASTM D 2369 | 30 percent, maximum |
| Specific Gravity** | ASTM D 1475 | 0.90 minimum at 77 °F |
| Flash Point | ASTM D 3278 | 180 °F minimum |
| Vapor Pressure** | ASTM D 323 | 1.0 mm Hg, maximum at 77 °F |
| PCC Saturated Surface-Dry Bond Strength (Adhesive) | California Test 551, part 5 | 700 psi, minimum at 24 hours and 70 ± 1°F (with PPC at 12% resin content by weight of the dry aggregate), primed surface |
| **Test shall be performed before initiator is added | | |

(B) Epoxy Polymer Concrete (EPC) materials shall consist of an epoxy resin binder/primer and aggregate.

- (1) Epoxy Resin Binder/Primer: Epoxy resin binder/primer shall have the following properties:
- (a) Be a low viscosity epoxy resin. The resin content shall be 12% +/-1% of the weight of the dry aggregate.
 - (b) Be 100% solids epoxy.
 - (c) Be a two-part, low modulus epoxy resin.
 - (d) Be moisture insensitive.
 - (e) Meet the required values for the material properties shown in Table 3, below.

Accelerators or inhibitors may not be used to achieve proper setting time of EPC.

Table 3
EPOXY RESIN BINDER/PRIMER PROPERTIES (EPC ONLY)
(Each lot sent to job shall be tested)

| Property | Test Method | Requirement |
|------------------|-------------|---|
| Viscosity | ASTM D 2196 | 75 – 150 cps (RVT No.1 Spindle, 20 RPM at 77 °F) |
| Specific Gravity | ASTM D 1475 | 1.05 to 1.08 at 77 °F |
| Elongation | ASTM D 638 | 35 percent, minimum Type I specimen, thickness 0.25 ± 0.03” at Rate = 0.45 inch/minute. |
| | ASTM D 618 | Sample Conditioning: 18/25/50+5/70 |
| Tensile Strength | ASTM D 638 | 2,800 psi, minimum Type I specimen, thickness 0.25 ± 0.03” at Rate = 0.45 inch/minute. |
| | ASTM D 618 | Sample Conditioning: 18/25/50+5/70 |

(C) Aggregates: PC overlay aggregate shall be used for PPC and EPC and have the following properties:

- (1) No more than 45 percent crushed particles retained on the No. 8 sieve when tested in accordance with American Association of State Highway and Transportation Officials (AASHTO) Test Method T335.
- (2) Fine aggregate consists of natural sand only.
- (3) Weighted-average aggregate absorption of no more than 1.0 percent when tested under AASHTO Test Methods T84 and T85.
- (4) At the time of mixing with resin, have moisture content of not more than one-half (½) of the weighted-average aggregate absorption when tested under AASHTO Test Method T255.
- (5) Moh’s hardness of seven (7) or greater.
- (6) Comply with the requirements for the aggregate gradation indicated in Table 4, below:

Table 4
AGGREGATE GRADATION
(Tested yearly)

| Sieve Size | Percent Passing |
|------------|-----------------|
| 3/8" | 100 |
| No. 4 | 60-85 |
| No. 8 | 55-65 |
| No. 16 | 29-50 |
| No. 30 | 16-36 |
| No. 50 | 5-20 |
| No. 100 | 0-7 |
| No. 200 | 0-3 |

(D) Sand/Fine Aggregate: Sand or fine aggregate for an abrasive finish shall be used for PPC and EPC and have the following properties:

- (1) Commercial-quality blast sand/fine aggregate.
- (2) Not less than 95 percent pass the No. 8 sieve and not less than 95 percent retained on the No. 20 sieve when tested under AASHTO Test Method T27.
- (3) Shall be dry at the time of application.

(E) Composite system: The composite PC overlay system shall have the following properties indicated in Table 5, below:

Table 5
COMPOSITE PROPERTIES
(Tested every 2 years)

| Property | Test Method | Requirement |
|---|-------------|---|
| PCC Saturated Surface Dry Bond Strength | CT 551 | 500 psi minimum at 24 hrs. and 70° F (without primer, at 12% resin content by weight of the dry aggregate, on Saturated Surface Dry Specimen) |
| Abrasion Resistance | CT 550 | < 2g weight loss (at 12% resin content by weight of the dry aggregate) |
| Modulus of Elasticity | ASTM C 469 | 1,000,000 psi to 2,000,000 psi (at 12% resin content by weight of the dry aggregate) |

CONSTRUCTION REQUIREMENTS

- (A) PC Overlay Pre-placement Conference: A Pre-placement Conference shall be held before any overlay operations begin. Attendees shall include representatives from all parties involved in the work. If necessary, teleconferencing of attendees may be approved by the Engineer.
- (B) PC Overlay Placement Notice: Contractor shall provide a minimum 48 hours notice to the Engineer, prior to placement of PC overlay on any structure.
- (C) Trial Application: Prior to constructing the overlay, one or more trial applications shall be placed on a previously constructed concrete base to demonstrate proper initial set time and the

effectiveness of the mixing, placing, and finishing equipment proposed. The set time can be determined as the time elapsed from resin catalyzation until the in-place PC trial application cannot be deformed by pressing with a finger, indicating the resin binder is no longer in a liquid state. Each trial application shall be the planned paving width, at least ten (10) feet long, and have the same thickness as the specified overlay. Conditions during the construction of the trial application(s) and equipment used shall be similar to those to be used for construction of the overlay. The location of the trial application(s) shall be approved by the Engineer. Trial applications shall be properly disposed of off-site by the Contractor, if removal is necessary.

The number of trial applications required shall be as many as necessary for the Contractor to demonstrate the ability to construct an acceptable trial overlay section and competency to perform the work. However, the installer or proposed equipment/techniques may be rejected if not shown to be acceptable after three (3) trials.

Overlay direct tension bond testing shall be performed in accordance with Section (F)(1) of this special provision. Acceptable test results shall be achieved on a trial application before the installation may proceed.

(D) Equipment: All equipment for cleaning the existing concrete surface and mixing and applying the overlay system shall be in accordance with the System Provider's recommendations, as approved by the Engineer prior to commencement of any work.

(1) Surface Preparation Equipment: Provide appropriate scarifying, shotblasting, sandblasting and other equipment to adequately prepare the bridge deck substrate, as required in the Overlay Surface Preparation for Polymer Concrete special provision.

(2) Mixing Equipment: A continuous automated mixer shall be used for all PC overlay applications. The continuous mixer shall:

(a) Employ an auger screw/chute device capable of sufficiently mixing catalyzed resin with dry aggregate.

(b) Employ a plural component pumping system capable of handling binder resin and catalyst while maintaining proper ratios to achieve set/cure times within the specified limits. Catalyzed resin shall flow through a static mix tube for sufficient duration to completely mix the liquid system.

(c) Be equipped with an automatic metering device that measures and records aggregate and resin volumes. Record volumes at least every five (5) minutes, including time and date. Submit recorded volumes at the end of the work shift to the Engineer.

(d) Have a visible readout gage that displays volumes of aggregate and resin being recorded.

(e) Produce a satisfactory mix consistently during the entire placement.

A portable mechanical mixer of appropriate size for proposed batches, as recommended by the System Provider and approved by the Engineer, may be used for all PC patching applications and for smaller area overlay applications if approved by the Engineer.

(3) Finishing Equipment: Finishing may be accomplished with a Self-Propelled Slip-Form Paving Machine or Vibratory Screed.

(a) Self-Propelled Slip-Form Paving Machine: A self-propelled slip-form paving machine, which is modified or specifically built to effectively place the PC overlay in a manner

that meets the objectives and requirements of the project, may be used for PC overlay applications. The paving machine shall:

- (i) Employ a vibrating pan to consolidate and finish the PC overlay.
- (ii) Be fitted with hydraulically controlled grade automation to establish the finished profile. The automation shall be fitted with substrate grade averaging devices on both sides of the new placement; the device shall average 15 feet in front and behind the automation sensors; or the sensor shall be constructed to work with string-line control. It is acceptable to match grade when placing lanes adjacent to previously placed PC.
- (iii) Be calibrated for the projects requirements, and calibrated periodically following the manufacturers recommendations.
- (iv) Have sufficient engine power and weight to provide adequate vibration of the finishing pan while maintaining consistent forward placement speed.
- (v) Be capable of both forward and reverse motion under its own power.

(b) Vibratory Screed: A vibratory screed may be used for finishing the PC overlay, but must be approved by the Engineer at least two (2) weeks prior to PC overlay placement.

(D) Concrete Deck Repairs and Surface Preparation: All areas that require removal of existing patches or unsound concrete shall be removed and prepared in accordance with the requirements of the Overlay Surface Preparation for Polymer Concrete special provision. Placement of concrete for deck repair material shall be Polymer Concrete in accordance with this special provision. Prepare all concrete deck and repaired deck surfaces in accordance with the requirements of the Overlay Surface Preparation for Polymer Concrete special provision.

(E) Application of Overlay: Methods indicated in this special provision are typical of general installations and may be modified per the System Provider's recommendations as approved by the Engineer. The application of the overlay shall not begin until the concrete deck is completely surface dry in accordance with ASTM D4263, with a wait time revised from 16 hours to two (2) hours, or as directed by the System Provider's Technical Representative. Prior to overlay application, the concrete surface temperature shall be within the specified temperature ranges below. Night work may be required when temperatures cannot be met during the day.

(a) For PPC overlays, the concrete surface temperature shall be between 40° and 100° F.

(b) For EPC overlays, the concrete surface temperature shall be between 60° and 90° F.

During overlay application, precaution shall be taken to assure that traffic is protected from rebound, dust, and construction activities. Appropriate shielding shall be provided as required and directed by the Engineer.

During overlay application, the Contractor shall provide suitable coverings (e.g. heavy duty drop cloths) as needed to protect all exposed areas not to receive overlay, such as curbs, sidewalks, parapets, etc. All damage or defacement resulting from this application shall be cleaned and/or repaired to the Engineer's satisfaction at no additional cost to the Department.

(1) Primer Application: Immediately before placing primer, all exposed surfaces shall be completely dry and blown clean with oil-free compressed air. Exposed surfaces shall be protected from precipitation and heavy dew during and after the application of the primer.

After the exposed surfaces have been prepared and are dry, primer shall be applied in accordance with the System Provider's recommendations. Primer shall be placed within five (5) minutes of mixing at approximately 90-100 ft²/ gal or the rate acceptable to the Engineer.

Primer shall be applied by flooding and uniformly spread to completely cover surfaces to receive overlay. Care shall be taken to avoid heavy application that results in excess ponding. Excess material shall be removed or distributed to meet the required application rate. Primer shall be reapplied to any areas that appear dry prior to overlay placement.

Primer shall not be allowed to leak onto areas that have not received surface preparation.

- (2) PC Overlay Application: The PC overlay shall be applied during the interval between 15 minutes and two (2) hours after the primer has been applied. The PC overlay shall be placed prior to gelling. For PPC overlays, the overlay shall be placed within 15 minutes following addition of initiator, unless otherwise recommended by the System Provider's Technical Representative.

The resin binder shall be initiated for PPC overlays and blended completely. Aggregate shall be added and mixed sufficiently.

The set time can be determined in the field when the in-place PC application cannot be deformed by pressing with a finger, indicating that the resin binder is no longer in a liquid state.

- (a) When using PPC, the initial set time shall be at least 30 minutes and at most 90 minutes. If the PPC initial set is not within 30 to 90 minutes, the material shall be removed and replaced.
- (b) When using EPC, the initial set time shall be at least 30 minutes and at most 180 minutes. If the EPC initial set is not within 30 to 180 minutes, the material shall be removed and replaced.

The overlay shall be consolidated and finished to the required grade and cross-section using PC placement equipment as defined herein.

If a vibratory screed is used, prior to placing the PC overlay, place and fasten screed rails in position to ensure finishing the new surface to the required profile. Do not treat screed rails with parting compound to facilitate their removal. Prior to placing the overlay, attach a filler block to the bottom of the screed and pass it over the overlay area to check the thickness. The filler block thickness shall be equal to the design overlay thickness as shown in the plans. Remove all concrete that the block does not clear.

Place the PC overlay in one operation. Provide a minimum overlay thickness as shown in the plans.

Although the paver or screed may yield a finished or nearly finished surface, additional finishing may be necessary. The PC overlay shall be finished, as necessary, through traditional concrete finishing methods, producing a slight resin bleed indicating complete consolidation of aggregates.

Finishing of Polymer Concrete used as patching of an existing deck surface or overlay shall be completed and finished using traditional concrete hand finishing methods and hand

concrete finishing tools. Such patches shall be placed flush with the top of the existing deck surface.

Resin content shall be as specified in the Materials section of this special provision and to yield a Polymer Concrete consistency that requires surface applied consolidation and finishing to consolidate aggregates and yield a slight sheen of bleed resin on top surface, yet does not yield excess bleed resin.

A surface friction sand/fine aggregate finish of at least 2.2 lbs/ yd² shall be broadcast onto the glossy surface immediately after sufficient finishing and before resin gelling occurs. To ensure adequate pavement friction, the completed PC overlay surface shall be free of any smooth or "glassy" areas such as those resulting from insufficient quantities of surface aggregate. Any such surface defects shall be repaired by the Contractor in the manner recommended by the System Provider and approved by the Engineer at no additional cost to the Department.

All final edges of PC overlay not adjacent to barrier rail, parapet, or bridge deck joints shall be finished neat, straight, and square, unless otherwise noted on project plans or approved by the Engineer.

Unless otherwise indicated on the plans, groove the deck surface in accordance with Subarticle 420-14(B) of the *Standard Specifications*. Vehicular traffic may travel across a deck surface that has not been grooved; however, the entire deck area shall be grooved after the PC overlay achieves design strength and no later than seven (7) calendar days after completion of the overlay unless otherwise approved by the Engineer.

Before completion of the project, all deck joints shall be sawcut, prepared, and sealed according to the details in the plans.

After the PC material has set, if final sawcutting for joint seals will not be done within 12 hours, at minimum, a single sawcut shall be made at the approximate midpoint of each joint. The sawcut shall be made within 12 hours or prior to opening of PC placement to traffic, if traffic will be allowed within 12 hours. Two (2) saw cuts may be made, but final saw cutting for the joints shall be done in accordance with the special provisions for the installation of the joint seals.

Any surface that is scarified shall be covered with the PC overlay before traffic is returned to the bridge deck, unless otherwise approved by the Engineer.

Upon approval by the Engineer, if traffic is to be returned to the site, but the overlay is not completed within the allowable lane closure time and is more than ¾ inch higher in elevation than the adjacent pavement, the PC overlay edges shall be tapered. The leading edge of the overlay shall be tapered at a 4:1 (horizontal: vertical) slope. Tapered edges longitudinal to the direction of traffic and tapered edges on the trailing edge of the overlay and shall be at a 45 degree slope. Tapers of 45 degrees may remain, and PC overlay may be placed adjacent. Tapers with a 4:1 (horizontal: vertical) slope shall be sawcut square to the overlay surface, prior to placing adjacent PC overlay.

The Contractor shall collect a ticket for each pass or portion of a pass that is provided by each mixer, and ensure that the following information is shown on each ticket:

(a) Project Number.

- (b) Bridge Number.
- (c) Date and Time.
- (d) Location of Placement (Lane and Station Limits or location and length of placement along the length of the bridge).
- (e) Aggregate Weight.
- (f) Resin Binder Weight.

The tickets shall be available on site for Inspection personnel to use in tabulating quantities.

Curing: The Contractor shall allow the overlay to cure sufficiently before subjecting it to loads or traffic of any nature that may damage the overlay. Cure time depends upon the ambient and deck temperatures as well as initiator/accelerator levels.

The overlay shall be considered cured to a traffic ready state when a minimum reading of 25 on a properly calibrated Swiss hammer is achieved. Other rebound hammers may be use as approved by the Engineer.

(F) Acceptance Testing: Acceptance of the deck repairs, surface preparation, and PC overlay will be determined by the Engineer based on direct tension bond testing, and smoothness quality testing performed by the Engineer, assisted by the Contractor.

- (1) Overlay Direct Tension Bond Testing: Direct tension bond (pull-off) tests shall be performed after 24 hours by the Contractor in accordance with ASTM C1583. At a minimum, three (3) direct tension bond tests shall be performed on each bridge overlay. For bridges with deck areas greater than 25,000 square feet, additional tests shall be performed at a frequency of one test per 25,000 square feet of additional deck area, rounded up. Additional testing may be required as directed by the Engineer.

The test result shall be the average of the tests for each structure. Test cores shall be drilled a minimum of ½” below the bond line.

The average minimum bond strength of the PC 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. The Contractor shall repair all direct tension test locations with PC overlay in accordance with this special provision.

Direct tension bond testing shall be performed by an independent testing firm and shall be arranged by the Contractor. The Contractor may perform the direct tension bond testing with the approval of the Engineer. Testing shall be performed using a calibrated tensile loading device, in the presence of the Engineer. The tensile loading device shall be calibrated annually. The cost of direct tension bond testing shall be included in the bid price for *Placing and Finishing PC Overlay* item.

- (2) Smoothness Quality Testing: As soon as practical after the PC overlay has hardened sufficiently, the Contractor shall test the finished surface with an approved rolling straightedge that is designed, constructed, and adjusted, so that it will accurately indicate or mark all deck areas which deviate from a plane surface by more than 1/8” in 10’. The Contractor shall remove all high areas in the hardened surface in excess of 1/8” in 10’ with an approved grinding or cutting machine. Any fins or other protrusions remaining after grinding operations shall be removed to the satisfaction of the Engineer. Additionally, the final PC deck surface shall not deviate from the line and elevation indicated on the plans

by more than 0.3" over any 50' length. If approved by the Engineer, correct low areas in an acceptable manner.

(G) Corrective Work

- (1) Repair of Surface Defects: The repair materials and finishing methods for surface defects in the overlay shall be in accordance with those used for the application of the overlay. All surface defects shall be repaired to the satisfaction of the Engineer before acceptance of the work is made.
- (2) Correction for Smoothness: Areas showing high spots of more than 1/8" in 10' shall be marked and ground until the high spot does not exceed 1/8" in 10'. Ground surface may be sawcut grooved to restore the texture if ordered by the Engineer. Areas showing low spots of more than 1/8" in 10' shall be marked and a proposed repair procedure shall be submitted to the Engineer. The use of the proposed repair procedure shall be as recommended by the System Provider and approved by the Engineer.
- (3) Replacement of Defective Overlay: A defective overlay, or portion thereof, resulting in failing overlay pull bond test results shall be removed and replaced at the Contractor's expense. The Contractor shall submit a written corrective work proposal to the Engineer, which shall include the methods and procedures that will be used. The Contractor shall not commence corrective work until the methods and procedures have been approved in writing by the Engineer. The Engineer's approval shall not relieve the Contractor of the responsibility of producing work in conformity with the Contract.
- (4) Repair of Cracking: After a one-week cure period, if cracks are in the overlay, the Contractor shall fill the cracks with properly catalyzed and mixed primer material at no cost to the Department. Care shall be taken to fill the cracks only and ensure minimal primer material is left on the finished surface of the overlay.

MEASUREMENT AND PAYMENT

Concrete Deck Repair for PC Overlay will be measured and paid for at the contract unit price bid per square yard and will be full compensation for placement of concrete deck repair material and shall include the cost of labor, tools, equipment and incidentals necessary to complete the work.

Placing and Finishing PC Overlay will be measured and paid for as the contract unit price bid per square yard of overlay placement and final surface finishing. Payment will be full compensation for all labor, equipment, and all incidentals necessary to complete the PC overlay placement. Construction and removal (if required) of trial application(s), including concrete base surfaces, will not be measured and paid for separately, but shall be incidental to complete the work. Tining of bridge deck, if used, will be incidental to this pay item.

Grooving Bridge Floors will be measured and paid in accordance with Article 420-21 of the *Standard Specifications*.

Only one of the following pay items shall be used for materials, dependent on the PC overlay system used.

- (A) *Polyester Polymer Concrete Materials* will be measured as the actual volume of PPC material complete-in-place. The volume shall include material used for overlay, patching of existing unsound concrete deck surface or overlays, and bridge deck concrete repairs as directed by the Engineer. Tickets provided to the project inspector, showing quantities of PPC produced, shall

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be sufficient to calculate volume of material placed. Materials placed for trial application(s) shall be included in this Pay Item if placed and remaining on the bridge deck as part of the permanent overlay. *Polyester Polymer Concrete Materials* will be paid for at the contract unit price per cubic yard and will be full compensation to furnish the PPC material, including HMWM primer, freight to the project site, receiving, storage, and disposal of any unused PPC overlay material. Payment by cubic foot will be based on a 135 lbs/ ft³ unit weight and quantities recorded by calibrated mixer unit readouts.

(B) *Epoxy Polymer Concrete Materials* will be measured as the actual volume of EPC material complete-in-place. The volume shall include material used for overlay, patching of existing unsound concrete deck surface or overlays, and bridge deck concrete repairs as directed by the Engineer. Tickets provided to the project inspector, showing quantities of EPC produced, shall be sufficient to calculate volume of material placed. Materials placed for trial application(s) shall be included in this Pay Item if placed and remaining on the bridge deck as part of the permanent overlay. *Epoxy Polymer Concrete Materials* will be paid for at the contract unit price per cubic yard and will be full compensation to furnish the EPC material, including epoxy primer, freight to the project site, receiving, storage, and disposal of any unused EPC overlay material. Payment by cubic foot will be based on a 135 lbs/ ft³ unit weight and quantities recorded by calibrated mixer unit readouts.

Payment will be made under:

Pay Item

Concrete Deck Repair for PC Overlay
Placing & Finishing PC Overlay
Polyester Polymer Concrete Materials
Epoxy Polymer Concrete Materials

Pay Unit

Square Yard
Square Yard
Cubic Yard
Cubic Yard

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

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

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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.

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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.

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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 |

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CONCRETE REPAIRS**(2-11-19)****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.

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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.

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(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 |

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EPOXY RESIN INJECTION**(2-11-19)****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 in bent columns, struts, piles and caps, girders, bridge rail parapets and in the cantilevered portion of the superstructure deck.

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

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

COOPERATION

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

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

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

TESTING

The North Carolina Department of Transportation Materials and Tests Unit will obtain cores from the repaired concrete for testing. If the failure plane is located at the repaired crack, a minimum compressive strength of 3,000 psi is required of these cores.

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:

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| | 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 x 10 ⁵ psi |
| Compressive Yield Strength | ASTM D695 | 11,000 psi (min.) |
| Compressive Modulus | ASTM D695 | 2.0 - 3.5 x 10 ⁵ psi |
| Heat Deflection Temperature Cured 28 days @ 77 ± 3°F | ASTM D648* | 125°F min. 135°F min. |

| | | |
|---|-------------|--|
| Slant Shear Strength, 5,000 psi (34.5 MPa) compressive strength concrete Cured 3 days @ 40°F wet concrete Cured 7 days @ 40°F wet concrete Cured 1 day @ 77°F dry concrete | AASHTO T237 | 3,500 psi (min.) 4,000 psi (min.) 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 $\pm 5\%$ 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 not less than the thickness of the concrete at that location, unless otherwise directed by the Engineer.
- (C) Apply surface seal material to the face of the crack between the entry ports. For through cracks, apply surface seal to both faces.

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(D) Allow enough time for the surface seal material to gain adequate strength before 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.

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

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

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

Perform epoxy adhesive injection continuously until cracks are completely filled. 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, immediately stop the work and notify the Engineer.

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.

Drill 4" diameter cored holes of the cured epoxy to the full depth of the crack to verify the cracks has been completely filled with epoxy. Three (3) cored holes are required for every 100 linear feet of crack to be injected, or as directed by the Engineer. The 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 flush to the adjacent concrete, removing any indentations or protrusions caused by the placement of entry ports.

BASIS OF PAYMENT

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

Pay Item

Epoxy Resin Injection

Pay Unit

Linear Foot

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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.

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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.

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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

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BRIDGE JOINT REMOVAL

(SPECIAL)

1.0 DESCRIPTION

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

2.0 REMOVAL AND PREPARATION

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

Removal of existing joint material by methods approved by the Engineer.

3.0 MEASUREMENTS AND PAYMENT

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

Pay Item

Pay Unit

Bridge Joint Removal

Linear Feet

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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 $1/8'' \pm$ wide by $1/8'' \pm$ deep and spaced between $1/4''$ and $1/2''$ 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 $1/4''$. 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. |

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| | | |
|---------------------|-----------|------------------|
| 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, 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 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.

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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

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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 installing these seals in place and accepted.

Pay Item

Foam Joint Seals for Preservation

Pay Unit

Linear Feet

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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

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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. 12* or *Type II Bridge Jacking Bridge No. 12* 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. 12 | Each |
| Type II Bridge Jacking Bridge No. 12 | Each |

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STEEL REINFORCED ELASTOMERIC BEARINGS

(6-22-16)

The 2018 Standard Specifications shall be revised as follows:

In **Section 1079-2(A) – Elastomeric Bearings** add the following after the second paragraph:

Internal holding pins are required for all shim plates when the contract plans indicate the structure contains the necessary corrosion protection for a corrosive site.

Repair laminated (reinforced) bearing pads utilizing external holding pins via vulcanization. Submit product data for repair material and a detailed application procedure to the Materials and Tests Unit for approval before use and annually thereafter.

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CATHODIC PROTECTION INTEGRAL PILE JACKETS**(SPECIAL)****DESCRIPTION**

Furnish, fabricate and install an integral pile jacket including the installation of galvanic cathodic protection pile jackets (as described in the Contract Documents) with zinc mesh and bulk zinc anodes.

QUALIFICATIONS

Provide a cathodic protection specialist to supervise the overall installation of the cathodic protection (CP) systems and conduct the tests indicated in the contract documents. CP specialist qualifications shall be submitted to the engineer for approval. This individual shall be under contract with the contractor and should be involved with the coordination of work. As a minimum the individual shall have a minimum of 10 years of experience in the field and be either an independent specialist with a National Association of Corrosion Engineers (NACE) cathodic protection specialist certification or an independent registered professional engineer proficient in cathodic protection of steel in concrete. The specialist shall provide services which include, but are not limited to, the following:

1. Conduct strand continuity tests and certify results.
2. Verify and certify effectiveness of continuity bonds.
3. Verify and certify negative connections.
4. Certify overall installation of each pile CP system.
5. Energize each cathodic protection pile jacket.
6. Certify all test results

QUALITY CONTROL

Provide a quality control plan, certified by the CP specialist that all work must comply with for approval prior to commencing the installation work for the CP systems or CP system components.

Work under this Project Special Provision shall be included in the Contractor's Quality Control Plan. As a minimum include in the quality control plan methods of measuring electrical continuity, voltages, currents, and rebar potentials. Also include frequency of intended quality assurance visits and time to discuss quality control and method of construction with Contractor's and Department personnel.

The CP specialist shall provide verbal and written notice to the Engineer on a monthly basis, regarding the status and quality of the CP work on the job.

MATERIALS**Stay-In-Place Forms:**

Use forms composed of a durable, inert, corrosion resistant material with an interlocking joint along one or two sides that permits the form to be assembled and sealed in place around the pile or column. Fabricate the forms from glass or carbon fibers and polyester or vinylester resins. Provide jackets with a minimum thickness of 1/8 inch with a minimum thickness at the corners of 3/16 inch and dimensions as shown in the Contract Documents. 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 filler material. Provide the forms with bonded or bolted-on, non-metallic, adjustable 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 and ensure bond with the filler material. Equip the forms with a compressible sealing strip at the bottom which will effectively seal the annular space between the pile or column and the form. Use non-metallic hardware for pumping ports when these are provided. Fabricate the jacket form in a workmanlike manner and have it inspected and approved by the Engineer prior to placement. Remove from the project any jacket form that has been rejected.

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. | |

Anode Material:

Use expanded zinc mesh anodes pre-installed inside the form by the manufacturer when cathodic protection integral pile or column jackets are specified. The anode shall be suitable for encapsulation in a sand-cement grout or concrete filler. Use anode type and configuration shown in the Contract Documents. If galvanic anodes are used, place the anodes in direct contact with the inside face of the form.

Cathodic Protection System Acceptance:

Preliminary acceptance of systems shall be based on voltage potential measurement tests obtained between the anode and the reinforcing steel to verify that no electrical shorts exist. Any jackets shorted to the rebar cage, welded wire fabric, or pile reinforcement shall be removed and replaced at no cost to the Department.

Jackets misaligned or with the anode shorted to the reinforcement shall be removed and replaced prior to final acceptance. Jackets exhibiting misalignment that do not exceed 50% from the specified position may be accepted at a reduced price not to exceed 60% of the bid price if approved by the Engineer.

Zinc Mesh:

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) | 0.003% 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 |
| 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:

A 48-50 lb bulk zinc anode is required for the cathodic protection system for the jackets. 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". A 3/4" diameter hole shall be predrilled at each end of the steel strap prior to galvanizing.

The bulk zinc anode shall be clamped to the pile using a two inch galvanized steel channel with the flanged side placed against the concrete surface and using two hop dip galvanized carriage bolts of 5/8" diameter which extend to the anode. The anode shall be connected to the reinforcing steel as shown in the plans. Minor excavation (up to 2 ft) may be required to place the bulk zinc anode (or address a deficiency). No jetting is permitted, only hand excavation will be allowed. The mudline must be returned to original condition.

Fillers:

Use portland cement grout fillers for non-structural jackets and concrete fillers for structural jackets unless otherwise specified in the Contract Documents. See Special Filler Addendum at end of this PSP.

Portland Cement Grout:

Use a mix design of portland cement, fine aggregate, water and an admixture containing a minimum of 940 pounds of cementitious material per cubic yard. Up to 30%, by weight of cement, may be replaced by fly ash for standard pile jackets. Do not use fly ash, slag, or silica fume for cathodic protection jackets unless specified in the Contract Documents.

Use silica sand fine aggregate meeting the requirements of Section 1014.

Use portland cement meeting the requirements of Section 1024.

Use admixtures meeting the requirements of Sections 1000 and 1024, ASHTO M194, Types A and D.

Use air-entraining admixtures meeting the requirements of Section 1024 and containing no chlorides or other salts corrosive to metals.

Use fly ash meeting the requirements of Section 1024, ASTM C618, Type F, except that loss on ignition shall not exceed 4%.

Provide a grout filler mix with a minimum compressive strength of 5,000 psi at 28 days and a slump of 7 inches to 9 inches. Submit the design mix to the Engineer for approval by the Department before placing any grout filler.

Class AA Concrete:

Use Class AA Concrete meeting the requirements of Section 1000 with an adjusted slump of 7 inches to 9 inches. Reduced size coarse aggregate may be used as approved by the Engineer. Do not use fly ash, slag, or silica fume for cathodic protection jackets.

Submit the design mix to the Engineer for approval by the Department before placing any concrete filler.

Special:

When specified, furnish special fillers in accordance with the Contract Documents. Submit test results and documentation that demonstrate the material meets the requirements for the project. Use materials meeting the requirements of the attached addendum for special fillers when cementitious pre-bagged fillers are specified.

Chlorides:

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

Water:

Use water that meets the requirements of Section 1024 for all filler mixing. Use potable water for cleaning, rinsing, or any other application that requires direct contact with the piles.

Reinforcing Steel:

Use reinforcing steel meeting the requirements of Section 1070 for all structural jackets.

MATERIALS CERTIFICATION AND TESTING**Certification:**

For materials other than those for Portland cement grout and Class AA concrete, submit a certificate to the Engineer certifying that the materials furnished meet all the requirements of this Section and conform in all respects to the materials tested.

Attach current test reports to the certificate.

Submit certified test results of the chemical composition of the anode and submit a manufacturer certification stating that the dimensions and physical characteristics of the anode meet the requirements of the Contract Documents when cathodic protection jackets are specified.

Testing:

No test report for tests made more than two years prior to shipment will be accepted for the form material.

Test materials for Portland cement grout and Class AA concrete as required in Section 1000 for approved design mixes. Perform sampling and testing using Quality Control technicians meeting the requirements of this Project Special Provision.

Test properties of materials for other cement based fillers allowed under "Special" in this project special provision, the same as required for the Department approved design mixes. Test the materials at a frequency of one set of tests per load of the mixer. For each set of tests, cast three 4 inch by 8 inch cylinders for compressive strength testing at the required test date. The Engineer may adjust the frequency of testing based on consistency of the mixes. Conduct a field verification mix prior to commencing the jacket installation. Cure samples of cement based materials in accordance with ASTM C31.

Hardened concrete or grout will be accepted on the basis of strength test results as defined in this Section. Test the laboratory cured samples for compressive strength at 28 days in a laboratory meeting and maintaining at all times the qualification requirements listed in Section 1000.

CONSTRUCTION

Shop Drawings:

Submit shop drawings and obtain approval prior to field installation. Submit shop drawings showing locations of standoff spacers, method of fastening jacket form to piling, method of sealing the form after assembly, and method for bracing during placement of filler. Include details of access holes, fiberglass caps, method of securing anode from movement, and methods for placing the filler and cutting and sealing the pumping ports.

Surface Preparation:

Remove all cracked or delaminated concrete and excavate to a depth of 3/4 inch to 1 inch behind the exposed reinforcement. Limit the size of chipping hammers to 20 pounds unless otherwise approved by the Engineer. Thoroughly clean all pile/column surfaces that the jackets will cover. Remove all oil, grease, dirt, broken concrete, marine growth and any other deleterious material that could prevent proper bonding. Sandblast all exposed reinforcing steel to SSPC-SP10, near white, per the Society of Protective Coatings, 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 yield

an equivalent result. Do not place the form until the surface preparation has been approved by the Engineer.

Cathodic Protection:

Provide connection to the reinforcement for cathodic protection integral pile jackets inside the jacket limits unless otherwise specified in the Contract Documents. Use connection methods and materials in accordance with the Contract Documents.

Form Placement:

Place the fiberglass form in position around the pile; secure and seal the interlocking joints, and seal the bottom of the form against the pile surface with the compressible seal and an Engineer approved epoxy mastic suitable for underwater application. Adjust stand-offs as necessary to prevent misalignment and install temporary hard backing to prevent deformation of the jacket. Place a temporary plastic wrap around the form prior to placement of the hardbacking to protect the gel coat.

Filler Placement:

Wet to saturation the surface of the existing concrete immediately prior to placing the filler. Place the filler in one continuous pour at no more than 72 hours after surface preparation. Fill the annulus between the pile or column and jacket form following the jacket manufacturer's instructions and the Contract Documents. Do not drop filler material into forms higher than five feet or into forms containing water. Prevent contamination of the filler during placement and provide internal or external vibration to ensure proper consolidation.

Cure filler for a minimum of 96 hours before removing any external bracing. Remove any filler or other extraneous material from the exterior surface of the form 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 an Engineer approved listed epoxy.

Anode Configuration:

Resistance weld one end of each of two No. 8 AWG copper strand wires with THHN insulation to the spiral that was exposed during the continuity test and one end each of another two wires to the rebar cage or welded wire fabric. The connections shall be coated with two coats of 100% solids non-conductive epoxy such that no wire or weld will be in contact with concrete or patching material. Route the copper wire in conduit so that the free end of the wire terminates near the proposed junction box for fastening later. Resistance weld one end of a No. 8 AWG copper strand wire with HMWPE insulation to the steel bar at the bulk zinc anode. Welding of the connection wire to the bulk anode should be performed prior to anode installation. Attach the bulk zinc anode to the pile. Route the copper cable

in the corner of the jacket between the mesh and the form so that the free end of the cable terminates near the proposed junction box for fastening later.

Perform surface preparation and jacket installation as per this Project Special Provision. The zinc mesh/fiberglass jacket halves shall be placed around the pile no later than 18 hours after the water wash and filled with grout/concrete within 96 hours after this PSP surface preparation. After jacket halves have been placed, route the two copper wires coming out of the jacket in conduit so that the free end of the cable terminates near the proposed junction box for fastening later.

The free ends of the copper wires/cables shall be connected in the junction box as shown. The following cables shall be present:

- 2 spiral (negative) (cathode)
- 2 cage or wwf (negative) (cathode)
- 1 bulk anode (positive) (anode)
- 2 zinc mesh (positive) (anode)

Continuity Testing (Electrical Resistance Check):

Prior to installing any negative connections perform an electrical continuity test between all strands and spiral ties on all piles receiving cathodic protection. After the test is approved, the Contractor shall perform continuity corrections where necessary. Certified test results shall be submitted to the Engineer for approval prior to pile jacket installation. Excavation for electrical continuity test shall be sealed with approved mortar after test within 20 hours.

If the electrical resistance tests reveal continuity between every strand and spiral, make local 4" x 4" excavation for the negative connection that will be needed for resistance welding to the spiral, then proceed to determine which jacket type is required. The 4" x 4" excavation can be located by the Contractor.

If the electrical resistance tests reveal that discontinuity exists in no more than two strands per face, perform scheme 1 as detailed in the Contract Documents, then proceed to determine which jacket type is required.

If the electrical resistance tests reveal that discontinuity exists in three or more strands per face, perform scheme 2 as detailed in the Contract Documents, then proceed to determine which jacket type is required.

CP jackets shall be energized within 14 days after placement of filler material.

A final report detailing the pile jacket system, which includes the testing of systems, potential survey measurements, results of the continuity testing, location of continuity corrections where applicable, and initial energizing information shall be submitted by the Cathodic Protection Specialist to the Engineer and:

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Mr. Tim Sherrill
 Staff Engineer – Preservation & Repair
 North Carolina Department of Transportation
 Structures Management Unit
 1000 Birch Ridge Drive
 Raleigh, NC 27610

E-mail: tmsherrill@ncdot.gov

METHOD OF MEASUREMENT

The quantities to be paid for under this Section will be the total feet of integral pile or column jacket furnished, installed, completed and accepted. Measure length from bottom of the form to top of the form.

An additional quantity to be paid for under this section will be the number of pile jacket assemblies furnished, installed, completed and accepted. Measure total number of completed and accepted pile jackets. All survey work shall be incidental to the cathodic protection system installation.

BASIS OF PAYMENT

Price and payment will be full compensation for all work specified in this Section. No separate payment will be made for reinforcing steel or filler material. Include payment for anode material, jackets, and concrete or filler in the price per foot for cathodic protection integral pile jackets.

Include payment for anode connection accessories, testing, pile jacket survey, and activation in the price per each for cathodic protection integral pile jackets.

Remove and replace jackets with misalignment exceeding 3/4 inch or CP jackets with the anode electrically shorted to the reinforcement at no additional cost to the Department. Price and payment will also be full compensation for removal, containment and disposal off-site of unsound concrete, as well as all other work necessary to complete the work per contract documents

Payment will be made under:

| Pay Item | Unit |
|--|-------------|
| CP Integral Pile Jacket (Structural) 16 to 30 In. | Linear Foot |
| CP Integral Pile Jacket 16 to 30 In. | Each |

SPECIAL FILLER ADDENDUM FOR INTEGRAL PILE JACKETS**SPECIAL FILLERS****General:**

This material is intended to be used as filler material and for rapid repairs to pile jacket structures and other locations specified in the Plans when no design mix concrete is available or a special filler is specified in the Contract Documents. Meet the requirements of this Project Special Provision for preparing the surfaces, placing, testing and curing the concrete.

Mix the material in accordance with the manufacturer's recommendations.

Classification:

The materials to be considered under this classification shall meet the following requirements:

Cathodic Protection (CP) Filler:

Provide cementitious based materials with a minimum cement content of 900 pounds of cement per cubic yard of mix. Material formulation must not contain fly ash, slag, silica fume or other mineral admixtures which may produce increased electrical resistance. The material shall not contain any substances corrosive to metals.

Non-Cathodic Protection (Non-CP) Filler:

Provide cementitious based materials with a minimum cement content of 650 pounds of cement per cubic yard of mix.

The material shall not contain any substances corrosive to metals.

Where concrete filler materials are specified, approved mortar materials may be extended using size number 89 gradation aggregates from a certified Department approved source.

Physical Properties:

The repair material shall meet or exceed the physical properties stated in Table 4 as determined by the specified standard test methods. If extended, materials shall meet the minimum requirements of Table 4.

| Table 4 - Physical Properties of Special Fillers | | | |
|--|-------------|---------------------|-------------------------|
| Requirement | Test Method | Cathodic Protection | Non-Cathodic Protection |
| Minimum Compressive Strength, psi | | | |

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| | | | |
|---|----------------------------|-------|-------|
| 24 hours | ASTM C39* or ASTM C109* | 1,500 | 2,000 |
| 28 days | | 5,000 | 5,000 |
| Maximum Length Change, % | | | |
| Allowable expansion at 28 days when water cured compared to length at one day | ASTM C157** | 0.12 | 0.12 |
| Allowable shrinkage at 28 days when air cured compared to length at one day | | -0.12 | -0.12 |
| Allowable difference between increase in water and decrease in air | | 0.20 | 0.20 |

| | | | |
|---|-----------------------------|------------|---------------|
| Slump (Concrete), inches | ASTM C143 | 7-9 | 7-9 |
| Minimum Flow (Mortar), % | ASTM C1437 | 100 | 100 |
| Time of Setting (Initial), minutes | ASTM C191* or ASTM C403* | 200 to 400 | 200 to 400 |
| Minimum Bond Strength by Slant Shear (at 7 days), psi | FM 5-587 | 450 | 450 |
| Minimum Flexural Strength (at 7 days), psi | ASTM C580 | 700 | 700 |
| Minimum Tensile Strength (at 7 days), psi | ASTM C307 | 200 | 200 |
| Surface Resistivity (at 28 days), KOhm-cm | FM 5-578 | 15 or less | 22 or greater |
| Maximum Allowable Total Chlorides lbs/yd ³ | FM 5-516 | 0.40 | |
| * as applicable | | | |
| ** Make and cure the test specimens in accordance with ASTM C157, except omit the curing period in Section 10.3; however both 11.1.1 and 11.1.2 shall apply for 28 day curing period. | | | |

Constructability:

Submit to the Engineer for approval shop drawing as may be required to complete repairs in compliance with the design shown in the Plans and the manufacturer's recommended repair system.

CATHODIC PROTECTION SYSTEM – SUBMERGED ZINC BULK ANODE (SPECIAL)**DESCRIPTION**

This work consists of furnishing and placing a submerged bulk zinc (ZnSBA) anode cathodic protection system at substructure units defined in the plans. The surface of the concrete shall be prepared and the cathodic protection system shall be applied in accordance with this provision in conformity with the lines, and details shown on the plans or as approved by the Engineer.

Work includes: bridge substructure concrete repairs, monitoring port and reference steel installation and associated electrical work, excavation for continuity; placement of bulk anode assemblies comprised of coated steel channels mounted on the substructure with assemblies shown in the plans; and any incidentals necessary to complete the project as specified or as shown on the plans.

QUALIFICATIONS AND SUBMITTALS

The cathodic protection (CP) Contractor conducting the installation of the ZnSBA system must be engaged in cathodic protection installation operations and shall have a minimum of three years of previous experience in cathodic protection operations with concrete. Provide locations and contact names of successful previous projects for verification at the preconstruction conference.

A. Quality Control Plan:

Include the work under this Project Special Provision in the Contractor General Requirements set forth in NCDOT Specification Division 1. The portion of the Quality Control Plan covering cathodic protection shall be certified by the CP Specialist. For the ZnSBA system the plan shall include but not be limited to, method and frequency of Contractor's QC testing, continuity testing procedures, zinc anode application, time dedicated for training, monitoring port installation plan, and method(s) for initial activation of the cathodic protection systems.

The Contractor shall submit two copies of the System Provider's material information, written installation instructions, material safety data sheets, and independent test results for approval.

B. Cathodic Protection Report:

Provide a final report produced by the CP Specialist for the metalizing system. The report shall describe the general characteristics of the systems and installation sequence. The report shall describe the general characteristics of the cathodic protection work, the size and connection details for each metalized component, as well as native potentials and evidence of polarization after energizing the system. The report and all collected data shall be in typed form and a digital version of the report must be provided along with 4 bound hard copies.

C. Cathodic Protection Specialist Qualifications: The Contractor shall employ the services of a CP Specialist as outlined in the SP for CP for Intermediate Bent Metalizing. Qualifications and Responsibilities are the same for this work as for intermediate bent metalizing, but for the ZnSBA system.

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MATERIALS*Bulk Zinc Anode*

Bulk Zinc Anodes shall be 50 pounds by weight with rectangular cross section sufficient for welding to the proposed steel channel. The Bulk Zinc Anode shall meet the requirements of ASTM B418-01, Type I.

Steel Channels

Provide structural steel, galvanizing and weld material per the Standard Specifications sections 1072, and 1076.

Stainless Steel Rod

Provide stainless steel threaded rods for connection in accordance with ASTM A304.

Electrical Materials

Provide electrical materials, including wire, leads and associated parts in accordance with Standard Specifications Section 1091.

Reinforcing Steel for Monitoring

Provide mild reinforcing steel per Standard Specifications Section 1070.

Epoxy

Provide epoxy Type 1, 3, or 3A per Standard Specifications Section 1081.

Grout

Provide grout for structures per these special provisions and Standard Specifications Section 1003.

CONSTRUCTION REQUIREMENTS**Concrete Removal and Repair:**

All concrete removal and repair shall be made under the requirements of the Project Special Provision for Concrete Restoration. The CP specialist may select a different repair mortar than for other applications in order to provide a repair material with lower resistivity to enhance the overall performance of the Cathodic Protection System.

Electrical Continuity:

Electrical continuity of the reinforcing steel and any other metallic component in the concrete shall be tested by the CP Specialist and corrected by the Contractor as shown in the Contract Documents. Although part of the cathodic protection work, continuity shall be provided during the concrete restoration operation. Care shall be observed as not to damage any rebar connecting rods or wires for connection plates which may have been installed during the concrete restoration work.

Monitoring Ports:

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Excavate monitoring port holes as shown in the Contract Documents and attach different colored electrical leads to native steel and CP system samples placed in monitoring port holes. Attach bare wire leads to steel samples and cover all exposed wire with epoxy.

Attach weatherproof monitoring junction box to the substructure unit per the plans and insert lead wires into junction box. Attach a jumper wire to the CP system.

Cut grooves for wire routing to a depth and width sufficient to fully encapsulate wire and grout into place on the substructure unit. Clearly identify which wires are native structure representative sample and CP sample in the CP report submitted to the Department.

Anode Attachment Assembly:

Fabricate and prepare galvanized steel channels as shown in the plans for attachment to the substructure. Weld bulk anodes to the steel channel per the Standard Specifications for structural welding prior to coating the assembly. Attach each assembly to the substructure unit with concrete anchors and bolts as shown in the plans.

Energizing CP system Time Window:

Coordinate the CP assembly and concrete restoration operations such that cathodic protection is completed and connected to the reinforcement on each component at no less than 10 days and no more than 90 days after placing the concrete for concrete restoration. Any cathodic protection to be accepted after 90 days (not to exceed 120 days) following the placement of the concrete shall be tested and certified as having a low probability of corrosion activity around the repaired area.

MEASUREMENT AND PAYMENT*Cathodic Protection System – Submerged Zinc Bulk Anode*

Price and Payment will be full compensation for all work and materials specified in this Project Special Provision and all incidental items necessary to provide a function Zinc Bulk Anode Cathodic Protection System

Payment will be made under:

Pay Item

Cathodic Protection System – Submerged Zinc Bulk Anode

Pay Unit

Each

CATHODIC PROTECTION SYSTEM – ZINC ALUMINUM SPRAY**(SPECIAL)****1. DESCRIPTION**

The work under this Project Special Provision includes the installation of the following cathodic protection (CP) system at the intermediate bent caps.

1.1 Metalizing:

The first system requires the application of arc-sprayed zinc (anode) to selected damaged areas (as described in the Contract Documents) that exhibit corrosion problems. This application shall be performed by thermal spraying (metalizing) the concrete with the required surface preparation necessary to produce a good bond between the zinc and concrete. A good bond is essential to provide an efficient system.

2. METALIZING CONTRACTOR/SUBCONTRACTOR QUALIFICATIONS

The metalizing Contractor conducting the installation of the metalized coating must be engaged in thermal spray operations and shall have a minimum of three years of previous experience in metalizing operations with concrete. Provide locations and contact names of successful previous projects for verification at the preconstruction conference.

3. SHOP DRAWINGS

Submit shop drawings and obtain approval prior to field installation. Provide shop drawings for forms and construction methods indicating method of performing the surface preparation, method of supporting any formwork during installation, method of placing encapsulation material, and curing of material.

4. QUALITY CONTROL**4.1 Quality Control Plan:**

Include the work under this Project Special Provision in the Contractor General Requirements set forth in NCDOT Specification Division 1. The portion of the Quality Control Plan covering cathodic protection shall be certified by the CP Specialist. For the metalizing system the plan shall include but not be limited to, method and frequency of Contractor's QC testing, continuity testing procedures, zinc anode application, time dedicated for training, thickness measurements, metalizing equipment, and method(s) for initial activation of the cathodic protection systems. The zinc rebound containment system(s) and waste disposal methods shall also be submitted.

4.2 Cathodic Protection Report:

Provide a final report produced by the CP Specialist for the metalizing system. The report shall describe the general characteristics of the systems and installation sequence. The report shall describe the general characteristics of the metalizing work, the thickness and bond strength results for each metalized component. The report and all collected data shall be in typed form and a digital version of the report must be provided along with 4

bound hard copies.

4.3 QC Certification:

Manufacturer Certification for specific materials is required in addition to the Contractor's certification. Unless otherwise required the Contractor shall perform all quality control testing with verification by the Cathodic Protection Specialist. The Contractor shall use certified materials from a Department approved source where applicable.

4.4 Personnel Qualifications:

4.4.1 Metalizing Spray Technician Qualifications:

The Thermal Spray Technician must have a minimum of one year of experience in the operation of Thermal Spray Equipment which includes experience on at least one project of similar scope using a wire metalizing arc unit. The Thermal Spray Technician shall be certified by the metalizing equipment manufacturer.

4.4.2 Cathodic Protection Specialist Qualifications and Responsibilities:

4.4.2.1 Qualifications:

Provide the services of an independent CP Specialist with the following qualifications:

1. A National Association of Corrosion Engineers (NACE) certification in cathodic protection of level CP-4 or a qualified P.E.
2. A minimum of 10 years of experience in the installation and testing of impressed current and galvanic CP systems to protect reinforced concrete structures,
3. Performed quality control and performance testing of CP systems for concrete structures in a minimum of three projects the past five years.
4. Provide the experience record of the CP Specialist(s).

The CP Specialist shall be a subcontractor and may be one individual for multiple cathodic protection systems or multiple individuals responsible for each of the single systems. The CP Specialist shall be independent and shall not be affiliated with the Contractor, the Contractor's Organization, the anode distributor or a subcontractor on the project.

No cathodic protection work will be allowed if at any time an approved CP Specialist is not active or otherwise involved in the Project.

4.4.2.2 Responsibilities:

4.4.2.2.1 Metalizing Cathodic Protection Specialist Services:

For this work the CP Specialist shall be responsible for the following tasks:

1. Supervise every phase of the application of the thermally

- sprayed zinc, the continuity testing and corrections of rebar, and any other function further specified for the system.
2. Inspection and testing of the test patch areas for the determination of the target bond strength and submitting the proposed target bonds for approval of the Engineer.
 3. Review and verify electrical continuity test results.
 4. Review all contractor documents related to the cathodic protection work prior to submittal to the Department for approval.
 5. Training Contractor's and Department personnel in performing the required quality control testing for cathodic protection.
 6. Visit the project site at a minimum frequency of once per month to inspect the work performed in his/her absence and conduct random QC tests and meet and directly update the Engineer (verbally and in writing) regarding quality of the work in progress. These random tests shall be in addition to the Contractor's QC tests specified in this Project Special Provision.
 7. Conduct all other specified testing to meet the requirements of the Contract Documents.
 8. Provide Cathodic Protection report in accordance with Section 4.2.
 9. Certify Quality Control Plan in accordance with Section 4.1.

5. MATERIALS

5.1 Material Certification and Test Results:

Contractor shall provide as a minimum, but not limited to the following, required test results and certifications for the anode encapsulation material and zinc wire anode.

5.2 Blasting Media:

Contractor shall provide as a minimum, but not limited to the following, technical data sheets of blasting media and equipment, and schematics of containment system.

6. EQUIPMENT AND INSTRUMENTATION

Contractor shall provide as a minimum, but not limited to detailed technical specifications of all equipment and instrumentation intended for use in the Project.

7. METALIZING

7.1 Scope of Work

7.1.1 Sounding Survey:

No metalizing shall be performed until concrete removal/restoration and surface preparation have been approved by the Engineer.

7.1.2 Staging of Work:

The work shall be performed in accordance with the Transportation Management Plans and the Contract Plans regarding time, location, and methods. All work is subject to the approval of the Engineer.

7.2 Materials and Testing**7.2.1 Metalizing Wire:**

The metalizing material shall be essentially pure zinc (99.9% pure) produced in wire form of 1/8 inch standard size which can be molten and sprayed with the equipment described in this Project Special Provision.

7.2.2 Quality Control:

Provide manufacturers certifications for the following:

1. Metalizing zinc anode wire; shall indicate chemical composition, wire diameter, lot number, manufacturing date and relative manufacturing data where applicable.
2. Abrasive blasting material data sheet and MSDS;
3. Water based inorganic zinc silicate metalizing overcoat; Provide manufacturer's specifications and technical data sheets for the following:
 - i. Metalizing equipment;
 - ii. QC testing equipment;

7.3 Construction Methods**7.3.1 Arc-Sprayed Zinc Construction Methods:****7.3.1.1 General:**

This system requires the application of sprayed zinc (anode) to selected damaged areas that exhibit severe corrosion problems after concrete restoration has been completed. The application shall be performed by thermal spraying (metalizing) the concrete with the required surface preparation necessary to produce an acceptable target bond between the zinc and the concrete as further described. A good bond is essential to provide an efficient system.

The Contractor shall apply zinc anodes on all surfaces within the cathodic protection zones defined in the Contract Documents or as directed by the Engineer.

7.3.1.2 Surface Preparation Execution:

Blasting for preparation of the surfaces to receive metalizing shall be performed by the group in charge of the metalizing application and achieving the established target bond. Different levels of abrasive blasting

may be necessary to achieve the target bond for different types of concrete.

7.3.2 Metalizing Equipment:

Zinc application equipment must meet the following minimum requirements:

7.3.2.1 Metalizing Unit:

The metalizing unit shall be a portable, electric arc spray unit capable of spraying zinc wire of 1/8" diameter and should meet the following minimum requirements.

1. The application gun shall be provided with a self-contained electric arc.
2. Spray pattern shall be elliptical in shape and have provisions for adjustments to circular pattern.
3. The application gun shall be capable of operating remotely from the wire feed unit at a distance of no less than 10 feet.
4. The wire feed unit must have moisture/oil separators provided within the unit itself (in addition to the separators already in the line) and shall be enclosed as to protect the anode wire from the environment.
5. The wire feed method shall be dual drive wheel, push type system only. Other wire feed systems may only be given temporary approval based on performance.
6. The system shall be capable of operation at 500 amps continuous duty cycle.
7. The system shall be able to operate remotely from the power supply unit for a minimum distance of 50 feet.
8. The wire feed unit and thermal spray gun assembly shall be reasonably portable and capable of operating from a reach-all, scaffolding, boat, or a small barge.

7.3.2.2 DC Power Supply Unit:

The power supply unit shall be a gasoline or diesel engine driven, direct current power source with a minimum NEMA output rating of 600 amps at 40 volts operating at 80 percent duty cycle.

Alternate power supplies may be approved based on satisfactory recommendation of the metalizing unit manufacturer.

The power supply shall be capable of operation at constant current or constant voltage modes with fully adjustable output over the entire voltage and current range and shall be capable of connection to the metalizing unit at a minimum distance of 50 feet. An ammeter, voltmeter, and oil pressure and engine temperature gauges shall be mounted in the Control Panel of the unit. The gauges shall be maintained clean and readable at all times during the metalizing operation.

7.3.2.3 Air Supply Equipment:

The air supply unit shall be capable of delivering a minimum of 250 CFM of air at 100 pounds of pressure and having an adjustable pressure range of 50 to 125 pounds per square inch (psi). The air compressor shall produce moisture free air at the blast nozzle. When used in conjunction with the metalizing unit and an operator temperature control unit, the system shall be capable of maintaining a minimum air volume of 175 CFM at 90 pounds of pressure at the gun head.

The air compressor shall be provided with a moisture/oil separators mounted within the unit and additional separators or filters as necessary to produce moisture free air. Separators and filters shall be serviced at a minimum of once per day to provide moisture free air. Air moisture and pressure shall be tested daily prior to commencing production.

7.3.2.4 Abrasive Blast Equipment:

The blasting equipment shall be a conventional force fed pressure type stationary sandblaster. The nozzle size shall be such that a minimum of 80 psi is maintained at the blast nozzle. The sandblasting unit shall be securely mounted on the barge (or boat) for the duration of the project. The unit shall be equipped with a minimum 1 1/4 inch piping and valves to provide a sufficient air-sand volume. The blast hose shall be capable of withstanding a working pressure of 175 psi.

7.3.3 Surface Preparation for Sprayed Zinc Cathodic Protection:

7.3.3.1 Concrete Removal:

All concrete removal shall be made under the requirements of the Project Special Provision for Concrete Restoration.

7.3.3.2 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 zinc application. Sandblasting of the concrete should leave a clean, rough surface, which leaves the appearance of medium grit sandpaper without exposing the coarse aggregate.

The abrasive stream should be directed against the work surface at an angle of approximately 15 degrees from the plane and not in excess of 30 degrees unless necessary to reach specific areas. Level of sandblasting of the concrete surface to achieve the highest possible bond of the zinc 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.

Although not anticipated, any steel component requiring metalizing shall

receive an abrasive blast to the extent that a near white appearance is obtained as per NACE 2 as referenced in NACE12/AWS C2.23/SSPC-CS23 Standard.

7.3.3.3 Electrical Continuity:

Electrical continuity of the reinforcing steel and any other metallic component in the concrete shall be tested by the CP Specialist and corrected by the Contractor as shown in the Contract Documents. Although part of the cathodic protection work, continuity shall be provided during the concrete restoration operation. Care shall be observed as not to damage any rebar connecting rods or wires for connection plates which may have been installed during the concrete restoration work.

7.3.3.4 Connection for Connection Plates:

The Contractor shall have the option to install the threaded connection rods for the connecting plates during the concrete removal/restoration operation or the surface preparation for metalizing work. However, 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 Contractor will locate connection plates on solid (original) concrete. Location of the plates will vary by components based on location of spalls. Place the connection plate after applying initial metalizing to the area under the plate and then metalize over the plate extending a minimum of 2 inches in every direction from the plate as shown in the Contract Documents.

7.3.4 Arc-Sprayed Zinc Anode Application:

7.3.4.1 Test Sections-Target Bond:

Prior to commencing the arc-spraying operation, the Contractor shall metalize a minimum of 4 on-site test sections with minimum dimensions of four square feet each. 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 be representative of all of the concrete conditions present on the bridge to receive metalizing. Bond strength on the test sections shall be measured at no less than 3 hours and no more than 24 hours after metalizing and shall be conducted as described by ASTM D4541. 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 for each type of concrete to receive metalizing. Mock-ups of concrete patch materials to be metalized shall be prepared for this test.

Target bond shall be established based on the higher strengths obtained from the test areas. It is expected that a minimum of 100 psi of bond strength will be achieved and strengths lower than the expected will not be accepted. Various levels of sandblasting of the test sections of concrete may be necessary to determine the proper surface condition to achieve the target bond.

7.3.4.2 Cleaning:

Prior to zinc application, the concrete surface shall be air blasted to remove any residue from the abrasive blasting operation. Air stream shall be 100% moisture free and discharge a minimum pressure of 50 psi.

7.3.4.3 Zinc Application:

Thermal spraying operation shall not be performed during periods where rainfall, high seas, rough waters or any other wet conditions are present. Zinc spraying shall not be performed when excessive wind is blowing which could interfere with the operation as determined by the Engineer.

Metalizing shall only be applied to surface areas that have been properly prepared as per this Project Special Provision. Metalizing shall be continuous and un-interrupted within the bridge component (piles, caps, etc.) being metalized. overlaps of the zinc will only be allowed for deficiencies correction. On previously metalized components, the existing zinc shall be 100% removed prior to metalizing.

Typically, zinc application shall be performed around the bottom and the entire vertical perimeter of the caps. If the entire component is not being metalized, metalizing shall extend 2 feet on every direction from the edge of the concrete repaired area.

Zinc application shall be performed employing multiple spray passes crossing at a 90 degree angle to achieve a coating thickness of 15 to 20 mils as determined by thickness measurements on test coupons or by other means acceptable to the Engineer.

7.3.4.4 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 placing the concrete for the concrete restoration operation. Any metalizing to be accepted after 90 days (not to exceed 120 days) following the placement of the concrete shall be tested and certified as having a low probability of corrosion activity around the repaired area.

No metalizing will be approved if placed after 120 days following the placement of the concrete. Metalizing shall be completed within two hours

following sandblasting and before any contamination on the concrete develops. If concrete is not metalized within two hours or contamination develops, concrete shall be sandblasted prior to metalizing.

7.3.4.5 Thickness Measurements:

A minimum of one thickness measurement shall be obtained at 25 square feet intervals and recorded. 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.

Where deficient coat thickness values are found, the deficient section and the immediate surface around (minimum of one square foot or within three inches), shall receive additional coating so that the coat thickness of the repaired area will reach a minimum of 15 mils. This shall be performed immediately (not to exceed 2 hours) following the first application or the entire element shall be re-metalized.

7.3.4.6 Bond Strength Test:

The Contractor shall conduct a minimum of one coating adhesion strength test (pull-off test) on each metalized element (caps, piles, etc.) or at every 100 square feet as applicable (if the metalized area is larger than 100 square feet in one component). Each test shall be made in triplicate and the values averaged. Results shall be recorded.

Pull-off tests shall be conducted using a mechanical 0 to 500 psi, fixed alignment adhesion tester as per ASTM -D 4541. 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 24 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.

7.3.4.7 Zinc 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 zinc application. The masked surfaces shall form neat horizontal and vertical lines. Surfaces of the zinc 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 10x.

7.3.4.8 Zinc 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 zinc anode over previously metalized areas shall not blister burn or otherwise damage the bottom anode layer. Should this occur, the entire element shall be sandblasted to remove the zinc and re-metalized.

7.3.4.9 Overcoat:

After zinc coating is approved satisfactory by the Engineer, the Contractor shall apply a coat of water based inorganic zinc silicate over the metalized areas of the structure. This work shall be performed within 72 hours after the metalizing.

Coating shall be spray applied only and in accordance with the manufacturer recommended thickness and specifications. No roller application is allowed and brush application can only be used as touch-up for correction of small deficient areas. The silicate coating application shall extend six inches beyond the metalized areas in each direction whenever possible and shall have a minimum dry-film thickness of 5-8 mils. Thickness measurements of the silicate overcoat shall be made at a minimum of 2 locations per metalized element or as directed by the Engineer. Areas not to be coated shall be properly masked to protect them from over-spraying or over-run, and to form neat horizontal or vertical lines.

8. METHOD OF MEASUREMENT

8.1 General:

All survey work shall be incidental to the cathodic protection systems installation.

8.2 Cathodic Protection System (Zinc Aluminum Spray):

The quantity to be paid will be the area, in square feet, of the completed and accepted metalized work.

9. BASIS OF PAYMENT

9.1 Cathodic Protection System (Zinc Aluminum Spray):

Price and payment will be full compensation for all work specified in this Project Special Provision and all incidental items necessary to provide a functional metalizing system.

| Pay Item | Unit |
|--------------------------------|-------------|
| CP System, Zinc Aluminum Spray | Square Feet |

**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.

There are two different types of installation specified in the Contract Plans: monitoring and non-monitoring. 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. The monitoring type system (a non-shorted system) will be installed at select locations to document CP system performance. The CP system shall consist of TSA coating, anode connection plates, embedded reference electrodes, conduit, junction boxes, and all necessary wiring.

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 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**A. TSA Wire**

The TSA wire shall meet the following specifications:

| | |
|--|--|
| Nominal Chemical Composition: | Al-20Zn-0.2In |
| Max. Cu Content: | 100 PPM |
| Wire Diameter: | 1/8 in. (3.2 mm) |
| Density: | 0.12 lb/in ³ (3.24g/cm ³) |
| Open circuit potential in simulated concrete pore solution (pH = 12-13): | > -1.6 V (CSE) |

B. 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 admixtures such as flash, silica fume, or slag is not allowed.

C. 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.

D. Wires

Positive (anode) and negative lead (Rebar/Strand) wires shall be No. 12 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.

E. Reference Electrode (for Monitoring Sites)

Two reference electrodes shall be installed in each girder designated as a monitoring girder. 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 calibrated calomel electrode or silver/silver chloride reference electrode in a saturated calcium hydroxide solution. A digital multimeter with high internal resistance ($\geq 10 \text{ M}\Omega$) 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 $\pm 5 \text{ mV}$ 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 the 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. Conduits, Junction Boxes, 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.

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 conduit, junction box, and electrical connections shall be Type 316 Stainless Steel, unless otherwise specified.

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 metalizing 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 and certify wire connections to strand and supplemental steel.

7. Verify and certify wire connections 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 CP on each girder.
11. Energize CP on each girder (Question#1).
12. 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.

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Submit shop drawings of all the CP zones with dimensions, installations of anode connection plates; conduits; junction boxes; reference electrodes; and other relevant CP details.

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 (refer to Section 8).

Submit technical sheet and MSDS for the blasting media.

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

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

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 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 airpockets 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.

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, gritblasting, scarifying, waterblasting, 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 ($\geq 10M\Omega$). 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 section 5.1 "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 sandblaster 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.

ii. Installation of Anode Connection Plates for Monitoring Sites

For monitoring sites, one lead wire from strand and one lead wire from the anode plate shall extend to a junction box. Install the anode plate and wires in accordance with the Contract Document.

Installation of Reference Electrodes for Monitoring Sites

The CP specialist shall mark the exact location of the reference electrodes in the field based on the half-cell potential data obtained before spraying Al-Zn-In anode.

1. 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. Prior to excavating, locate the stirrups and strands in the area of the excavation. Cut a slot for placement of the reference electrode. The Contractor shall not expose any reinforcement (rebars or strands) 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.
2. The reference electrode shall be placed in the excavation and the lead wire routed through the conduit into the junction box. An identification tag shall be affixed to the end of the wire indicating the reference electrode location and number.
3. 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. 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.

Installation of Junction Boxes for Monitoring Sites

There are two types of junction boxes, as shown in the Contract Plans. The Contactor shall install junction boxes as shown on the Plans. For monitoring girders, junction boxes (type 2) shall be extended down to a convenient location, when necessary (5 feet above MHW), for future testing.

1. Anode wire connection: Securely attach an anode (red) wire between the anode connection plate and the stainless steel washer and nut – making sure that the nut is firmly tightened. Route the anode wire through the conduit to the junction box type 1.
2. Strand wire connection: Securely attach a strand/rebar (black) wire to the strand as shown on the Contract Document and route this wire to the junction box type 1 through the PVC conduit. Provide a connection between the anode and the strand wires through a precision 0.1 ohm shunt, rated to 2 amperes, inside the junction box type 2.
3. Fastening: The junction boxes and the conduit shall be secured to the concrete surface using durable 316 stainless steel fasteners. The conduit fastener spacing shall be in accordance with Table 352.30(B) National Electrical Code (NEC). The Contractor shall monitor the electrical isolation between the anode and the reinforcement during the installation of conduits and junction boxes for all monitoring areas. Any short between the anode and reinforcement shall be immediately corrected by the Contractor at no additional cost to the Department.
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 anode connection plates, 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.

Wiring and Conduit (for Monitoring Sites)

1. Wiring: Route all lead wires and reference electrode wires (without splices), through PVC conduits to the junction boxes.
2. Conduit: All wiring shall be installed in PVC conduits.
3. Connections: All conduit joints, fittings, couplings and adapters shall be jointed by means of solvent cement or as recommended by the conduit manufacturer.
4. Bending: Any conduit sections to be bent must be heated evenly over the entire length of the curve. Only electrical heaters designed specifically for the size and purpose of bending non-metallic conduit shall be used. Conduit bending shall be performed per the conduit manufacturer's recommendations. For "blind" bends or for compound turns in a conduit run, the heated conduit may be solvent cemented

in place while still flexible. The use of torches or other flame-type devices shall not be permitted. PVC conduit sections that were exposed to excessive heating, as evident by brown discoloration, shall be discarded.

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. These test sections shall be performed for both low level and high level girders. 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 surfacewaters.

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 16 mils. The thickness of the anode coating shall not exceed 20 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 16 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. 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 overspraying 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

SYSTEM ENERGIZING (FOR MONITORING SITES)

At each monitoring site, the CP Specialist shall measure and record the AC resistance and DC voltage between the anode and steel, the DC millivolt drop across each shunt, the AC resistance between each reference electrode and the steel and the native potential of the steel and anode using the embedded reference electrodes. Conduct depolarization tests per NACE International Standard Practice SP 0290-2007 using the embedded reference electrodes. Submit test results and energizing data to the Engineer for approval. The CP specialist shall conduct these tests, and the results of the testing shall be a part of the CP report.

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.

Repairs to Prestressed Concrete Girders 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), TSA Full Length (Monitoring), TSA Partial Length (Non-Monitoring), TSA Partial Length (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, wiring, conduit, junction boxes, reference electrodes, and any other incidental items associated with this work.

15BPR.46

BP-105

Dare County

Pay Item

Repairs to Prestressed Concrete Girders
Splicing of Prestressing Strand
TSA Full Length (Non-Monitoring)
TSA Full Length (Monitoring)

Pay Unit

Cubic Feet
Each
Square Feet
Square Feet

15BPR.46

BP-106

Dare County

2-BAR METAL RAIL REPAIRS

(SPECIAL)

Furnish and place metal bridge railing, in accordance with the plans and standard specifications.

Secure all loose connection at all locations throughout the structure. Replace broken or missing connections as determined by the Engineer.

Replace any other broken or missing components throughout the structure as deemed necessary by the Engineer.

Measurement and payment will be for the actual number of linear foot of bridge railing. These prices and payments will be full compensation for all materials, labor, equipment, tools, and incidentals necessary to remove any existing damaged bridge railing and to construct the proposed bridge railing as deemed acceptable by the Engineer.

Pay Item

2-Bar Metal Rail Repairs

Pay Unit

Linear Feet

County : Dare

| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|----------------------|--------------|-------|--|--------------|-----------|--------|
| ROADWAY ITEMS | | | | | | |
| 0001 | 0000100000-N | 800 | MOBILIZATION | Lump Sum | L.S. | |
| 0002 | 0106000000-E | 230 | BORROW EXCAVATION | 25 CY | | |
| 0003 | 1121000000-E | 520 | AGGREGATE BASE COURSE | 45 TON | | |
| 0004 | 1308000000-E | 607 | MILLING ASPHALT PAVEMENT, **** TO ***** (1-1/2" TO 3") | 5,101 SY | | |
| 0005 | 1523000000-E | 610 | ASPHALT CONC SURFACE COURSE, TYPE S9.5C | 660 TON | | |
| 0006 | 1575000000-E | 620 | ASPHALT BINDER FOR PLANT MIX | 40 TON | | |
| 0007 | 2556000000-E | 846 | SHOULDER BERM GUTTER | 240 LF | | |
| 0008 | 3345000000-E | 864 | REMOVE & RESET EXISTING GUARD- RAIL | 240 LF | | |
| 0009 | 4405000000-E | 1110 | WORK ZONE SIGNS (PORTABLE) | 690 SF | | |
| 0010 | 4410000000-E | 1110 | WORK ZONE SIGNS (BARRICADE MOUNTED) | 102 SF | | |
| 0011 | 4415000000-N | 1115 | FLASHING ARROW BOARD | 9 EA | | |
| 0012 | 4420000000-N | 1120 | PORTABLE CHANGEABLE MESSAGE SIGN | 2 EA | | |
| 0013 | 4430000000-N | 1130 | DRUMS | 880 EA | | |
| 0014 | 4445000000-E | 1145 | BARRICADES (TYPE III) | 128 LF | | |
| 0015 | 4480000000-N | 1165 | TMA | 2 EA | | |
| 0016 | 4650000000-N | 1251 | TEMPORARY RAISED PAVEMENT MARKERS | 4,555 EA | | |
| 0017 | 4685000000-E | 1205 | THERMOPLASTIC PAVEMENT MARKING LINES (4", 90 MILS) | 13,332 LF | | |
| 0018 | 4805000000-N | 1205 | COLD APPLIED PLASTIC PAVEMENT MARKING SYMBOL, TYPE ** (II) | 12 EA | | |

County : Dare

| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|------------------------|--------------|-------|---|---------------|-----------|--------|
| 0019 | 4810000000-E | 1205 | PAINT PAVEMENT MARKING LINES (4") | 78,396 LF | | |
| 0020 | 4850000000-E | 1205 | REMOVAL OF PAVEMENT MARKING LINES (4") | 21,560 LF | | |
| 0021 | 4860000000-E | 1205 | REMOVAL OF PAVEMENT MARKING LINES (8") | 3,984 LF | | |
| 0022 | 4890000000-E | SP | GENERIC PAVEMENT MARKING ITEM POLYUREA PAVEMENT MARKING LINES, 4", 30 MILS (STANDARD GLASS BEADS) | 36,305 LF | | |
| 0023 | 4890000000-E | SP | GENERIC PAVEMENT MARKING ITEM THERMOPLASTIC RUMBLE BARS | 3,253 LF | | |
| 0024 | 4900000000-N | 1251 | PERMANENT RAISED PAVEMENT MARKERS | 582 EA | | |
| 0025 | 6084000000-E | 1660 | SEEDING & MULCHING | 0.2 ACR | | |
| STRUCTURE ITEMS | | | | | | |
| 0026 | 2275000000-E | SP | FLOWABLE FILL | 7.6 CY | | |
| 0027 | 8121000000-N | 412 | UNCLASSIFIED STRUCTURE EXCAVATION AT STATION ***** (65+52.10 -L-) | Lump Sum | L.S. | |
| 0028 | 8161000000-E | 420 | GROOVING BRIDGE FLOORS | 314,624 SF | | |
| 0029 | 8594000000-E | 876 | RIP RAP, CLASS B | 30 TON | | |
| 0030 | 8622000000-E | 876 | GEOTEXTILE FOR DRAINAGE | 65 SY | | |
| 0031 | 8657000000-N | 430 | ELASTOMERIC BEARINGS | Lump Sum | L.S. | |
| 0032 | 8660000000-E | SP | CONCRETE REPAIRS | 3 CF | | |
| 0033 | 8664000000-E | SP | SHOTCRETE REPAIRS | 37 CF | | |
| 0034 | 8678000000-E | SP | EPOXY RESIN INJECTION | 4,043 LF | | |

County : Dare

| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|--------|--------------|-------|---|--------------|-----------|--------|
| 0035 | 8867000000-E | SP | GENERIC STRUCTURE ITEM 2-BAR METAL RAIL REPAIRS | 200 LF | | |
| 0036 | 8867000000-E | SP | GENERIC STRUCTURE ITEM BRIDGE JOINT REMOVAL | 366 LF | | |
| 0037 | 8867000000-E | SP | GENERIC STRUCTURE ITEM CP INTEGRAL PILE JACKET(STRUC- TURAL), 16" TO 30" | 300 LF | | |
| 0038 | 8867000000-E | SP | GENERIC STRUCTURE ITEM FOAM JOINT SEALS FOR PRESERVA- TION | 4,545 LF | | |
| 0039 | 8882000000-E | SP | GENERIC STRUCTURE ITEM REPAIRS TO PRESTRESSED CON- CRETE GIRDERS | 201 CF | | |
| 0040 | 8892000000-E | SP | GENERIC STRUCTURE ITEM CP SYSTEM, ZINC ALUMINUM SPRAY | 14,820 SF | | |
| 0041 | 8892000000-E | SP | GENERIC STRUCTURE ITEM EPOXY COATING | 24,628 SF | | |
| 0042 | 8892000000-E | SP | GENERIC STRUCTURE ITEM TSA FULL LENGTH (MONITORING) | 1,862 SF | | |
| 0043 | 8892000000-E | SP | GENERIC STRUCTURE ITEM TSA FULL LENGTH (NON-MONITOR- ING) | 29,173 SF | | |
| 0044 | 8893000000-E | SP | GENERIC STRUCTURE ITEM PLACING & FINISHING POLYMER CONCRETE OVERLAY | 36,967 SY | | |
| 0045 | 8893000000-E | SP | GENERIC STRUCTURE ITEM SCARIFYING BRIDGE DECK | 36,967 SY | | |
| 0046 | 8893000000-E | SP | GENERIC STRUCTURE ITEM SHOT-BLASTING BRIDGE DECK | 36,967 SY | | |
| 0047 | 8897000000-N | SP | GENERIC STRUCTURE ITEM CATHODIC PROTECTION SYSTEM - SUBMERGED ZINC BULK ANODE | 382 EA | | |
| 0048 | 8897000000-N | SP | GENERIC STRUCTURE ITEM SPLICING OF PRESTRESSING STRAND | 15 EA | | |

County : Dare

| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|--------|--------------|-------|---|----------|-----------|--------|
| 0049 | 8897000000-N | SP | GENERIC STRUCTURE ITEM TYPE I BRIDGE JACKING BRIDGE NO 12 | 165 | EA | |

***** BEGIN SCHEDULE AA *****
***** (2 ALTERNATES) *****

| | | | | | | |
|------|--------------|----|---|-------|----|--|
| 0050 | 8881000000-E | SP | GENERIC STRUCTURE ITEM POLYESTER POLYMER CONCRETE MATERIALS | 3,322 | CY | |
|------|--------------|----|---|-------|----|--|

AA1

*** OR ***

| | | | | | | |
|------|--------------|----|---|-------|----|--|
| 0051 | 8881000000-E | SP | GENERIC STRUCTURE ITEM EPOXY POLYMER CONCRETE MATERI- ALS | 3,322 | CY | |
|------|--------------|----|---|-------|----|--|

AA2

***** END SCHEDULE AA *****

1244/Nov01/Q683157.8/D313445100000/E51

Total Amount Of Bid For Entire Project :