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

FINAL REQUEST FOR PROPOSALS

DESIGN-BUILD PROJECT

TIP I-3306A / W-5707C

July 14, 2021
Includes
Addendum No. 1 - June 18, 2021
Addendum No. 2 - June 29, 2021
Addendum No. 3 - July 14, 2021

VOID FOR BIDDING

DATE AND TIME OF TECHNICAL PROPOSAL SUBMISSION: **July 27, 2021** BY **4:00 PM**

DATE AND TIME OF PRICE PROPOSAL SUBMISSION: **August 10, 2021** BY **4:00 PM**

DATE AND TIME OF PRICE PROPOSAL OPENING: **August 17, 2021** AT **2:00 PM**

CONTRACT ID: C204632

WBS ELEMENT NO. 34178.3.GV3

FEDERAL-AID NO. IMS-040-4(148)259

COUNTIES: Orange and Durham

ROUTE NO. I-40

MILES: 13.0

LOCATION: I-40 Widening from I-85 in Orange County to the Durham County Line with Interchange Modifications, Including the I-40 / NC 86 Interchange; and I-40 Westbound Temporary Pavement Marking and Overhead Lane Use Sign Modifications near US 15-501 in Durham County

TYPE OF WORK: DESIGN-BUILD AS SPECIFIED IN THE SCOPE OF WORK CONTAINED IN THE REQUEST FOR PROPOSALS

NOTICE:

ALL PROPOSERS 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 PROPOSER 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. PROPOSERS 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. NOT WITHSTANDING THESE LIMITATIONS ON BIDDING, THE PROPOSER WHO IS AWARDED ANY PROJECT SHALL COMPLY WITH CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA FOR LICENSING REQUIREMENTS WITHIN 60 CALENDAR DAYS OF BID OPENING, REGARDLESS OF FUNDING SOURCES.

_____ 5% BID BOND OR BID DEPOSIT REQUIRED

_____

PROPOSAL FORM FOR THE CONSTRUCTION OF CONTRACT NO. C204632

IN ORANGE AND DURHAM COUNTIES, NORTH CAROLINA

Date_____ 20_____

DEPARTMENT OF TRANSPORTATION,

RALEIGH, NORTH CAROLINA

The Design-Build Team herein acknowledges that it has carefully examined the location of the proposed work to be known as Contract No. C204632; has carefully examined the Final Request for Proposals (RFP) and all addendums thereto, specifications, special provisions, the form of contract, and the forms of contract payment bond and contract performance bonds, which are acknowledged to be part of the Contract; and thoroughly understands the stipulations, requirements and provisions. The undersigned Design-Build Team agrees to be bound upon their execution of the Contract and including any subsequent award to them by the Secretary of Transportation in accordance with this Contract to provide the necessary contract payment bond and contract performance bond within fourteen calendar days after the written notice of award is received by them.

The undersigned Design-Build Team further agrees to provide all necessary materials, machinery, implements, appliances, tools, labor, and other means of construction, except as otherwise noted, to perform all the work and required labor to design, construct and complete all the work necessary for State Highway Contract No. C204632 in Orange and Durham Counties by no later than the dates(s) specified in the Final RFP or Technical Proposal, whichever is earlier, and in accordance with the requirements of the Engineer, the Final RFP and Addenda thereto, the 2018 *Standard Specifications for Roads and Structures*, specifications prepared by the Department, the Technical Proposal prepared by the Design-Build Team, at the lump sum price(s) bid by the Design-Build Team in their Price Proposal.

The Design-Build Team shall provide signed and sealed documents prepared by the Design-Build Team, which specifications and plans show the details covering this project and adhere to the items noted above.

The Design-Build Team acknowledges that project documents furnished by the Department are preliminary and provided solely to assist the Design-Build Team in the development of the project design. Unless noted otherwise herein, the Department does not warrant or guarantee the sufficiency or accuracy of any information furnished by the Department.

The Department does not warrant or guarantee the sufficiency or accuracy of any investigations made, nor the interpretations made or opinions of the Department as to the type of materials and conditions to be encountered at the project site. The Design-Build Team is advised to make such independent investigations, as they deem necessary to satisfy their self as to conditions to be encountered on this project. The Design-Build Team shall have no claim for additional compensation or for an extension of contract time for any reason resulting from the actual conditions encountered at the site differing from those indicated in any of the information or

documents furnished by the Department except as may be allowed under the provisions of the 2018 *Standard Specifications for Roads and Structures*.

Although the Department has furnished preliminary designs for this project, unless noted otherwise herein, the Design-Build Team shall assume full responsibility, including liability, for the project design, including the use of portions of the Department design, modification of such design, or other designs as may be submitted by the Design-Build Team.

The Design-Build Team shall be fully and totally responsible for the accuracy and completeness of all work performed under this contract, and shall indemnify and hold the Department harmless for any additional costs and all claims against the Department or the State which may arise due to errors or omissions of the Department in furnishing the preliminary project designs and information, and of the Design-Build Team in performing the work.

The published volume entitled *North Carolina Department of Transportation, Raleigh, Standard Specifications for Roads and Structures*, January 2018, as well as, all design manuals, policy and procedures manuals, and AASHTO publications and guidelines referenced in the Request For Proposals, with all amendments and supplements thereto, are by reference, incorporated and made part of this contract; that, except as herein modified, all the design, construction and Construction Engineering Inspection included in this contract shall be done in accordance with the documents noted above and under the direction of the Engineer.

If the Design-Build Proposal is accepted and the award is made, the Technical Proposal submitted by the Design-Build Team is by reference, incorporated and made part of this contract. 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 by written approval as allowed by the Request for Proposals.

Accompanying the Price Proposal shall be 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 Design-Build Team fails 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 them, as provided in the 2018 *Standard Specifications for Roads and Structures*; otherwise said deposit will be returned to the Design-Build Team.

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Itemized Proposal Sheet (TAN SHEET)
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Listing of DBE Subcontractors
Execution of Bid, Non-Collusion Affidavit, Debarment Certification and Gift Ban Certification
Signature Sheet

*** PROJECT SPECIAL PROVISIONS ***

CONTRACT TIME AND LIQUIDATED DAMAGES

(7-12-7) DB1 G04A

The date of availability for this contract is September 27, 2021, except that the Design-Build Team shall only begin ground disturbing activities as allowed by this Request for Proposals (RFP). The Design-Build Team shall consider this factor in determining the proposed completion date for this project.

The completion date for this contract is defined as the date proposed in the Technical Proposal by the proposer who is awarded the project. The completion date thus proposed shall not be later than November 1, 2025.

When observation periods are required by the special provisions, they are not a part of the work to be completed by the completion date and / or intermediate contract times. Should an observation period extend beyond the Final Completion Date proposed by the Design-Build Team in the Technical Proposal, the performance and payment bonds shall remain in full force and effect until the observation period has been completed and the work accepted by the Department.

The liquidated damages for this contract are **Seven Thousand Dollars ($7,000.00)** per calendar day. As an exception to this amount, where the contract has been determined to be substantially complete as defined by the *Substantial Completion* Project Special Provision found elsewhere in this RFP, the liquidated damages will be reduced to **Twenty-Five Hundred Dollars ($2,500.00)** per calendar day.

Where the Design-Build Team who is awarded the contract has proposed a completion date for the contract as required above, but also has proposed an earlier date for substantial completion, then both of these proposed dates will become contract requirements.

Liquidated damages of **Seven Thousand Dollars ($7,000.00)** per calendar day will be applicable to the early date for substantial completion proposed by the bidder. Liquidated damages of **Twenty-Five Hundred Dollars ($2,500.00)** per calendar day will be applicable to the Final Completion Date proposed by the bidder where the Design-Build Team has proposed an earlier date for substantial completion.

INTERMEDIATE CONTRACT TIME NUMBER 1 AND LIQUIDATED DAMAGES

(3-22-07) DB 1 G07

Intermediate Contract Time #1 is for the completion of all signing and pavement marking modifications necessary to temporarily remove the existing I-40 westbound left lane drop near US 15-501 (Exit 270); and convert the I-40 westbound outside through lane (third I-40 westbound lane from the median) to an “Exit Only” lane onto US 15-501 exit ramp. The aforementioned exit ramp shall be designed as a single lane, parallel exit. (Reference the Transportation Management Scope of Work, Pavement Markings Scope of Work, and Signing Scope of Work found elsewhere in this RFP, and the Preliminary W-5707C Signing and Pavement Marking Plans provided by the Department)

The Date of Availability for Intermediate Contract Time #1 is the date of availability for this contract.

The completion date for Intermediate Contract Time #1 is defined as the date proposed in the Technical Proposal by the proposer who is awarded the project. The completion date thus proposed shall not be later than December 15, 2021.

Liquidated Damages for Intermediate Contract Time #1 are **$500.00** per calendar day or any portion thereof.

OTHER LIQUIDATED DAMAGES AND INCENTIVES

(3-22-7) (Rev. 2-14-8) DB1 G11

Reference the Transportation Management, ITS, and Traffic Signals and Signal Communications Scopes of Work found elsewhere in this RFP for more information on the following time restrictions and liquidated damages:

Liquidated Damages for Intermediate Contract Time #2 for lane narrowing, lane closure, holiday and special event time restrictions on I-40 are $2,500.00 per 15-minute period or any portion thereof.

Liquidated Damages for Intermediate Contract Time #3 for lane narrowing, lane closure, holiday and special event time restrictions on all ramps and loops, US 15-501 (Durham-Chapel Hill Boulevard) and NC 86 (Martin Luther King Jr. Boulevard) are $1,250.00 per 15-minute period or any portion thereof.

Liquidated Damages for Intermediate Contract Time #4 for lane narrowing, lane closure, holiday and special event time restrictions on SR 1006 (Orange Grove Road), SR 1009 (Old NC 86), SR 1723 (New Hope Church Road), SR 1725 (Millhouse Road), SR 1732 (Sunrise Road), SR 1734 (Erwin Road) and SR 1134 (Dimmocks Mill Road) are $500.00 per 15-minute period or any portion thereof.

Liquidated Damages for Intermediate Contract Time #5 for road closure time restrictions for construction operations on I-40 are $5,000.00 per 15-minute period or any portion thereof.

Liquidated Damages for Intermediate Contract Time #6 road closure time restrictions for construction operations on all ramps and loops, SR 1009 (Old NC 86) and SR 1725 (Millhouse Road) are $1,250.00 per 15-minute period or any portion thereof.

Liquidated Damages for Intermediate Contract Time #7 for road closure time restrictions for ramp reconstruction at the I-40 westbound exit ramp onto SR 1009 (Old NC 86) interchange are $2,000.00 per calendar day or any portion thereof.

Liquidated Damages for Intermediate Contract Time #8 for road closure time restrictions for ramp reconstruction at the I-40 westbound entrance ramp from SR 1009 (Old NC 86) are $2,000.00 per calendar day or any portion thereof.

Liquidated Damages for Intermediate Contract Time #9 for road closure time restrictions for rehabilitation work on the bridge on SR 1134 (Dimmocks Mill Road) over I-40 and I-85 are $1,000.00 per calendar day or any portion thereof.

Liquidated Damages for Intermediate Contract Time #10 for road closure time restrictions for rehabilitation work on the bridge on SR 1732 (Sunrise Road) over I-40 are $1,000.00 per calendar day or any portion thereof.

Liquidated Damages for Intermediate Contract Time #11 for road closure time restrictions for rehabilitation work on the bridge on SR 1723 (New Hope Church Road) over I-40 are $2,000.00 per calendar day or any portion thereof.

Liquidated Damages for Intermediate Contract Time #12 for lane closure time restrictions for rehabilitation work on the bridge on SR 1006 (Orange Grove Road) over I-40 are $1,000.00 per calendar day or any portion thereof.

Liquidated Damages for Intermediate Contract Time #13 for lane closure time restrictions for rehabilitation work on the bridge on NC 86 (Martin Luther King Jr. Boulevard) over I-40 are 5,000.00 per calendar day or any portion thereof.

Liquidated Damages for Intermediate Contract Time #14 for road closure time restrictions for widening the bridges on I-40 over NSR and SR 1725 (Millhouse Road) are $1,250.00 per calendar day or any portion thereof.

Liquidated Damages for Intermediate Contract Time #15 for failure to repair a damaged or malfunctioning Dynamic Traveler Information System device and restore operation within 72 hours are $250.00 per calendar day or any portion thereof.

Liquidated Damages for Intermediate Contract Time #16 for lane closure time restrictions for median barrier and overhead sign assembly foundation construction to replace the first of two diagrammatic overhead sign assemblies on I-85 northbound / I-40 eastbound west of the proposed I-40 eastbound exit lane taper located west of SR 1134 (Dimmocks Mill Road) are $1,000.00 per calendar day or any portion thereof.

Liquidated Damages for Intermediate Contract Time #17 for lane closure time restrictions for median barrier and overhead sign assembly foundation construction to replace the second of two diagrammatic overhead sign assemblies on I-85 northbound / I-40 eastbound west of the proposed I-40 eastbound exit lane taper located west of SR 1134 (Dimmocks Mill Road) are $1,000.00 per calendar day or any portion thereof.

Liquidated Damages for Intermediate Contract Time #18 for failure to repair a damaged NCDOT or Town of Chapel Hill fiber optic communications cable and restore communications within 24 hours are $500.00 per hour or any portion thereof.

Liquidated Damages for Intermediate Contract Time #19 for failure to reestablish NCDOT or Town of Chapel Hill fiber optic communications within 24 hours are $2,500.00 per calendar day or any portion thereof.

Liquidated Damages for Intermediate Contract Time #20 for failure to provide a plan that defines 1) an anticipated NCDOT or Town of Chapel Hill fiber optic communications disruption timeframe, and 2) a plan of action for reestablishing NCDOT or Town of Chapel Hill fiber optic communications a minimum of 21 calendar days prior to a proposed disruption in service are $10,000.00 per failure.

Liquidated Damages for Intermediate Contract Time #21 for failure to restore communication or provide a replacement device within 24 hours are $500.00 per hour or any portion thereof.

Liquidated Damages for Erosion and Sedimentation Control efforts apply to this project.

Reference the Erosion and Sedimentation Control Scope of Work found elsewhere in this RFP for additional information under the Erosion Control Damages Section.

PAYOUT SCHEDULE

(11-16-09) DB1 G13

No later than 12:00 o'clock noon on the sixth day after the Price Proposal opening, the responsive proposer with the lowest adjusted price shall submit a proposed Anticipated Monthly Payout Schedule to the office of the State Contract Officer. The Anticipated Monthly Payout Schedule shall be submitted as a hard copy version and as an electronic version in Excel Spreadsheet. Both versions of the Anticipated Monthly Payout Schedule shall be submitted in a sealed package with the outer wrapping clearly marked "Anticipated Monthly Payout Schedule" along with the Design-Build Team name and the contract number. The Anticipated Monthly Payout Schedule will be used by the Department to establish the monthly funding levels for this project. The Anticipated Monthly Payout Schedule shall parallel, and agree with, the project schedule the Design-Build Team submits as a part of their Technical Proposal. The Anticipated Monthly Payout Schedule shall include a monthly percentage breakdown (in terms of the total contract amount percentages) of the work anticipated to be completed. The Anticipated Monthly Payout Schedule shall begin with the Date of Availability and end with the Actual Completion Date proposed by the Design-Build Team. If the Anticipated Monthly Payout Schedule is not submitted as stated herein, the Technical and Price Proposals will be considered irregular by the Department, and the bid may be rejected.

As detailed above, the Design-Build Team shall submit electronic and hard copy updates of the Anticipated Monthly Payout Schedule on March 15th, June 15th, September 15th, and December 15th of each calendar year until project acceptance. The Design-Build Team shall submit all updates to the Resident Engineer, with copies to the State Construction Engineer at 1 South Wilmington Street, 1543 Mail Service Center, Raleigh, NC 27699-1543.

MOBILIZATION

(3-11-19) DB1 G15B

Revise the 2018 *Standard Specifications for Roads and Structures* as follows:

Page 8-1, Subarticle 800-2, MEASUREMENT AND PAYMENT

Delete this subarticle in its entirety and replace with the following:

800-2 MEASUREMENT AND PAYMENT

Five percent of the "Total Amount of Bid for Entire Project" shall be considered the lump sum amount for Mobilization. Partial payments for Mobilization will be made beginning with the first partial pay estimate paid on the contract. Payment will be made at the rate of 50 percent of the lump sum amount calculated for Mobilization. The remaining 50 percent will be paid with the partial pay estimate following approval of all permits required in the Environmental Permits Scope of Work for this project.

SUBSTANTIAL COMPLETION

(3-22-07) DB1 G16

When the special provisions provide for a reduction in the rate of liquidated damages for the contract time or an intermediate contract time after the work is substantially complete, the work will be considered substantially complete when the following requirements are satisfied:

1. Through traffic has been placed along the project or along the work required by an intermediate contract time and the work is complete to the extent specified below, and all lanes and shoulders are open such that traffic can move unimpeded at the posted speed. Intersecting roads and service roads are complete to the extent that they provide the safe and convenient use of the facility by the public.

2. The final layers of pavement for all lanes and shoulders along the project or along the work required by an intermediate contract time are complete.

3. Excluding signs on intersecting roadways, all signs are complete and accepted.

4. All guardrails, drainage devices, ditches, excavation and embankment are complete.

5. Remaining work along the project consists of permanent pavement markings, permanent pavement markers or incidental construction that is away from the paved portion of the roadway.

Upon apparent substantial completion of the entire project or the work required by an intermediate contract time, the Engineer will make an inspection of the work. If the inspection discloses the entire project or the work required by an intermediate contract time is substantially complete; the Engineer will notify the Design-Build Team in writing that the work is substantially complete. If the inspection discloses the entire project or the work required by an intermediate contract time is not substantially complete, the Engineer will notify the Design-Build Team in writing of the work that is not substantially complete. The entire project or the

work required by an intermediate contract time will not be considered substantially complete until all of the recommendations made at the time of the inspection have been satisfactorily completed.

SUBMITTAL OF QUANTITIES, FUEL BASE INDEX PRICE AND OPT-OUT OPTION

1/23/14 DB1 G43

(A) Submittal of Quantities

Submit quantities on the *Fuel Usage Factor Chart and Estimate of Quantities* sheet, located in the back of this RFP, following the Itemized Proposal Sheet.

The Design-Build Team shall prepare an Estimate of Quantities that they anticipate incorporating into the completed project and upon which the Price Proposal was based. The quantity breakdown shall include all items of work that appear in the *Fuel Usage Factor Chart and Estimate of Quantities* sheet. Only those items of work which are specifically noted in the *Fuel Usage Factor Chart and Estimate of Quantities* sheet will be subject to fuel price adjustments.

Submittal - The submittal shall be signed and dated by an officer of the Design-Build Team. The information shall be copied and submitted in a separate sealed package with the outer wrapping clearly marked "Fuel Price Adjustment" and shall be delivered at the same time and location as the Technical Proposal. The original shall be submitted in the Price Proposal.

Trade Secret - Information submitted on the *Fuel Usage Factor Chart and Estimate of Quantities* sheet will be considered "Trade Secret" in accordance with the requirements of G.S. 66-152(3) until such time as the Price Proposal is opened.

(B) Base Index Price

The Design-Build Team's Estimate of Quantities will be used on the various partial payment estimates to determine fuel price adjustments. The Design-Build Team shall submit a payment request for quantities of work completed based on the work completed for that estimate period. The quantities requested for partial payment shall be reflective of the work actually accomplished for the specified period. The Design-Build Team shall certify that the quantities are reasonable for the specified period. The base index price for DIESEL #2 FUEL is **$2.2313** per gallon.

(C) Opt Out of Fuel Price Adjustment

If the Design-Build Team elects not to pursue reimbursement for Fuel Price Adjustments, a quantity of zero shall be entered for all quantities in the *Fuel Usage Factor Chart and Estimate of Quantities* sheet and the declination box shall be checked. Failure to complete this form will mean that the Design-Build Team is declining the Fuel Price Adjustments for this project.

(D) Change Option

The proposer will not be permitted to change the option after the copy of the *Fuel Usage Factor Chart and Estimate of Quantities* sheet is submitted with the Technical Proposal.

(E) Fuel Usage Factor for Asphalt Line Items

If the Design-Build Team elects to pursue reimbursement for Fuel Price Adjustments, the Design-Build Team shall select either the 0.90 **or** 2.90 Fuel Usage Factor for each individual asphalt line item by marking the appropriate Factor on the *Fuel Usage Factor Chart*. If the Design-Build Team does not mark either Fuel Usage Factor or marks both Fuel Usage Factors for an asphalt line item, the 2.90 Fuel Usage Factor shall be used for that asphalt line item.

(F) Failure to Submit

Failure to submit the completed *Fuel Usage Factor Chart and Estimate of Quantities* sheet separately with the Technical Proposal and in the Price Proposal will result in the Technical and Price Proposal being considered irregular by the Department and the Technical and Price Proposal may be rejected.

INDIVIDUAL MEETINGS WITH PROPOSERS

(9-1-11) DB1 G048

The Department will provide at least two Question and Answer Sessions to meet with each proposer individually to specifically address questions regarding the draft Requests for Proposals.

The Department will afford each proposer one additional meeting with the Department (maximum two-hour time limit) to discuss project specifics and address the proposer's concerns and questions. The meeting may occur at any time after the first Question and Answer Session with the proposers and before two weeks prior to the Technical Proposal submittal date. The proposer shall request the meeting in writing to the State Contract Officer, providing the Department a minimum of one week advance notice of the requested date. The proposer shall also state in the request those disciplines within the Department that are requested to be in attendance. The Department makes no assurance that the request may be honored on that specific date or that all disciplines requested can be in attendance.

EXECUTION OF BID, NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN CERTIFICATION

(1/24/13) DB1 G52

The Proposer's attention is directed to the various sheets in the Request for Proposals which are to be signed by the Proposer. A list of these sheets is shown below. The signature sheets are located behind the Itemized Proposal Sheet in this Request for Proposal. The NCDOT bid bond form is available on-line at:

https://connect.ncdot.gov/letting/Pages/Design-Build-Resources.aspx

or by contacting the Records and Documents office at 919-707-6900.

1. Applicable Signature Sheets: 1, 2, 3, 4, 5, or 6 (Bid)

2. Bid Bond dated the day of the Price Proposal submission

The Proposer shall certify to the best of his knowledge all subcontractors, material suppliers and vendors utilized herein current status concerning suspension, debarment, voluntary exclusion, or determination of ineligibility by any federal agency, in accordance with the "Debarment Certification" located behind the *Execution of Bid Non-Collusion Affidavit, Debarment Certification and Gift Ban Certification* signature sheets in this RFP. Execution of the bid signature sheets in conjunction with any applicable statements concerning exceptions, when such statements have been made on the "Debarment Certification", constitutes the Proposer's certification of "status" under penalty of perjury under the laws of the United States.

SUBMISSION OF DESIGN-BUILD PROPOSAL

(9-1-11) (Rev. 8-30-17) DB1 G55A

The Proposer's attention is directed that each Proposer's Design-Build Proposal shall comply with the following requirements in order for that Design-Build Proposal to be responsive and considered for award.

1. The Proposer shall be prequalified with the Department prior to submitting a Price Proposal.

2. The Proposer shall deliver the Technical Proposal and the Price Proposal to the place indicated, and prior to the times indicated in this Request for Proposals.

3. The Price Proposal documents shall be signed by an authorized employee of the Proposer.

4. The Price Proposal shall be accompanied by Bid surety in the form of a Bid Bond or Bid Deposit, dated the day of the Price Proposal submission.

5. If Disadvantaged Business Enterprises (DBE) goals are established for this contract, the Proposer shall complete the form Listing of DBE Subcontractors contained elsewhere in this RFP in accordance with the *Disadvantaged Business Enterprises* Project Special Provision found elsewhere in this RFP.

6. The Design-Build Proposal shall address all the requirements as specified in this Request for Proposals.

In addition to the above requirements, failure to comply with any of the requirements of Article 102-8 of the Standard Special Provisions, Division One (found elsewhere in this RFP), Article 102-9 of the 2018 *Standard Specifications for Roads and Structures,* or Article 102-10 of the 2018 *Standard Specifications for Roads and Structures* and as amended in the Standard

Special Provisions, Division One (found elsewhere in this RFP) may result in a Design-Build Proposal being rejected.

ALTERNATIVE TECHNICAL CONCEPTS AND CONFIDENTIAL QUESTIONS

(6-8-11) (Rev. 7-20-17) DB1 G56A

To accommodate innovation that may or may not be specifically allowed by the RFP, or other documents incorporated into the contract by reference, the Design-Build Team has the option of submitting Confidential Questions and Alternative Technical Concepts.

Definitions

A Confidential Question is a private query to the Department containing information whose disclosure could alert others to certain details of doing business in a particular manner.

An Alternative Technical Concept is a private query to the Department that requests a variance to the requirements of the RFP, or other documents incorporated into the contract by reference, that is equal or better in quality or effect, as determined by the Department in its sole discretion, and that has been used elsewhere under comparable circumstances.

Confidential Questions

The Design-Build Team will be permitted to ask Confidential Questions of the Department, and neither the question nor the answer will be shared with other Design-Build Teams. The Department, in its sole discretion, will determine if a question is considered confidential.

Confidential Questions arising prior to issuance of the Final RFP will be allowed during the industry review of the draft RFPs with the individual Design-Build Teams. The Department will answer the Confidential Question verbally at the industry review meeting, if possible, and / or through subtle changes in the Final RFP, which will clarify the scope by either allowing or disallowing the request. To the greatest extent possible, the revision will be made in such a manner as to not disclose the Confidential Question.

After issuance of the Final RFP, Confidential Questions may be submitted to the State Contract Officer via the Design-Build e-mail address (designbuild@ncdot.gov). After evaluation, the State Contract Officer will respond to the question in writing and / or through subtle changes in the Final RFP, as reflected in an Addendum, which will clarify the scope by either allowing or disallowing the request. To the greatest extent possible, the revision will be made in such a manner as to not disclose the Confidential Question. Minor questions will not be acknowledged or answered.

If the Design-Build Team includes concepts / work based on the Confidential Questions and answers, the concepts / work shall be discussed in the Technical Proposal.

Alternative Technical Concepts

The Design-Build Team will be allowed to submit a maximum of four Alternative Technical Concepts. The aforementioned maximum number of ATCs shall include both Preliminary and

Formal ATCs. Excluding (1) Formal ATCs that are submitted in response to the Department's favorable review of a Preliminary ATC, (2) ATCs that are deemed to take advantage of an error or omission in the RFP, and (3) ATCs that contain multiple concepts, all ATCs submitted by the Design-Build Team shall count towards the maximum number of allowable ATCs, regardless of the Department's response. (e.g. an ATC submitted by the Design-Build Team that the Department deems does not qualify as an ATC and an ATC that is not permitted shall count towards the maximum number of allowable ATCs).

Once an ATC has been submitted to the Department, the Design-Build Team will **NOT** be allowed to rescind the ATC.

Should the Design-Build Team submit a single ATC with multiple concepts, the Department (1) will not evaluate the concepts proposed in the ATC, and (2) will return the ATC to the Proposer requiring a separate submittal for each individual concept. The single ATC with multiple concepts will not be considered received within the ATC submittal deadlines noted below.

Initial ATC submittals shall be submitted in accordance with the following deadlines:

- The Design-Build Team will be allowed to submit the maximum number of allowable ATCs prior to the Final RFP distribution.

- The Design-Build Team will be allowed to submit a maximum of two (2) ATCs after the Final RFP distribution provided (1) the ATC submittal does not exceed the aforementioned maximum number of allowable ATCs, and (2) the ATC is received by the Department no later than five weeks prior to the deadline for submitting the Technical Proposal.

The Design-Build Team may include an ATC in the Technical and Price Proposal only if the ATC was received by the Department in accordance with the requirements noted above and it has been approved by the Department (including conditionally approved ATCs, if all conditions are met).

The submittal deadlines above only apply to initial ATC submittals that contain one concept. Resubmittal of an ATC that (1) has been revised in response to the Department's requests for further information concerning a prior submittal, (2) is a Formal ATC for a Preliminary ATC that received a favorable response from the Department, or (3) requests approval of additional required variances to the RFP requirements that were omitted in the original ATC submittal shall be received by the Department no later than two weeks prior to the deadline for submitting the Technical Proposal.

The Design-Build Team shall be solely responsible for reviewing all versions of the RFP, including all Addenda, and determining variances required by a Formal ATC. The Design-Build Team is cautioned that the Department's approval in no way implies that the Design-Build Team has requested approval of all the required variances to the RFP requirements. Additionally, should the Department revise the RFP after a Formal ATC has been approved, the Design-Build Team shall be solely responsible for reviewing the RFP and determining if the ATC deviates

from the revised requirements. If necessary, the Design-Build Team must submit a request for approval of all additional required variance(s) no later than two weeks prior to the deadline for submitting the Technical Proposal.

An ATC shall in no way take advantage of an error or omission in the RFP, or other documents incorporated into the contract by reference. If, at the sole discretion of the Department, an ATC is deemed to take advantage of an error or omission in the RFP, or other documents incorporated into the contract by reference, the RFP will be revised without further regard for confidentiality.

If at any time, the Department receives a documented question on the project similar to a concept submitted in the form of a Preliminary ATC or Formal ATC, the Department reserves the right to revise the RFP without further regard for confidentiality.

By approving an ATC, the Department acknowledges that the ATC may be included in the design and RFC Plans; however, approval of any ATC in no way relieves the Design-Build Team of its obligation to satisfy (1) other contract requirements not specifically identified in the ATC submittal; (2) the Department's comments resulting from review of the design details post-Award; (3) any obligation that may arise under applicable laws and regulations; and (4) any obligation mandated by the regulatory agencies as a permit condition.

ATC Submittals

All ATCs shall be submitted in electronic .pdf format to the State Contract Officer, via the Design-Build e-mail address (designbuild@ncdot.gov). Excluding the ATC distribution letter, the ATC shall not include any reference to the submitter's identity.

Formal ATCs

Each Formal ATC submittal shall include the following information:

1) **Description -** A detailed description and schematic drawings of the ATC configuration or other appropriate descriptive information (including, if appropriate, product details [i.e., specifications, construction tolerances, special provisions, etc.] and a traffic operational analysis, if appropriate)

2) **Usage -** Where and how the ATC would be used on the project

3) **Deviations -** References to all RFP requirements, or other documents incorporated into the contract by reference, that are inconsistent with the proposed ATC, an explanation of the nature of the deviations from said requirements, and a request for approval of such variance(s)

4) **Analysis -** An analysis justifying use of the ATC and why the variance to the RFP requirements, or other documents incorporated into the contract by reference, should be allowed. **All intersection and interchange reconfigurations shall include corresponding electronic traffic analyses files and a signing concept.**

5) **Impacts -** Discussion of potential vehicular traffic impacts, environmental impacts, community impacts, safety and life-cycle project impacts, and infrastructure costs (including impacts on the cost of repair and maintenance)

6) **History -** A detailed description of other projects where the ATC has been used, the success of such usage, and names and telephone numbers of project owners that can confirm such statements

7) **Risks -** A description of added risks to the Department and other entities associated with implementing the ATC

8) **Costs -** An estimate of the ATC implementation costs to the Department, the Design-Build Team, and other entities (right of way, utilities, mitigation, long term maintenance, etc.)

The Formal ATC, if approved, shall be included in the Price Proposal if the Design-Build Team elects to include it in their Technical Proposal.

Review of ATCs

A panel will be selected to review each ATC, which may or may not include members of the Technical Review Committee. The Design-Build Team shall make no direct contact with any member of the review panel, except as may be permitted by the State Contract Officer. Unapproved contact with any member of the review panel shall result in a disqualification of that ATC.

At any time, the Department may request additional information regarding a proposed ATC. To the greatest extent possible, the Department will return responses to, or request additional information from, the Design-Build Team within 15 business days of the original submittal of a Formal ATC. If additional information is requested, the Department will provide a response within five business days of receipt of all requested information.

In accordance with the *Individual Meetings with Proposers* Project Special Provision found elsewhere in this RFP, a Design-Build Team's ATC may be discussed during confidential one-on-one meeting(s). Under no circumstances will the Department be responsible or liable to the Design-Build Team or any other party as a result of disclosing any ATC materials, whether the disclosure is deemed required by law, by a court order, or occurs through inadvertence, mistake or negligence on the part of the Department or their respective officers, employees, contractors, or consultants.

In the event that the Department receives 1) ATCs from more than one Design-Build Team or 2) an ATC and a documented question outside of the ATC process that are deemed by the Department, in its sole discretion, to be similar in nature, the Department reserves the right to modify the RFP without further regard for confidentiality.

The Department Response to Formal ATCs

The Department will review each Formal ATC and will respond to the Design-Build Team with one of the following determinations:

1) The Formal ATC is approved.

2) The Formal ATC is not approved.

3) The Formal ATC is not approved in its present form, but may be approved upon satisfaction, in the Department's sole discretion, of certain identified conditions that shall be met or certain clarifications or modifications that shall be made (conditionally approved).

4) The submittal does not qualify as an ATC but may be included in the Design-Build Proposal without an approved ATC (i.e., the concept complies with the baseline requirements of the RFP).

5) **** NOTE **** Deleted bullet No. 5

6) The Formal ATC is deemed to take advantage of an error or omission in the RFP, or other documents incorporated into the contract by reference, in which case the Formal ATC will not be considered, and the RFP will be revised to correct the error or omission without further regard for confidentiality.

7) A documented question has been received outside of the ATC process on the same topic and the RFP will be revised to address that question without further regard for confidentiality.

8) More than one ATC has been received on the same topic and the Department has elected to exercise its right to revise the RFP without further regard for confidentiality. This response could also follow and supersede one of the other previously provided responses above.

9) The Formal ATC contains multiple concepts and has not been considered. Should the Design-Build Team wish to pursue one or more of the concepts presented in the Formal ATC, a separate submittal for each individual concept shall be required.

Formal ATC Inclusion in Technical Proposal

The Design-Build Team may incorporate one or more approved Formal ATCs as part of its Technical and Price Proposals. If the Department responded to a Formal ATC by stating that it would be approved if certain conditions were met, those conditions shall be stipulated and met in the Technical Proposal or the concept will be deemed in violation of the RFP requirements.

In addition to outlining each implemented Formal ATC, and providing assurances to meet all attached conditions, the Design-Build Team shall also include a copy of the Formal ATC approval letter from the State Contract Officer in each of the twelve Technical Proposals submitted. This letter will be included in the distribution of the Technical Proposals to the Technical Review Committee.

Approval of a Formal ATC in no way implies that the Formal ATC will receive a favorable review from the Technical Review Committee. The Technical Proposals will be evaluated in regards to the evaluation criteria found in this RFP, regardless of whether or not Formal ATCs are included.

The Price Proposal shall reflect all incorporated Formal ATCs. Except for incorporating approved Formal ATCs, the Technical Proposal may not otherwise contain exceptions to, or deviations from, the requirements of the RFP, or other documents incorporated into the contract by reference.

Preliminary ATCs

At the Design-Build Team's option, a Preliminary ATC submittal may be made that presents a concept and a brief narrative of the concept's benefits. The purpose of allowing a Preliminary ATC is to limit the Design-Build Team's expense in the pursuit of a Formal ATC that may be quickly denied by the Department.

To the greatest extent possible, the Department will review Preliminary ATCs within ten business days of submittal and will respond to the Design-Build Team with one of the following determinations:

1) The Preliminary ATC would be considered as a Formal ATC if the Team so elects to pursue a Formal ATC submission.

2) The Preliminary ATC is denied.

3) An ATC is not required.

4) The Preliminary ATC takes advantage of an error or omission in the RFP or other documents incorporated into the contract by reference, in which case the Preliminary ATC will not be considered, and the RFP will be revised to correct the error or omission without further regard for confidentiality.

5) A documented question has been received outside of the ATC process on the same topic and the RFP will be revised to address that question without further regard for confidentiality.

6) More than one ATC has been received on the same topic and the Department has elected to exercise its right to revise the RFP without further regard for confidentiality. This response could also follow and supersede one of the other previously supplied responses above.

7) The Preliminary ATC contains multiple concepts and has not been considered. Should the Design-Build Team wish to pursue one or more of the concepts presented in the Preliminary ATC, a separate submittal for each individual concept shall be required.

The Department in no way warrants that a favorable response to a Preliminary ATC submittal will translate into a favorable response to a Formal ATC submittal. Likewise, a favorable response to a Preliminary ATC submittal is not sufficient to include the ATC in the Technical Proposal.

SCHEDULE OF ESTIMATED COMPLETION PROGRESS

(9-1-11) (Rev. 3-30-20) DB1 G58

The Design-Build Team's attention is directed to the *Availability of Funds - Termination of Contracts* Standard Special Provision found elsewhere in this RFP. The Department of Transportation's schedule of estimated completion progress for this project, as required by that Standard Special Provision, shall be as follows:

Fiscal Year	Progress (% of Dollar Value)
2022 (07/01/21 - 06/30/22)	9% of Total Amount Bid
2023 (07/01/22 - 06/30/23)	34% of Total Amount Bid
2024 (07/01/23 - 06/30/24)	36% of Total Amount Bid
2025 (07/01/24 - 06/30/25)	19% of Total Amount Bid
2026 (07/01/25 – 06/30/26)	2% of Total Amount Bid

In accordance with Article 108-2 of the 2018 *Standard Specifications for Roads and Structures*, the Design-Build Team shall also furnish its own progress schedule. Any acceleration of the progress as shown by the Design-Build Team's progress schedule over the progress as shown above shall be subject to the approval of the Engineer.

DISADVANTAGED BUSINESS ENTERPRISE

(10-16-07) (Rev. 11-7-19) 102-15(J) SP1 G61 DB1 G061

Description

The purpose of this special provision is to carry out the U.S. Department of Transportation's policy of ensuring nondiscrimination in the award and administration of contracts financed in whole or in part with Federal funds. This provision is guided by 49 CFR Part 26.

Definitions

Additional DBE Subcontractors - Any DBE submitted at the time of bid that will not be used to meet the DBE goal. No submittal of a Letter of Intent is required.

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

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

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

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

Goal Confirmation Letter - Written documentation from the Department to the Proposer confirming the Design-Build Team's approved, committed DBE participation along with a listing of the committed DBE firms.

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

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) DBE firm.

North Carolina Unified Certification Program (NCUCP) - A program that provides comprehensive services and information to applicants for DBE certification, such that an applicant is required to apply only once for a DBE certification that will be honored by all recipients of USDOT funds in the state and not limited to the Department of Transportation only. The Certification Program is 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.

Forms and Websites Referenced in this Provision

DBE Payment Tracking System - On-line system in which the Design-Build Team enters the payments made to DBE 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 DBE firms working on the project.

https://connect.ncdot.gov/business/Turnpike/Documents/Form%20DBE-IS%20Subcontractor%20Payment%20Information.pdf

RF-1 *DBE Replacement Request Form* - Form for replacing a committed DBE.

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 DBE subcontractor, manufacturer or regular dealer that affirms that a portion of said contract is going to be performed by the signed DBE 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 DBE Subcontractors Form - Form for entering DBE subcontractors on a project that will meet this DBE goal contained elsewhere in this RFP.

http://connect.ncdot.gov/municipalities/Bid%20Proposals%20for%20LGA%20Content/08%20DBE%20Subcontractors%20(Federal).docx

Subcontractor Quote Comparison Sheet - Spreadsheet for showing all subcontractor quotes in the work areas where DBEs 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

DBE Goal

The following DBE goal for participation by Disadvantaged Business Enterprises is established for this contract:

Disadvantaged Business Enterprises **10.0%**

(A) *If the DBE goal is more than zero*, the Design-Build Team shall exercise all necessary and reasonable steps to ensure that DBEs participate in at least the percent of the contract as set forth above as the DBE goal.

(B) *If the DBE goal is zero*, the Design-Build Team shall make an effort to recruit and use DBEs during the performance of the contract. Any DBE participation obtained shall be reported to the Department.

This goal is to be met through utilization of highway construction contractors and / or right of way acquisition firms. Utilization of DBE firms performing design, other preconstruction services, or Construction Engineering and Inspection are not included in this goal.

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 DBE certified shall be used to meet the DBE 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 DBE Subcontractors

At the time of bid, Proposers shall submit <u>all</u> DBE participation that they anticipate to use during the life of the contract. Only those identified to meet the DBE goal will be considered committed, even though the listing shall include both committed DBE subcontractors and additional DBE subcontractors. Additional DBE subcontractor participation submitted at the time of bid will be used toward the Department's overall race-neutral goal. Only those firms with current DBE certification at the time of Price Proposal opening will be acceptable for listing in the Proposer's submittal of DBE participation. The Design-Build Team shall indicate the following required information:

(1) *If the DBE goal is more than zero,*

(a) Proposers, at the time the Price Proposal is submitted, shall submit a listing of DBE participation, including the names and addresses on *Listing of DBE Subcontractors* contained elsewhere in the contract documents in order for the

Price Proposal to be considered responsive. Proposers shall indicate the total dollar value of the DBE participation for the contract.

(b) If Proposers have no DBE participation, they shall indicate this on the *Listing of DBE 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**. Price Proposals submitted that do not have DBE participation indicated on the appropriate form will not be read publicly during the opening of the Price Proposals. The Department will not consider these Price Proposals for award and the proposal will be rejected.

(c) The Proposer shall be responsible for ensuring that the DBE 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 opening of the Price Proposals, that DBE's participation will not count towards achieving the corresponding goal.

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

DBE Prime Contractor

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

For example, if the DBE goal is 45.0% and the DBE proposer will only perform 40.0% of the contract work, the prime will list itself at 40.0%, and the additional 5.0% shall be obtained through additional DBE participation with DBE subcontractors or documented through a good faith effort.

DBE Prime Contractors shall also follow Sections A and B listed under *Listing of DBE Subcontractor* just as a non-DBE proposer would.

Written Documentation - Letter of Intent

The Proposer shall submit written documentation for each DBE that will be used to meet the DBE goal of the contract, indicating the Proposer's commitment to use the DBE 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. on the sixth calendar day following opening of Price Proposals, 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 Proposer fails to submit the Letter of Intent from each committed DBE to be used toward the DBE goal, or if the form is incomplete (i.e. both signatures are not present), the DBE participation will not count toward meeting the DBE goal. If the lack of this participation drops the commitment below the DBE goal, the Design-Build Team shall submit evidence of good faith efforts, 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 the Price Proposals, 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.

Submission of Good Faith Effort

If the Proposer fails to meet or exceed the DBE goal the Proposer with the apparent adjusted low price shall submit to the Department documentation of adequate good faith efforts made to reach the DBE 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 the Price Proposals 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 Design-Build Team cannot send the information electronically, then one complete set and five 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 DBE 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 DBE Goals More Than Zero

Adequate good faith efforts mean that the Proposer took all necessary and reasonable steps to achieve the goal which, by their scope, intensity, and appropriateness, could reasonably be expected to obtain sufficient DBE participation. Adequate good faith efforts also mean that the Proposer actively and aggressively sought DBE 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 Proposer has made. Listed below are examples of the types of actions a proposer will take in making a good faith effort to meet the goal 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 DBEs who have the capability to perform the work of the contract. The Proposer must solicit this interest within at least ten days prior to the opening of the Price Proposals to allow the DBEs to respond to the solicitation. Solicitation shall provide the opportunity to DBEs within the Division and surrounding Divisions where the project is located. The Proposer must determine with certainty if the DBEs are interested by taking appropriate steps to follow up initial solicitations.

(B) Selecting portions of the work to be performed by DBEs in order to increase the likelihood that the DBE goals will be achieved.

(1) Where appropriate, break out contract work items into economically feasible units to facilitate DBE 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 contract DBE goal when the work to be sublet includes potential for DBE participation (2nd and 3rd tier subcontractors).

(C) Providing interested DBEs 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 DBEs. It is the Proposer's responsibility to make a portion of the work available to DBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DBE subcontractors and suppliers, to facilitate DBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of DBEs 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 DBEs to perform the work.

(2) A proposer using good business judgment would consider a number of factors in negotiating with subcontractors, including DBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using DBEs is not in itself sufficient reason for a proposer's failure to meet the contract DBE 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 Proposer of the responsibility to make good faith efforts. Proposing Design-Build Teams are not, however, required to accept higher quotes from DBEs if the price difference is excessive or unreasonable.

(E) Not rejecting DBEs as being unqualified without sound reasons based on a thorough investigation of their capabilities. The Proposer'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 Proposer's efforts to meet the project goal.

(F) Making efforts to assist interested DBEs in obtaining bonding, lines of credit, or insurance as required by the recipient or proposer.

(G) Making efforts to assist interested DBEs 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 DBEs. Contact within seven days from the Price Proposals opening the Business Opportunity and Work Force Development Unit at BOWD@ncdot.gov to give notification of the Proposer's inability to get DBE quotes.

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

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

(1) Whether the Proposer's documentation reflects a clear and realistic plan for achieving the DBE goal.

(2) The Proposer's past performance in meeting the DBE goals.

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

If the Department does not award the contract to the Proposer with the apparent adjusted low price, the Department reserves the right to award the contract to the Proposer with the next apparent adjusted low price that can satisfy the Department that the DBE goal can be met or that an adequate good faith effort has been made to meet the DBE goal.

Non-Good Faith Appeal

The State Prequalification Engineer will notify the Design-Build Team verbally and in writing of non-good faith. A Design-Build Team may appeal a determination of non-good faith made by the Goal Compliance Committee. If a Design-Build Team 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 two business days of notification of the determination of non-good faith.

Counting DBE Participation Toward Meeting DBE Goal

(A) Participation

The total dollar value of the participation by a committed DBE will be counted toward the contract goal requirement. The total dollar value of participation by a committed DBE will be based upon the value of work actually performed by the DBE and the actual payments to DBE firms by the Design-Build Team.

(B) Joint Checks

Prior notification of joint check use shall be required when counting DBE 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 DBE may enter into subcontracts. Work that a DBE subcontracts to another DBE firm may be counted toward the contract goal requirement. Work that a DBE subcontracts to a non-DBE firm does <u>not</u> count toward the contract goal requirement. If a DBE 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 DBE is not performing a commercially useful function. The DBE may present evidence to rebut this presumption to the Department. The Department's decision on the rebuttal of this presumption is subject to review by the Federal Highway Administration but is not administratively appealable to USDOT.

(D) Joint Venture

When a DBE performs as a participant in a joint venture, the Design-Build Team may count toward its contract goal requirement a portion of the total value of participation with the DBE in the joint venture, that portion of the total dollar value being a distinct clearly defined portion of work that the DBE performs with its forces.

(E) Suppliers

A Design-Build Team may count toward its DBE requirement 60.0 percent of its expenditures for materials and supplies required to complete the contract and obtained from a DBE regular dealer and 100.0 percent of such expenditures from a DBE manufacturer.

(F) Manufacturers and Regular Dealers

A Design-Build Team may count toward its DBE requirement the following expenditures to DBE firms that are not manufacturers or regular dealers:

(1) The fees or commissions charged by a DBE 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 DBE, 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) DBE Utilization

The Design-Build Team may count toward its contract goal requirement only expenditures to DBEs that perform a commercially useful function in the work of a contract. A DBE 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 DBE 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 DBE 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 DBE credit claimed for its performance of the work, and any other relevant factors.

(B) DBE Utilization in Trucking

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

(1) The DBE 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 DBE goals.

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

(3) The DBE 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 DBE may subcontract the work to another DBE firm, including an owner-operator who is certified as a DBE. The DBE who subcontracts work to another DBE receives credit for the total value of the transportation services the subcontracted DBE provides on the contract.

(5) The DBE may also subcontract the work to a non-DBE firm, including from an owner-operator. The DBE who subcontracts the work to a non-DBE is entitled to credit for the total value of transportation services provided by the non-DBE subcontractor not to exceed the value of transportation services provided by DBE-owned trucks on the contract. Additional participation by non-DBE 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 DBE and the Design-Build Team will not count towards the DBE contract requirement.

(6) A DBE may lease truck(s) from an established equipment leasing business open to the general public. The lease must indicate that the DBE 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 DBE, so long as the lease gives the DBE absolute priority for use of the leased truck. This type of lease may count toward the DBE's credit as long as the driver is under the DBE's payroll.

(7) Subcontracted / leased trucks shall clearly display on the dashboard the name of the DBE 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.

DBE Replacement

When a Design-Build Team has relied on a commitment to a DBE subcontractor (or an approved substitute DBE subcontractor) to meet all or part of a contract goal requirement, the Design-

Build Team shall not terminate the DBE for convenience. This includes, but is not limited to, instances in which the Design-Build Team seeks to perform the work of the terminated subcontractor with another DBE subcontractor, a non-DBE subcontractor, or with the Contractor's own forces or those of an affiliate.

The Design-Build Team must give notice in writing both by certified mail and e-mail to the DBE subcontractor, with a copy to the Engineer of its intent to request to terminate and / or substitute, and the reason for the request. The Design-Build Team must give the DBE subcontractor five (5) business days to respond to the Design-Build Team's notice of intent to request termination and / or substitution. If the DBE subcontractor objects to the intended termination / substitution, the DBE, within five (5) business days, must advise the Design-Build Team 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 DBE subcontractor.

A committed DBE 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 DBE subcontractor fails or refuses to execute a written contract.

(b) The listed DBE 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 DBE subcontractor to perform its work on the subcontract results from the bad faith or discriminatory action of the Prime Contractor.

(c) The listed DBE subcontractor fails or refuses to meet the Prime Contractor's reasonable, nondiscriminatory bond requirements.

(d) The listed DBE subcontractor becomes bankrupt, insolvent, or exhibits credit unworthiness.

(e) The listed DBE 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 DBE subcontractor is not a responsible contractor.

(g) The listed DBE voluntarily withdraws from the project and provides written notice of withdrawal.

(h) The listed DBE is ineligible to receive DBE credit for the type of work required.

(i) A DBE owner dies or becomes disabled with the result that the listed DBE contractor is unable to complete its work on the contract.

(j) Other documented good cause that compels the termination of the DBE subcontractor. Provided, that good cause does not exist if the Prime Contractor seeks to terminate a DBE

it relied upon to obtain the contract so that the Prime Contractor can self-perform the work for which the DBE contractor was engaged or so that the Prime Contractor can substitute another DBE or non-DBE contractor after contract award.

The Design-Build Team shall comply with the following for replacement of a committed DBE:

(A) Performance Related Replacement

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

If a replacement DBE is not found that can perform at least the same amount of work as the terminated DBE, the Design-Build Team 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 DBEs that their interest is solicited in contracting the work defaulted by the previous DBE or in subcontracting other items of work in the contract.

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

(a) The names, addresses, and telephone numbers of DBEs who were contacted.
(b) A description of the information provided to DBEs regarding the plans and specifications for portions of the work to be performed.

(3) A list of reasons why DBE quotes were not accepted.

(4) Efforts made to assist the DBEs contacted, if needed, in obtaining bonding or insurance required by the Design-Build Team.

(B) Decertification Replacement

(1) When a committed DBE is decertified by the Department after the SAF (*Subcontract Approval Form*) has been received by the Department, the Department will not require the Design-Build Team to solicit replacement DBE 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 DBE is decertified prior to the Department receiving the SAF (*Subcontract Approval Form*) for the named DBE firm, the Design-Build Team shall take all necessary and reasonable steps to replace the DBE subcontractor with another DBE subcontractor to perform at least the same

amount of work to meet the DBE goal requirement. If a DBE firm is not found to do the same amount of work, a good faith effort must be submitted to NCDOT (See A herein for required documentation).

All requests for replacement of a committed DBE firm shall be submitted to the Engineer for approval on Form RF-1 (DBE Replacement Request). If the Prime Contractor or any affiliated companies within the Design-Build Team fails to follow this procedure they may be disqualified from further bidding for a period of up to six 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 DBE, the Design-Build Team will not be required to seek additional participation. When the Engineer makes changes that result in additional work to be performed by a DBE based upon the Design-Build Team's commitment, the DBE shall participate in additional work to the same extent as the DBE 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 Design-Build Team shall seek additional participation by DBEs 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 DBE, the Design-Build Team shall seek participation by DBEs unless otherwise approved by the Engineer.

When the Design-Build Team requests changes in the work that result in the reduction or elimination of work that the Design-Build Team committed to be performed by a DBE, the Design-Build Team shall seek additional participation by DBEs equal to the reduced DBE 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 DBE subcontractor. The Department reserves the right to require copies of actual subcontract agreements involving DBE subcontractors.

When using transportation services to meet the contract commitment, the Design-Build Team 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 DBE for materials, supplies or services, not otherwise documented by the SAF as specified above, the Design-Build Team shall furnish the Engineer a copy of the agreement. The documentation shall also indicate the percentage (60.0% or 100.0%) of expenditures claimed for DBE credit.

Reporting Disadvantaged Business Enterprise Participation

The Design-Build Team shall provide the Engineer with an accounting of payments made to all DBE 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 Prime Contractor or other affiliated companies within the Design-Build Team 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 DBEs, 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 Design-Build Team to submit the required information in the time frame specified may result in the disqualification of that Prime Contractor and any affiliate companies within the Design-Build Team 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 Prime Contractor or any affiliate companies within the Design-Build Team from being approved for work on future NCDOT projects until the required information is submitted.

Design-Build Teams reporting transportation services provided by non-DBE 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 Design-Build Team shall report the accounting of payments through the Department's DBE 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 for Roads and Structures* may be cause to disqualify the Prime Contractor or any affiliated companies within the Design-Build Team from further bidding for a specified length of time.

PROTECTION OF RAILROAD INTEREST

(2-19-13) (Rev. 3-16-21) DB1 G73

Under the terms of this Project Special Provision, the North Carolina Department of Transportation shall hereinafter be called "Department", the Norfolk Southern Railway Company shall hereinafter be called "Railroad".

AUTHORITY OF RAILROAD ENGINEER AND DEPARTMENT ENGINEER

The Railroad and their authorized representative shall have final authority in all matters affecting the safe maintenance of railroad traffic including the adequacy of the foundations and structures supporting the railroad tracks. For Projects impacting the Railroad, the Railroad's Engineer, hereinafter referred to as "Railroad Engineer", shall serve as the authorized representative of the Railroad.

The Railroad and their authorized representative shall have final authority in all matters for Projects impacting the Railroad's property, which lie entirely beyond 25 feet from the tracks and do not impact the railroad tracks. The Railroad's Engineer, hereinafter referred to as "Railroad Engineer", shall serve as the authorized representative of the Railroad.

The authorized representative of the North Carolina Department of Transportation hereinafter referred to as the "Department Engineer", shall have authority over all other matters as prescribed herein and in the Project Specifications, Special Provisions, and the plans developed by the Design-Build Team.

The Department's Design-Build Team, hereinafter referred to as "Design-Build Team" shall be responsible for completing any and all work in accordance with the terms prescribed herein and in the Project Specifications.

NOTICE OF STARTING WORK

The Design-Build Team shall not commence any work on the Railroad's corridor until they have complied with the following conditions:

- Signed and received a fully executed copy of the required Norfolk Southern Railway Company Right of Entry Agreement.
- Given the Railroad written notice, in electronic format, with copy to the Department Engineer who is designated to be in charge of the work, at least ten (10) days in advance of the date they propose to begin work on Railroad right of way to:

  Mr. Scott Overbey
  Public Projects Engineer
  scott.overbey@nscorp.com

- Obtained written approval from the Railroad of Railroad Protective Liability Insurance coverage as required by the Insurance Section of this Project Special Provision. It should be noted that the Railroad does not accept notation of Railroad Protective insurance on a certificate of liability insurance form or

Binders as Railroad must have the full original countersigned policy. Further, please note that mere receipt of the policy is not the only issue but review for compliance. Due to the number of projects system-wide, it typically takes a minimum of 30 - 45 days for the Railroad to review.

- Obtained Railroad's Flagging Services as required by Section 7 herein.
- Obtained written authorization from the Railroad to begin work on Railroad's corridor, such authorization to include an outline of specific conditions with which the Design-Build Team must comply. Design-Build Team shall be responsible for completing the "Norfolk Southern Checklist for Construction"
- Furnished a schedule for all work within the Railroad's corridor as required by Scheduling and Notification Section of this Project Special Provision.

The Railroad's written authorization to proceed with the work shall include the names, addresses, and telephone numbers of the Railroad's representatives who are to be notified as hereinafter required. Where more than one representative is designated, the area of responsibility of each representative will be specified.

INTERFERENCE WITH RAILROAD OPERATIONS

- The Design-Build Team shall so arrange and conduct their work that there will be no interference with Railroad's operations, including train, signal, telephone and telegraphic services, or damage to the property of the Railroad or to poles, wires, and other facilities of tenants on the Railroad's corridor. Whenever work is liable to affect the operations or safety of trains, the method of doing such work shall first be submitted to the Railroad Engineer for approval, but such approval shall not relieve the Design-Build Team from liability. Any work to be performed by the Design-Build Team which requires flagging service or inspection service shall be deferred by the Design-Build Team until the flagging service or inspection service required by the Railroad is available at the job site.
- Whenever work within the Railroad's corridor is of such a nature that impediment to Railroad's operations such as use of runaround tracks or necessity for reduced speed is unavoidable, the Design-Build Team shall schedule and conduct their operations so that such impediment is reduced to the absolute minimum.
- Should conditions arising from, or in connection with the work, require that immediate and unusual provisions be made to protect operations and property of the Railroad, the Design-Build Team shall make such provisions. If in the sole judgment of the Railroad Engineer, or in his absence, the Railroad's Division Engineer, such provisions are insufficient, either may require or provide such provisions as he deems necessary. In any event, such unusual provisions shall be at the Design-Build Team's expense and without cost to the Railroad or the Department.
- "One Call" Services do not locate buried Railroad utilities. The Design-Build Team shall contact the Railroad's representative two days in advance of work at those places where excavation, pile driving, or heavy loads may damage the Railroad's underground facilities. Upon request from the Design-Build Team or Department, Railroad forces will locate and paint mark or flag the Railroad's

underground facilities. The Design-Build Team shall avoid excavation or other disturbances of these facilities. If disturbance or excavation is required near a buried Railroad facility, the Design-Build Team shall coordinate with the Railroad to have the facility potholed manually with careful hand excavation. The facility shall be protected by the Design-Build Team during the course of the disturbance under the supervision and direction of the Railroad's representative.

TRACK CLEARANCES

- The minimum track clearances to be maintained by the Design-Build Team during construction are shown on the plans developed by the Design-Build Team. If temporary clearances are not shown on the plans developed by the Design-Build Team, the following criteria shall govern the use of falsework and formwork above or adjacent to operated tracks.
    - A minimum vertical clearance of 22 feet above top of highest rail shall be maintained at all times.
    - A minimum horizontal clearance of 13 feet from centerline of tangent track or 14 feet from centerline of curved track shall be maintained at all times. Additional horizontal clearance may be required in special cases to be safe for operating conditions. This additional clearance shall be as determined by the Railroad Engineer.
    - All proposed temporary clearances which are less than those listed above must be submitted to Railroad Engineer for approval prior to construction and must also be authorized by the regulatory body of the State if less than the legally prescribed clearances.
    - The temporary clearance requirements noted above shall also apply to all other physical obstructions including, but not limited to: 1) stockpiled materials, 2) parked equipment, 3) placement or driving of piles, and 4) bracing or other construction supports.
- Before undertaking any work within the Railroad's corridor, and before placing any obstruction over any track, the Design-Build Team shall:
    - Notify the Railroad's representative at least 72 hours in advance of the work.
    - Receive assurance from the Railroad's representative that arrangements have been made for flagging service as may be necessary.
    - Receive permission from the Railroad's representative to proceed with the work.
    - Ascertain that the Railroad Engineer and the Department's Engineer have received copies of notice to the Railroad and of the Railroad's response thereto.

CONSTRUCTION PROCEDURES

General

- Construction work and operations by the Design-Build Team on the Railroad's corridor and property shall be:
  - Subject to the inspection and approval of the Railroad Engineer or their designated Construction Engineering Representative.
  - In accordance with the Railroad's written outline of specific conditions.
  - In accordance with the Railroad's general rules, regulations and requirements including those relating to safety, fall protection and personal protective equipment.
  - In accordance with this Project Special Provisions.
- Submittal Requirements
  - The Design-Build Team shall submit all construction related correspondence and submittals electronically to the Railroad.
  - The Design-Build Team shall allow a minimum of 30 days for the Railroad's, if required, review and response.
  - All work in the vicinity of the Railroad's corridor and property that has the potential to affect the Railroad's train operations or disturb the Railroad's Property must be submitted and approved by the Railroad, if required, prior to work being performed.
  - All submittals and calculations must be signed and sealed by a registered engineer licensed in the State of North Carolina.
  - All submittals shall first be approved by the Department's Engineer and the Railroad Engineer, but such approval shall not relieve the Design-Build Team from liability.
  - For all construction projects, the following submittals, but not limited to those listed below, shall be provided for review and approval when applicable:
    (1) General Means and Methods
    (2) Ballast Protection
    (3) Construction Excavation & Shoring
    (4) Pipe, Culvert, & Tunnel Installations
    (5) Demolition Procedure
    (6) Erection & Hoisting Procedure
    (7) Debris Shielding or Containment
    (8) Blasting
    (9) Formwork for the bridge deck, diaphragms, overhang brackets, and protective platforms

(10) Bent Cap Falsework. A lift plan will be required if the Design-Build Team want to move the falsework over the tracks.

- For Undergrade Bridges (Bridges carrying the Railroad) the following submittals in addition to those listed above shall be provided for review and approval:

  (1) Shop Drawings

  (2) Bearing Shop Drawings and Material Certifications

  (3) Concrete Mix Design

  (4) Structural Steel, Rebar, and / or Strand Certifications

  (5) 28-day Cylinder Test for Concrete Strength

  (6) Waterproofing Material Certification

  (7) Test Reports for Fracture Critical Members

  (8) Foundation Construction Reports

  Fabrication may not begin until the Railroad has approved the required shop drawings.

- The Design-Build Team shall include in all submissions a detailed narrative indicating the progression of work with the anticipated timeframe to complete each task. Work will not be permitted to commence until the Design-Build Team has provided the Railroad with a satisfactory plan that the project will be undertaken without scheduling, performance or safety related issues. Submission shall also provide a listing of the anticipated equipment to be used, the location of all equipment to be used and insure a contingency plan of action is in place should a primary piece of equipment malfunction.

Ballast Protection

- The Design-Build Team shall submit the proposed ballast protection system detailing the specific filter fabric and anchorage system to be used during all construction activities.
- The ballast protection shall extend 25’ beyond the proposed limit of work, be installed at the start of the project and be continuously maintained to prevent all contaminants from entering the ballast section of all tracks for the entire duration of the project.

Excavation

- The subgrade of an operated track shall be maintained with edge of berm at least 10’-0” from centerline of track and not more than 24 inches below top of rail. Design-Build Team will not be required to make existing section meet this specification if substandard, in which case existing section shall be maintained.
- Additionally, the Railroad shall require the installation of an OSHA approved handrail and orange construction safety fencing for all excavations of the corridor.

Excavation for Structures and Shoring Protection

- The Design-Build Team shall take special precaution and care in connection with excavating and shoring pits, and in driving piles or sheeting for footings adjacent to tracks to provide adequate lateral support for the tracks and the loads which they carry, without disturbance of track alignment and surface, and to avoid obstructing track clearances with working equipment, tools or other material. The Design-Build Team shall follow the following guidelines for shoring design if a Railroad approved shoring system is not included in the plans developed by the Design-Build Team or an alternate system is proposed.
- All plans and calculations for shoring shall be prepared, signed, and sealed by a Registered Professional Engineer licensed in the State of North Carolina, in accordance with Norfolk Southern's Overhead Grade Separation Design Criteria, subsection H.1.6.E-Construction Excavation (Refer to Norfolk Southern Public Projects Manual Appendix H). The Registered Professional Engineer shall be responsible for the accuracy of all controlling dimensions as well as the selection of soil design values which shall accurately reflect the actual field conditions.
- The Design-Build Team shall provide a detailed installation and removal plan of the shoring components. Any component that will be installed via the use of a crane or any other lifting device shall be subject to the guidelines outlined in Demolition Section of this Project Special Provision.
- The Design-Build Team shall survey the track(s) and railroad embankment and provide a cross section of the proposed excavation in relation to the tracks.
- Calculations for the proposed shoring shall include deflection calculations. The maximum deflection for excavations within 18 feet of the centerline of the nearest track shall be 3/8". For all other cases, the max deflection shall not exceed ½".
- Additionally, the Railroad shall require the installation of an OSHA approved handrail and orange construction safety fencing for all excavations of the Railroad's corridor.
- The front face of shoring located to the closest NS track for all shoring set-ups located in Zone 2 as shown on NS Typical Drawing No. 4 - Shoring Requirements (Refer to Norfolk Southern Public Projects Manual Appendix I) shall remain in place and be cut off two feet below the final ground elevation. The remaining shoring in Zone 2 and all shoring in Zone 1 may be removed and all voids must be backfilled with flowable fill.

Pipe, Culvert, & Tunnel Installations

- Pipe, Culvert, & Tunnel Installations shall be in accordance with the appropriate Norfolk Southern Design Specification as noted below:
    - For Open Cut Method refer to Norfolk Southern Public Projects Manual Appendix H.4.6.
    - For Jack and Bore Method refer to Norfolk Southern Public Projects Manual Appendix H.4.7.

- For Tunneling Method refer to Norfolk Southern Public Projects Manual Appendix H.4.8.

Demolition Procedures

General

- Demolition plans shall be required for all spans over the track(s), for all spans adjacent to the track(s), if located on (or partially on) the Railroad's corridor; and in all situations where cranes will be situated on, over, or adjacent to the Railroad's corridor and within a distance of the boom length plus 15 feet from the centerline of track.
- Railroad tracks and other Railroad property must be protected from damage during the procedure.
- A pre-demolition meeting shall be conducted with the Department, the Railroad Engineer or their representative, and the key Design-Build Team's personnel prior to the start of the demolition procedure.
- The Railroad Engineer or his designated representative must be present at the site during the entire demolition procedure period.
- Existing, obsolete, bridge piers shall be removed to a sufficient depth below grade to enable restoration of the existing / proposed track ditch, but in no case less than two feet below final grade.

Submittal Requirements

- In addition to the submittal requirements outlined in the Construction Procedures Submittal Requirements Section of this Project Special Provision, the Design-Build Team shall submit the following for approval by the Railroad Engineer:
  - A plan showing the location of cranes, horizontally and vertically, operating radii, with delivery or disposal locations shown. The location of all tracks and other Railroad facilities as well as all obstructions such as wire lines, poles, adjacent structures, etc. must also be shown.
  - Rating sheets showing cranes or lifting devices to be adequate for 150% of the actual weight of the pick, including all rigging components. A complete set of crane charts, including crane, counterweight, and boom nomenclature is to be submitted. Safety factors that may have been "built-in" to the crane charts shall not be considered when determining the 150% factor of safety.
  - Plans and computations showing the weight of the pick must be submitted. Calculations shall be made from plans of the existing structure showing complete and sufficient details with supporting data for the demolition the structure. If plans do not exist, lifting weights must be calculated from field measurements. The field measurements shall be made under the supervision of the Registered Professional Engineer submitting the procedure and calculations.

- The Design-Build Team shall provide a sketch of all rigging components from the crane's hook block to the beam. Catalog cuts or information sheets of all rigging components with their lifting capacities shall be provided. All rigging shall be adequate for 150% of the actual weight of the pick. Safety factors that may have been "built-in" to the rating charts shall not be considered when determining the 150% factor of safety. All rigging components shall be clearly identified and tagged with their rated lifting capacities. The position of the rigging in the field shall not differ from what is shown on the final plans developed by the Design-Build Team without prior review from the Department and the Railroad.
- A complete demolition procedure, including the order of lifts, time required for each lift, and any repositioning or re-hitching of the crane or cranes.
- Design and supporting calculations for the temporary support of components, including but not limited to the stability of the superstructure during the temporary condition, temporary girder tie-downs and falsework.

Overhead Demolition Debris Shield

- The demolition debris shield shall be installed prior to the demolition of the bridge deck or other relevant portions of the superstructure over the track area to catch all falling debris.
- The demolition debris shield shall provide a minimum vertical clearance as specified in the Track Clearances Section of this Project Special Provision or maintain the existing vertical clearance if the existing clearance is less than that specified in the Track Clearances Section of this Project Special Provision.
- The Design-Build Team shall include the demolition debris shield installation / removal means and methods as part of the proposed Demolition procedure submission.
- The Design-Build Team shall submit the demolition debris shield design and supporting calculations for approval by the Railroad Engineer.
- The demolition debris shield shall have a minimum design load of 50 pounds per square foot plus the weight of the equipment, debris, personnel, and other loads to be carried.
- The Design-Build Team shall include the proposed bridge deck removal procedure in its demolition means and methods and shall verify that the size and quantity of the demolition debris generated by the procedure does not exceed the shield design loads.
- The Design-Build Team shall clean the demolition debris shield daily or more frequently as dictated either by the approved design parameters or as directed by the Railroad Engineer.

Vertical Demolition Debris Shield

A vertical demolition debris shield may be required for substructure removals in close proximity to the Railroad's track and other facilities, as determined by the Railroad Engineer.

Erection & Hoisting Procedures

General

- Erection plans shall be required for all spans over the track(s), for all spans adjacent to the track(s), if located on (or partially on) the Railroad's corridor; and in all situations where cranes will be situated on, over, or adjacent to the Railroad's corridor and within a distance of the boom length plus 15 feet from the centerline of track.
- Railroad tracks and other Railroad property must be protected from damage during the erection procedure.
- A pre-erection meeting shall be conducted with the Department, the Railroad Engineer or their representative, and the key Design-Build Team's personnel prior to the start of the erection procedure.
- The Railroad Engineer or his designated representative must be present at the site during the entire erection procedure period.
- For field splices located over Railroad property, a minimum of 50% of the holes for each connection shall be filled with bolts or pins prior to releasing the crane. A minimum of 50% of the holes filled shall be filled with bolts. All bolts must be appropriately tightened. Any changes to previously approved field splice locations must be submitted to the Railroad for review and approval. Refer to Norfolk Southern's Overhead Grade Separation Design Criteria for additional splice details (Norfolk Southern Public Projects Manual Appendix H.1, Section 4.A.3.).

Submittal Requirements

- In addition, the submittal requirements outlined in Construction Procedures Section of this Project Special Provision, the Design-Build Team shall submit the following for approval by the Railroad Engineer:
    - As-built beam seat elevations - All as-built bridge seats and top of rail elevations shall be furnished to the Railroad Engineer for review and verification at least 30 days in advance of the erection, to ensure that minimum vertical clearances as approved in the plans developed by the Design-Build Team will be achieved.
    - A plan showing the location of cranes, horizontally and vertically, operating radii, with delivery or staging locations shown. The location of all tracks and other Railroad facilities as well as all obstructions such as wire lines, poles, adjacent structures, etc. must also be shown.
    - Rating sheets showing cranes or lifting devices to be adequate for 150% of the actual weight of the pick, including all rigging components. A complete set of crane charts, including crane, counterweight, and boom nomenclature shall be submitted. Safety factors that may have been "built-

in" to the crane charts shall not be considered when determining the 150% factor of safety.

- Plans and computations showing the weight of the pick must be submitted. Calculations shall be made from plans developed by the Design-Build Team of the proposed structure showing complete and sufficient details with supporting data for the erection of the structure. If plans do not exist, lifting weights must be calculated from field measurements. The field measurements shall be made under the supervision of a North Carolina Registered Professional Engineer submitting the procedure and calculations.
- The Design-Build Team shall provide a sketch of all rigging components from the crane's hook block to the beam. Catalog cuts or information sheets of all rigging components with their lifting capacities shall be provided. All rigging must be adequate for 150% of the actual weight of the pick. Safety factors that may have been "built-in" to the rating charts shall not be considered when determining the 150% factor of safety. All rigging components shall be clearly identified and tagged with their rated lifting capacities. The position of the rigging in the field shall not differ from what is shown on the final plans developed by the Design-Build Team without prior review from the Department and the Railroad.
- A complete erection procedure, including the order of lifts, time required for each lift, and any repositioning or re-hitching of the crane or cranes.
- Design and supporting calculations for the temporary support of components, including but not limited to temporary girder tie-downs and falsework.

Blasting

- The Design-Build Team shall obtain advance approval of the Railroad Engineer and the Department Engineer for use of explosives on or adjacent to Railroad property. The request for permission to use explosives shall include a detailed blasting plan. If permission for use of explosives is granted, the Design-Build Team shall be required to comply with the following:
  - Blasting shall be done with light charges under the direct supervision of a responsible officer or employee of the Design-Build Team and a licensed blaster.
  - Electric detonating fuses shall not be used because of the possibility of premature explosions resulting from operation of two-way radios.
  - No blasting shall be done without the presence of the Railroad Engineer or his authorized representative. At least 72 hours advance notice to the person designated in the Railroad's notice of authorization to proceed (see Notice of Starting Work Section of this Project Special Provision) shall be required to arrange for the presence of an authorized Railroad representative and such flagging as the Railroad may require.

- Have at the job site adequate equipment, labor and materials and allow sufficient time to clean up debris resulting from the blasting without delay to trains, as well as correcting, at their expense, any track misalignment or other damage to Railroad property resulting from the blasting as directed by the Railway's authorized representative. If their actions result in delay of trains, the Design-Build Team shall bear the entire cost thereof.
- The licensed blaster shall have a copy of the approved blasting plan on hand while on the site.
- Explosive materials or loaded holes shall not be left unattended at the blast site.
- A seismograph shall be placed on the track shoulder adjacent to each blast which will govern the peak particle velocity of two inches per second. Measurement shall also be taken on the ground adjacent to structures as designated by a qualified and independent blasting consultant. The Railroad reserves the option to direct the placement of additional seismographs at structures or other locations of concern, without regard to scaled distance.
- After each blast, the licensed blasting shall provide a copy of their drill log and blast report, which includes number of holes, depth of holes, and number of decks, type and pounds of explosives used per deck.
- The Railroad may require top of rail elevations and track centers taken before, during and after the blasting and excavation operation to check for any track misalignment resulting from the Design-Build Team's activities.

- The Railroad representative will:
  - Determine approximate location of trains and advise the Design-Build Team the appropriate amount of time available for the blasting operation and clean up.
  - Have the authority to order discontinuance of blasting if, in his opinion, blasting is too hazardous or is not in accord with this Project Special Provision.
- The Design-Build Team must hire, at no expense to the Railroad, a qualified and independent blasting consultant to oversee the use of explosives. The blasting consultant will:
  - Review the Design-Build Team's proposed drilling and loading patterns, and with the blasting consultant's personnel and instruments, monitor the blasting operations.
  - Confirm that the minimum amounts of explosives are used to remove the rock.
  - Be empowered to intercede if he concludes that the Design-Build Team's blasting operations are endangering the Railroad.
  - Submit a letter acknowledging that he has been engaged to oversee the entire blasting operation and that he approves of the blasting plan.

- Furnish copies of all vibration readings to the Railroad representative immediately after each blast. The representative will sign and date the seismograph tapes after each shot to verify the readings are for that specific shot.
- Advise the Railroad representative as to the safety of the operation and notify him of any modifications to the blasting operation as the work progresses.

- The request for permission to use explosives on the Railroad's corridor shall include a blasting proposal providing the following details:
  - A drawing which shows the proposed blasting area, location of nearest hole and distance to Railway structures, all with reference to the centerline of track.
  - Hole diameter
  - Hole spacing and pattern
  - Maximum depth of hole
  - Maximum number of decks per hole
  - Maximum pounds of explosives per hole
  - Maximum pounds of explosives per delay
  - Maximum number of holes per detonation
  - Type of detonator and explosives to be used. (Electronic detonating devices will not be permitted). Diameter of explosives if different from hole diameter.
  - Approximate dates and time of day when the explosives are to be detonated.
  - Type of flyrock protection
  - Type and patterns of audible warning and all clear signals to be used before and after each blast.
  - A copy of the blasting license and qualifications of the person directly in charge of the blasting operation, including their name, address and telephone number.
  - A copy of the Department's permit granting permission to blast on the site.
  - A letter from the blasting consultant acknowledging that he has been engaged to oversee the entire blasting operation and that he approves of the blasting plan.
  - In addition to the insurance requirements outlined in Insurance Section of this Project Special Provision, A certificate of insurance from the Design-Build Team's insurer stating the amount of coverage for XCU (Explosive Collapse and Underground Hazard) insurance and that XCU Insurance is in force for this project.

- A copy of the borings and Geotechnical information or report.

Track Monitoring

- At the direction of the Railroad Engineer, any activity that has the potential to disturb the Railroad track structure shall require the Design-Build Team to submit a detailed track monitoring program for approval by the Railroad Engineer.
- The program shall specify the survey locations, the distance between the location points, and frequency of monitoring before, during, and after construction. Railroad reserves the right to modify the survey locations and monitoring frequency as necessary during the project.
- The survey data shall be collected in accordance with the approved frequency and immediately furnished to the Railroad Engineer for analysis.
- If any movement has occurred as determined by the Railroad Engineer, the Railroad will be immediately notified. Railroad, at its sole discretion, shall have the right to immediately require all Design-Build Team operations to be ceased and determine what corrective action shall be required. Any corrective action required by the Railroad or performed by the Railroad including the monitoring of corrective action of the Design-Build Team shall be at no additional expense to the Department or Railroad.

Maintenance of Railroad Facilities

- The Design-Build Team shall maintain all ditches and drainage structures free of silt or other obstructions which may result from its operations and provide and maintain any erosion control measures as required. The Design-Build Team shall promptly repair eroded areas within the Railroad's corridor and repair any other damage to the property of the Railroad, or its tenants.
- If, in the course of construction, it may be necessary to block a ditch, pipe or other drainage facility, temporary pipes, ditches or other drainage facilities shall be installed to maintain adequate drainage, as approved by the Railroad Engineer. Upon completion of the work, the temporary facilities shall be removed and the permanent facilities restored.
- All such maintenance and repair of damages due to the Design-Build Team's operations shall be done at the Design-Build Team's expense.

Storage of Materials and Equipment

- Materials and equipment shall not be stored where they will interfere with Railroad operations, nor on the Railroad's corridor or property without first having obtained permission from the Railroad Engineer, and such permission will be with the understanding that the Railroad will not be liable for damage to such material and equipment from any cause and that the Railroad Engineer may move or require the Design-Build Team to move, at the Design-Build Team's expense, such material and equipment.
- All grading or construction machinery that is left parked near the track unattended by a watchman shall be effectively immobilized so that it cannot be moved by

unauthorized persons. The Design-Build Team shall protect, defend, indemnify and save Railroad, and any associated, controlled or affiliated corporation, harmless from and against all losses, costs, expenses, claim or liability for loss or damage to property or the loss of life or personal injury, arising out of or incident to the Design-Build Team's failure to immobilize grading or construction machinery.

Cleanup

- Upon completion of the work, the Design-Build Team shall remove from within the limits of the Railroad's corridor and property, all machinery, equipment, surplus materials, falsework, rubbish or temporary buildings of the Design-Build Team and leave said corridor and property in a neat condition satisfactory to the Railroad Engineer or their authorized representatives.

DAMAGES

- The Design-Build Team shall assume all liability for any and all damages to their work, employees, servants, equipment and materials caused by Railroad traffic.
- Any cost incurred by the Railroad for repairing damages to its property or to property of its tenants, caused by or resulting from the operations of the Design-Build Team, shall be paid directly to the Railroad by the Design-Build Team.

FLAGGING SERVICES

Requirements

- Flagging services will not be provided until the Design-Build Team's insurance has been reviewed & approved by the Railroad.
- Under the terms of the agreement between the Department and the Railroad, the Railroad has sole authority to determine the need for flagging required to protect its operations. In general, the requirements of such services shall be whenever the Design-Build Team's personnel or equipment are or are likely to be, working on the Railroad's corridor, or across, over, adjacent to, or under a track, or when such work has disturbed or is likely to disturb a Railroad structure or the Railroad roadbed or surface and alignment of any track to such extent that the movement of trains must be controlled by flagging.
- Normally, the Railroad will assign one flagman to a project; but in some cases, more than one may be necessary, such as yard limits where three (3) flagmen may be required. However, if the Design-Build Team works within distances that violate instructions given by the Railroad's authorized representative or performs work that has not been scheduled with the Railroad's authorized representative, a flagman or flagmen may be required full time until the project has been completed. Should such violations or unscheduled, unauthorized work by the Design-Build Team result in full time flagging being required by the Railroad, the additional cost of such flagging above normal flagging cost shall be deducted from the final payment by the Department to the Design-Build Team as provided in Article 109-9 of the 2018 *Standard Specifications for Roads and Structures*.

Neither Department nor Railroad will be liable for damages resulting from unscheduled or unauthorized work.

- For Projects exceeding 30 days of construction, the Design-Build Team shall provide the flagmen a small work area with a desk / counter and chair within the field / site trailer, including the use of bathroom facilities, where the flagman can check in / out with the Project, as well as to the flagman's home terminal. The work area shall provide access to two (2) electrical outlets for recharging radio(s), and a laptop computer; and have the ability to print off needed documentation and orders as needed at the field / site trailer. This should aid in maximizing the flagman's time and efficiency on the Project.

Scheduling and Notification

- The Design-Build Team's work requiring Railroad flagging shall be scheduled to limit the presence of a flagman at the site to a maximum of 50 hours per week. The Design-Build Team shall receive Railroad approval of work schedules requiring a flagman's presence in excess of 40 hours per week.
- Not later than the time that approval is initially requested to begin work on Railroad's corridor, Design-Build Team shall furnish to the Railroad and the Department a schedule for all work required to complete the portion of the project within the Railroad's corridor and arrange for a job site meeting between the Design-Build Team, the Department, and the Railroad's authorized representative. Flagman or Flagmen shall not be provided until the job site meeting has been conducted and the Design-Build Team's work scheduled.
- The Design-Build Team shall give the Railroad representative at least ten working days of advance written notice of intent to begin work within the Railroad's corridor in accordance with this special provision. Once begun, when such work is then suspended at any time, or for any reason, the Design-Build Team shall give the Railroad representative at least three working days of advance notice before resuming work on Railroad corridor. Such notices shall include sufficient details of the proposed work to enable the Railroad representative to determine if flagging will be required. If such notice is in writing, the Design-Build Team shall furnish the Engineer a copy; if notice is given verbally, it shall be confirmed in writing with copy to the Engineer. If flagging is required, no work shall be undertaken until the flagman, or flagmen are present at the job site. It may take up to 30 days to obtain flagging initially from the Railroad. When flagging begins, the flagman is usually assigned by the Railroad to work at the project site on a continual basis until no longer needed and cannot be called for on a spot basis. If flagging becomes unnecessary and is suspended, it may take up to 30 days to again obtain from the Railroad. Due to Railroad labor agreements, it is necessary to give five working days notice before flagging service may be discontinued and responsibility for payment stopped.
- If, after the flagman is assigned to the project site, an emergency arises that requires the flagman's presence elsewhere, then the Design-Build Team shall delay work on Railroad corridor until such time as the flagman is again available. Any additional costs resulting from such delay shall be borne by the Design-Build Team and not the Department or the Railroad.

Payment

- The Department will be responsible for paying the Railroad directly for any and all costs of flagging which may be required to accomplish the construction. The Design-Build Team shall reimburse the Railroad for any costs of the flagging which is required for the benefit of the Design-Build Team.
- The estimated cost of flagging is the current rate per day based on a ten-hour workday. This cost includes the base pay for the flagman, overhead, and includes a per diem charge for travel expenses, meals and lodging. The charge to the Department by the Railroad will be the actual cost based on the rate of pay for the Railroad's employees who are available for flagging service at the time the service is required.
- Work by a flagman in excess of eight hours per day or 40 hours per week, but not more than 12 hours a day will result in overtime pay at 1 and 1/2 times the appropriate rate. Work by a flagman in excess of 12 hours per day will result in overtime at two times the appropriate rate. If work is performed on a holiday, the flagging rate is 2 and 1/2 times the normal rate.
- Railroad work involved in preparing and handling bills will also be charged to the Department. Charges to the Department by the Railroad shall be in accordance with applicable provisions of Subchapter B, Part 140, Subpart I and Subchapter G, Part 646, Subpart B of the Federal-Aid Policy Guide issued by the Federal Highway Administration on December 9, 1991, including all current amendments. Flagging costs are subject to change. The above estimates of flagging costs are provided for information only and shall not be binding in any way.

Verification

- Railroad's flagman will electronically enter flagging time via Railroad's electronic billing system. Any complaints concerning flagging must be resolved in a timely manner. If the need for flagging is questioned, please contact the Railroad Engineer. All verbal complaints shall be confirmed in writing by the Design-Build Team within five working days with a copy to the Department Engineer. Address all written correspondence electronically to Railroad Engineer.

- The Railroad flagman assigned to the project will be responsible for notifying the Department Engineer upon arrival at the job site on the first day (or as soon thereafter as possible) that flagging services begin and on the last day that he performs such services for each separate period that services are provided. The Department's Engineer will document such notification in the project records. When requested, the Department Engineer will also sign the flagman's diary showing daily time spent and activity at the project site.

HAUL ACROSS RAILROAD TRACK

- Where the plans show or imply that materials of any nature must be hauled across tracks of the Railroad, unless the plans developed by the Design-Build Team clearly show that the Design-Build Team has included arrangements for such haul

in its agreement with the Railroad, the Design-Build Team shall make all necessary arrangements with the Railroad regarding means of transporting such materials across the tracks of the Railroad. The Design-Build Team shall bear all costs incidental to such crossings whether services are performed by their own forces or by Railroad personnel.

- No crossing may be established for use of the Design-Build Team for transporting materials or equipment across the tracks of the Railroad unless specific authority for its installation, maintenance, necessary watching and flagging thereof and removal, until a temporary private crossing agreement has been executed between the Design-Build Team and Railroad. The approval process for an agreement normally takes 90 days.

WORK FOR THE BENEFIT OF THE DESIGN-BUILD TEAM

- All temporary or permanent changes in wire lines or other facilities owned by the Railroad and which are considered necessary to the project shall be shown on the plans developed by the Design-Build Team; included in the force account agreement between the Department and the Railroad or shall be covered by appropriate revisions to same which will be initiated and approved by the Department and / or the Railroad.
- Should the Design-Build Team desire any changes in addition to the above, then the Design-Build Team shall make separate arrangements with the Railroad for same to be accomplished at the Design-Build Team's expense.

COOPERATION AND DELAYS

- It shall be the Design-Build Team's responsibility to arrange a schedule with the Railroad for accomplishing stage construction involving work by the Railroad. In arranging their schedule they shall ascertain, from the Railroad, the lead time required for assembling crews and materials and shall make due allowance therefore.
- No charge or claim of the Design-Build Team against either the Department or the Railroad shall be allowed for hindrance or delay on account of railroad traffic; any work done by the Railroad or other delay incident to or necessary for safe maintenance of railroad traffic or for any delays due to compliance with this Project Special Provision.
- The Design-Build Team's attention is called to the fact that neither the Department nor Railroad assumes any responsibility for any work performed by others in connection with the construction of the project, and the Design-Build Team shall have no claim whatsoever against the Department or Railroad for any inconvenience, delay, or additional cost incurred by them on account of such operations by others.

TRAINMAN'S WALKWAYS

- Along the outer side of each exterior track of multiple operated track, and on each side of single operated track, an unobstructed continuous space suitable for trainman's use in walking along trains, extending to a line not less than ten feet from centerline of track, shall be maintained. Any temporary impediments to

walkways and track drainage encroachments or obstructions allowed during work hours while Railroad's protective service is provided shall be removed before the close of each workday. If there is any excavation near the walkway, a handrail, with ten feet minimum clearance from centerline of track, shall be placed and must conform to AREMA and / or FRA standards.

GUIDELINES FOR PERSONNEL ON RAILROAD'S CORRIDOR

- The Design-Build Team and / or the Department's personnel authorized to perform work on Railroad's corridor as specified in Notice of Starting Work Section of this Project Special Provision are not required to complete Norfolk Southern Roadway Worker Protection Training. However, the Design-Build Team and the Department's personnel must be familiar with Norfolk Southern's standard operating rules and guidelines, shall conduct themselves accordingly, and may be removed from the property for failure to follow these guidelines.
- All persons shall wear hard hats. Appropriate eye and hearing protection must be used. Working in shorts shall be prohibited. Shirts must cover shoulders, back and abdomen. Working in tennis or jogging shoes, sandals, boots with high heels, cowboy and other slip-on type boots shall be prohibited. Hard-sole, lace-up footwear, zippered boots or boots cinched up with straps which fit snugly about the ankle are adequate. Wearing of safety boots is strongly recommended. Reflective vests shall also be required within 25 feet of the centerline of any track and are strongly recommend to be worn in the vicinity of public roadways.
- No one is allowed within 25 feet of the centerline of track without specific authorization from the flagman.
- All persons working near track while train is passing shall lookout for dragging bands, chains and protruding or shifted cargo.
- No one shall be allowed to cross tracks without specific authorization from the flagman.
- All welders and cutting torches working within 25 feet of track must stop when train is passing.
- No steel tape or chain shall be allowed to cross or touch rails without permission from the Railroad.

GUIDELINES FOR EQUIPMENT ON RAILROAD RIGHT OF WAY

- No crane or boom equipment shall be allowed to set up to work or park within boom distance plus 15 feet of centerline of track without specific permission from Railroad official and flagman.
- No crane or boom equipment shall be allowed to foul track or lift a load over the track without flag protection and track time.
- All employees shall stay with their machines when crane or boom equipment is pointed toward track.
- All cranes and boom equipment under load shall stop work while train is passing (including pile driving).

- Swinging loads shall be secured to prevent movement while train is passing.
- No loads shall be suspended above a moving train.
- No equipment shall be allowed within 25 feet of centerline of track without specific authorization of the flagman.
- Trucks, tractors or any equipment shall not touch ballast line without specific permission from Railroad official and flagman. Orange construction fencing may be required as directed.
- No equipment or load movement within 25 feet or above a standing train or Railroad equipment without specific authorization of the flagman.
- All operating equipment within 25 feet of track shall halt operations when a train is passing. All other operating equipment may be halted by the flagman if the flagman views the operation to be dangerous to the passing train.
- All equipment, loads and cables shall be prohibited from touching rails.
- While clearing and grubbing, no vegetation shall be removed from Railroad embankment with heavy equipment without specific permission from the Railroad Engineer and flagman.
- No equipment or materials shall be parked or stored on Railroad's corridor or property unless specific authorization is granted from the Railroad Engineer.
- All unattended equipment that is left parked on Railroad corridor or property shall be effectively immobilized so that it cannot be moved by unauthorized persons.
- All cranes and boom equipment shall be turned away from track after each workday or whenever unattended by an operator.
- Prior to performing any crane operations, the Design-Build Team shall establish a single point of contact for the Railroad flagman to remain in communication with at all times. Person must also be in direct contact with the individual(s) directing the crane operation(s).

INSURANCE

- In addition to any other forms of insurance or bonds required under the terms of the contract and specifications, the Design-Build Team shall carry insurance of the following kinds and amounts:
    - **Commercial General Liability Insurance** having a combined single limit of not less than $2,000,000 per occurrence for all loss, damage, cost and expense, including attorneys' fees, arising out of bodily injury liability and property damage liability during the policy period. Said policy shall include explosion, collapse, and underground hazard (XCU) coverage, shall be endorsed to name Railroad specified in the Railroad Protective Liability Insurance section of this provision both as the certificate holders and as an additional insured, and shall include a severability of interests provision.

- **Automobile Liability Insurance** with a combined single limit of not less than $1,000,000 each occurrence for injury to or death of persons and damage to or loss or destruction of property. Said policy or policies shall be endorsed to name Railroad specified in the Railroad Protective Liability Insurance section of this provision both as the certificate holder and as an additional insured and shall include a severability of interests provision.

- **Railroad Protective Liability Insurance** having a combined single limit of not less than $2,000,000 each occurrence and $6,000,000 in the aggregate applying separately to each annual period. If the project involves track over which passenger trains operate, the insurance limits required shall be not less than a combined single limit of $5,000,000 each occurrence and $10,000,000 in the aggregate applying separately to each annual period. Said policy shall provide coverage for all loss, damage or expense arising from bodily injury and property damage liability, and physical damage to property attributed to acts or omissions at the job site.

  The standards for the Railroad Protective Liability Insurance shall be as follows:

  - The insurer must be rated A- or better by A.M. Best Railroad, Inc.

    NOTE: NS does not accept from insurers Chartis (AIG or Affiliated Company including Lexington Insurance Company), Hudson Group or Liberty or Affiliated Company, American Contractors Insurance Company and Erie Insurance Company including Erie Insurance Exchange and Erie Indemnity Company.

  - The policy must be written using one of the following combinations of Insurance Services Office ("ISO") Railroad Protective Liability Insurance Form Numbers:

    a. CG 00 35 01 96 and CG 28 31 10 93; or

    b. CG 00 35 07 98 and CG 28 31 07 98; or

    c. CG 00 35 10 01; or

    d. CG 00 35 12 04; or

    e. CG 00 35 12 07; or

    f. CG 00 35 04 13.

  - The named insured on each policy as required to be issued to the Railroad shall read: (NOTE: The below insured is to be treated separately as an insured on each railroad protective policy for a total of (2) two separate policies being issued.)

    RAILROAD

    Norfolk Southern Corporation and its subsidiaries
    Three Commercial Place
    Norfolk, Virginia 23510-2191
    Attn: Risk Management

(NOTE: Railroad does not share coverage on RRPL with any other entity on this policy)

- The description of operations must appear on the Declarations, must match the project description in this project special provision, and must include the appropriate Department project and contract identification numbers. The Description and Designation shall read:
  - Widening I-40 to six lanes running in an easterly direction over the tracks owned by North Carolina Railroad and operated by Norfolk Southern Railway Company in Orange County, identified as State Project WBS 34178.3.GV3 (I-3306A / W-5707C) and Federal Project IMS-040-4(148)259
- The job location must appear on the Declarations and must include the city, state, and appropriate highway name / number. **NOTE: Do not include any references to milepost, valuation station, or mile marker on the insurance policy.**
- The name and address of the Design-Build Team must appear on the Declarations.
- The name and address of the Department must be identified on the Declarations as the "Involved Governmental Authority or Other Contracting Party."
- Endorsements / forms that shall be required are:
  - Physical damage to Property Amendment
  - Terrorism Risk Insurance Act (TRIA) coverage must be included
- Other endorsements / forms that will be accepted are:
  (1) Broad Form Nuclear Exclusion – Form IL 00 21
  (2) 30-day Advance Notice of Non-renewal or cancellation
  (3) Required State Cancellation Endorsement
  (4) Quick Reference or Index Form CL/IL 240
- Endorsements / forms that are NOT acceptable are:
  (1) Any Pollution Exclusion Endorsement except CG 28 31
  (2) Any Punitive or Exemplary Damages Exclusion
  (3) Known injury or Damage Exclusion form CG 00 59
  (4) Any Common Policy Conditions form
  (5) An Endorsement that limits or excludes Professional Liability coverage
  (6) A Non-Cumulation of Liability of Pyramiding of Limits Endorsement
  (7) An Endorsement that excludes TRIA coverage

(8) A Sole Agent Endorsement

(9) Any type of deductible endorsement of amendment

(10) Any other endorsement / form not specifically authorized in the "Endorsements / forms that are required" noted above.

- If any part of the work is sublet, similar insurance, and evidence thereof as specified in **Commercial General Liability Insurance** and **Automobile Liability Insurance** Sections of this Project Special Provision shall be provided by or on behalf of the subcontractor to cover its operations on Railroad's corridor.
- All insurance required under the Insurance Section of this provision shall be underwritten by insurers and be of such form and content, as may be acceptable to the Railroad. Prior to entry on Railroad's corridor, the original Railroad Protective Liability Insurance Policy and one duplicate copy shall be submitted by the Design-Build Team to the Department at the address below for its review and transmittal to the Railroad. In addition, certificates of insurance evidencing the Design-Build Team's and any subcontractors' Commercial General Liability Insurance shall be issued to the Railroad and the Department at the addresses below, and forwarded to the Department for its review and transmittal to the Railroad. The certificates of insurance shall state that the insurance coverage shall not be suspended, voided, canceled, or reduced in coverage or limits without (30) days advance written notice to the Railroad and the Department. No work will be permitted by Railroad on the Railroad's corridor until the Railroad has reviewed and approved the evidence of insurance required herein.

DEPARTMENT:	RAILROAD:
NCDOT Rail Division Engineering & Safety Branch C/O State Railroad Agent 1556 Mail Service Center Raleigh, NC 27699-1556	Risk Management Norfolk Southern Railway Company Three Commercial Place Norfolk, Virginia 23510-2191

- The insurance required herein shall in no way serve to limit the liability of the Design-Build Team.
- Insurance Submission Procedures
  - The Railroad will only accept initial insurance submissions via US Mail or Overnight carrier to the addresses noted above. The Railroad will NOT accept initial insurance submissions via email or faxes. **Provide point of contact information with the submission including a phone number and email address.**
  - The Railroad shall require the following two (2) forms of insurance in the initial insurance submission to be submitted under a cover letter providing details of the project and contact information. The Railroad shall be treated separately as an insured on each insurance policy for a total of (2) two separate policies being issued.

- The full original or certified true countersigned copy of the railroad protective liability insurance policy in its entirely inclusive of all declarations, schedule of forms and endorsements along with the policy forms and endorsements.
- The Design-Build Team's commercial general, automobile, and workers' compensation liability insurance certificate of liability insurance evidencing a combined single limit of a minimum of $2M per occurrence of general and $1M per occurrence of automobile liability insurance naming Norfolk Southern Railway Company, Three Commercial Place, Norfolk, VA 23510 as the certificate holder and as an additional insured on both the general and automobile liability insurance policy.

It should be noted that the Railroad shall not accept notation of Railroad Protective insurance on a certificate of liability insurance form or Binders as Railroad must have the full original countersigned policy. Further, please note that mere receipt of the policy is not the only issue, but it must be reviewed for compliance. Due to the number of projects system-wide, it typically takes a minimum of 30 - 45 days for the Railroad to review.

The insurance amounts specified are minimum amounts and the Design-Build Team may carry insurance in larger amounts if they so desire.

All insurance herein before specified shall be carried until the final inspection and acceptance of the Project by the Department and Railroad, or acceptance of that portion of the Project within Railroad's corridor. At this point, no work or any other activities by the Design-Build Team shall take place in Railroad's corridor without written permission from the Department and Railroad.

FAILURE TO COMPLY

In the event the Design-Build Team violates or fails to comply with any of the requirements of these Special Provisions:

- The Railroad Engineer may require that the Design-Build Team vacate Railroad's corridor.
- The Department's Engineer may withhold all monies due the Design-Build Team on monthly statements.

Any such orders shall remain in effect until the Design-Build Team has remedied the situation to the satisfaction of the Railroad Engineer and the Department's Engineer.

PAYMENT FOR COST OF COMPLIANCE

No separate payment will be made for any extra cost incurred on account of compliance with this Project Special Provision. All such costs shall be included in the lump sum price bid for the entire project.

COMPLETION AND ACCEPTANCE

Upon completion of the work, the Design-Build Team shall remove from within the limits of the Railroad's corridor all machinery, equipment, surplus materials, rubbish or temporary buildings of the Design-Build Team and leave said corridor in a neat and orderly condition. After the final

inspection has been made and work found to be completed in a satisfactory manner acceptable to the Department and the Railroad, the Department will be notified of the Railroad's acceptance in writing by the **Railroad's** Chief Engineer or his authorized representative within ten (10) days or as soon thereafter as practicable.

PROJECT INFORMATION

NS File No.:	BR0015427 SAO
NS Milepost:	J-4.44 & J-4.46
Department's Project No.:	I-3306A / W-5707C, WBS 34178.3GV3

CERTIFICATION FOR FEDERAL-AID CONTRACTS

(3-21-90) DB1 G85

The Proposer certifies, by signing and submitting a Design-Build Proposal, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, *Disclosure Form to Report Lobbying*, in accordance with its instructions.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by *Section 1352, Title 31, U.S. Code*. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

The Proposer also agrees by submitting a Design-Build Proposal that he or she shall require that the language of this certification be included in all lower tier subcontracts, which exceed $100,000 and that all such sub-recipients shall certify and disclose accordingly.

CONTRACTOR'S LICENSE REQUIREMENTS

(7-1-95) DB1 G88

If the Design-Build Team does not hold the proper license to perform any plumbing, heating, air conditioning, or electrical work in this contract, he shall 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).

USE OF UNMANNED AIRCRAFT SYSTEM (UAS)

(7-1-19) DB1 G092

The Design-Build Team 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 Design-Build Team 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, in writing, prior to beginning the operations.

All Design-Build Team members operating UAS shall have UAS specific general liability insurance to cover all operations under this contract.

The use of UAS shall be at the Design-Build Team's discretion. Except as allowed otherwise below, no measurement or payment will be made for the use of UAS. In the event that the Department directs the Design-Build Team to utilize UAS, all costs associated with using UAS will be paid for as extra work, in accordance with Subarticle 104-8(A) of the *Standard Specifications for Roads and Structures*.

CONSTRUCTION EQUIPMENT EMISSIONS

(6-29-20) DB1 G94

Reporting Requirements

During construction, within 60 days after the end of each calendar year, the Design-Build Team shall submit to the Department a list of non-road diesel-powered construction equipment that was used for construction work for more than 40 hours during that calendar year. Such list shall be submitted each year through the final acceptance of the project. The list shall be submitted on a form supplied by the Department and shall include the following information for each applicable piece of non-road construction equipment:

- Equipment type and manufacturer
- Engine manufacturer and model
- Engine model number
- Engine family name and model year
- Engine horsepower or kilowatts
- Engine serial number

- Engine EPA Tier number

The submittal shall include the Tier (0, 1, 2, 3 or 4) Non-road Exhaust Emission Standard that the equipment's engine currently satisfies in accordance with EPA current standards. In accordance with the requirements above, the Design-Build Team shall update and submit this list annually.

Failure to provide the equipment list by the timeframe provided above may result in the Department withholding money from the Design-Build Team due for work performed by that entity in the next partial payment until the necessary assurances are made consistent with this project special provision.

Minimum Tier Requirements

The Design-Build Team shall use applicable equipment so as to meet either of the following two criteria:

(1) a minimum of twenty-five percent (25.0%) of the reported construction equipment used on the project must meet Tier 4 requirements; or
(2) a minimum of fifty percent (50.0%) of the reported construction equipment used on the project must meet Tier 3, Tier 4 or Tier 4i requirements.

Incentive

The Department will pay a Fifty Thousand and 0/100 Dollars ($50,000.00) incentive to the Design-Build Team if, at the conclusion of the project, each calendar year's report reflects that both items below were accomplished:

(1) More than fifty-five percent (55.0%) of the total number of pieces of applicable construction equipment used on the project met Tier 4 Final requirements, and
(2) Less than twenty-five percent (25.0%) of the total number of pieces of applicable construction equipment used on the project was categorized as Tier 0 or 1.

Exclusions

A piece of applicable construction equipment operated by DBE firms (federally funded projects) or MBE / WBE firms (state funded projects) may be excluded from the Reporting Requirements and Minimum Tier Requirements Sections of this project special provision, provided the applicable piece of equipment meets at least the Tier 1 requirements. However, to be eligible for the incentive, the Design-Build Team must include all of these firms' applicable construction equipment in the percentage calculations provided in the Incentive Section of this project special provision.

Regardless of Tier level, cranes shall be subject to the Reporting Requirements Section of this project special provision. However, any crane may be excluded from the calculations provided under the Minimum Tier Requirements and Incentive Sections of this project special provision, provided that crane meets Tier 1 or higher requirements.

EQUIPMENT IDLING GUIDELINES

(12-29-20) 107 DB1 G096

Exercise reduced fuel consumption and reduced equipment emissions during the construction of all work associated with this contract. Except as allowed otherwise elsewhere in this project special provision, employees engaged in the construction of this project should turn off vehicles when stopped for more than thirty (30) consecutive minutes and off-highway equipment (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 / equipment is in safe operating condition.
3. Idling for testing, servicing, repairing or diagnostic purposes.
4. Idling necessary to accomplish work for which the vehicle / equipment 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 / equipment.
8. Idling when the propulsion engine is providing auxiliary power for other than heating or air conditioning, except as allowed below, such as hydraulic systems for pavers.
9. When specific traffic, safety, or emergency situations arise.
10. Limited idling, no longer than 30 minutes, to provide for the safety of occupants (e.g. to run the heater) when the ambient temperature is less than 32 degrees Fahrenheit.
11. Limited idling, no longer than 30 minutes, to provide for the safety of occupants (e.g. to run the air conditioning) when the ambient temperature is greater than 90 degrees Fahrenheit.
12. Diesel powered vehicles / equipment may idle for up to 30 minutes to minimize restart problems.

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

U.S. DEPARTMENT OF TRANSPORTATION HOTLINE

(11-22-94) 108-5 DB1 G100

To report bid rigging activities call: **1-800-424-9071**

The U.S. Department of Transportation (DOT) operates the above toll-free hotline Monday through Friday, 8:00 a.m. to 5:00 p.m. eastern time. Anyone with knowledge of possible bid rigging, bidder collusion, or other fraudulent activities should use the hotline to report such activities.

The hotline is part of the DOT's continuing effort to identify and investigate highway construction contract fraud and abuse is operated under the direction of the DOT Inspector General. All information will be treated confidentially and caller anonymity will be respected.

CARGO PREFERENCE ACT

(2-16-16) DB1 G100

Privately owned United States-flag commercial vessels transporting cargoes are subject to the Cargo Preference Act (CPA) of 1954 requirements and regulations found in 46 CFR 381.7. Contractors are directed to clause (b) of 46 CFR 381.7 as follows:

(b) Contractor and Subcontractor Clauses. "Use of United States-flag vessels: The contractor agrees-

"(1) To utilize privately owned United States-flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to this contract, to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels.

(2) To furnish within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States a legible copy of a rated, 'on-board' commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (b) (1) of this section to both the Contracting Officer (through the Prime Contractor in the case of subcontractor bills-of-lading) and to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590.

(3) To insert the substance of the provisions of this clause in all subcontracts issued pursuant to this contract."

SUBSURFACE INFORMATION

(10-2-20) DB1 G112C

Available subsurface information will be provided on this project. The Design-Build Team shall be responsible for additional investigations and for verifying the accuracy of the subsurface information supplied by the Department.

COOPERATION BETWEEN CONTRACTORS

(9-1-11) (Rev. 9-7-17) DB1 G133

The Design-Build Team's attention is directed to Article 105-7 of the 2018 *Standard Specifications for Roads and Structures*.

- Project I-5993 / I-5994 is located east of and adjacent to the eastern terminus of Project I-3306A. Project I-5993 / I-5994 has an anticipated December 2024 Let date.

- Project I-5958 is located west of the western terminus of Project I-3306A. Project I-5958 has an anticipated November 2026 Let date.

- Project I-5959 is located east of and adjacent to the western terminus of Project I-3306A. Project I-5959 has an anticipated November 2027 Let date.

The Design-Build Team on this project shall cooperate with the Contractor or Design-Build Team working within or adjacent to the limits of this project, to the extent that the work can be carried out to the best advantage of all concerned.

BID DOCUMENTATION

(7-31-12) (Rev. 8-3-15) DB1 G142

General

The successful Design-Build Team shall submit the original, unaltered bid documentation or a certified copy of the original, unaltered bid documentation used to prepare the Price Proposal for this contract to the Department within ten days after receipt of notice of award of contract. Such documentation shall be placed in escrow with a banking institution or other bonded document storage facility selected by the Department.

The Department will not execute the contract until the original, unaltered bid documentation or a certified copy of the original, unaltered bid documentation has been received by the Department.

Terms

Bid Documentation - Bid Documentation shall mean all written information, working papers, computer printouts, electronic media, charts, and all other data compilations which contain or reflect information, data, and calculations used by the Proposer in the preparation of the Price Proposal. The term *bid documentation* includes, but is not limited to, Design-Build Team equipment rates, Design-Build Team overhead rates, labor rates, efficiency or productivity factors, arithmetical calculations, and quotations from subcontractors and material suppliers to the extent that such rates and quotations were used by the Proposer in formulating and determining the Price Proposal. The term *bid documentation* also includes any manuals, which are standard to the industry used by the Proposer in determining the Price Proposal. Such manuals may be included in the bid documentation by reference. Such reference shall include the name and date of the publication and the publisher. *Bid Documentation* does not include bid documents provided by the Department for use by the Proposer in bidding on this project. The Bid Documentation can be in the form of electronic submittal (i.e. thumb drive) or paper. If the Bidder elects to submit the Bid Documentation in electronic format, the Department requires a backup submittal (i.e. a second thumb drive) in case one is corrupted.

Design-Build Team's Representative - Officer of the Prime Contractor's company; if not an officer, the Contractor shall supply a letter signed and notarized by an officer of the Prime Contractor's company, granting permission for the representative to sign the escrow agreement on behalf of the Prime Contractor.

Escrow Agent - Officer of the select banking institution or other bonded document storage facility authorized to receive and release bid documentation.

Escrow Agreement Information

A draft copy of the Escrow Agreement will be mailed to the Proposer after the notice of award for informational purposes. The Proposer and Department will sign the actual Escrow Agreement at the time the bid documentation is delivered to the Escrow Agent.

Failure to Provide Bid Documentation

The Proposer's failure to provide the original, unaltered bid documentation or a certified copy of the original, unaltered bid documentation within ten days after the notice of award is received by him may be just cause for rescinding the award of the contract and may result in the removal of the Proposer from the Department's list of qualified bidders for a period of up to 180 days. Award may then be made to the Proposer with the next lowest adjusted price or the work may be readvertised and constructed under the contract or otherwise, as the Department may decide.

Submittal of Bid Documentation

(A) Appointment - Email **specs@ncdot.gov** or call 919.707.6900 to schedule an appointment.

(B) Delivery - A representative of the Bidder shall deliver the original, unaltered bid documentation or a certified copy of the original, unaltered bid documentation to the Department, in a container suitable for sealing, within ten days after the notice of award is received.

(C) Packaging - The container shall be no larger than 15.5 inches in length by 12 inches wide by 11 inches high and shall be water resistant. The container shall be clearly marked on the face and the back of the container with the following information: Bid Documentation, Bidder's Name, Bidder's Address, Date of Escrow Submittal, Contract Number, TIP Number if applicable, and County.

Affidavit

Bid documentation will be considered a certified copy if the proposer includes an affidavit stating that the enclosed documentation is an EXACT copy of the original documentation used by the Proposer to determine the bid for this project. The affidavit shall also list each bid document with sufficient specificity so a comparison may be made between the list and the bid documentation to ensure that all of the bid documentation listed in the affidavit has been enclosed for escrow. The affidavit shall attest that the affiant has personally examined the bid documentation, that the affidavit lists all of the documents used by the proposer to determine the bid for this project, and that all bid documentation has been included. The affidavit shall be signed by a chief officer of the company, have the person's name and title typed below the signature, and the signature shall be notarized at the bottom of the affidavit.

Verification

Upon delivery of the bid documentation, the Department's Contract Officer and the Design-Build Team's representative will verify the accuracy and completeness of the bid documentation compared to the affidavit. Should a discrepancy exist, the Design-Build Team's representative shall immediately furnish the Department's Contract Officer with any other needed bid documentation. The Department's Contract Officer upon determining that the bid documentation is complete will, in the presence of the Design-Build Team's representative, immediately place the complete bid documentation and affidavit in the container and seal it. Both parties will deliver the sealed container to the Escrow Agent for placement in a safety deposit box, vault, or other secure accommodation.

Confidentiality of Bid Documentation

The bid documentation and affidavit in escrow are, and will remain, the property of the Proposer. The Department has no interest in, or right to, the bid documentation and affidavit other than to verify the contents and legibility of the bid documentation unless the Design-Build Team gives written notice of intent to file a claim, files a written claim, files a written and verified claim, or initiates litigation against the Department. In the event of such written notice of intent to file a claim, filing of a written claim, filing a written and verified claim, or initiation of litigation against the Department, or receipt of a letter from the Design-Build Team authorizing release, the bid documentation and affidavit may become the property of the Department for use in considering any claim or in litigation as the Department may deem appropriate.

Any portion or portions of the bid documentation designated by the Proposer as a *trade secret* at the time the bid documentation is delivered to the Department's Contract Officer shall be protected from disclosure as provided by *G.S. 132-1.2*.

Duration and Use

The bid documentation and affidavit shall remain in escrow until 60 calendar days from the time the Prime Contractor receives the final estimate; or until such time as the Design-Build Team:

(A) Gives written notice of intent to file a claim,
(B) Files a written claim,
(C) Files a written and verified claim,
(D) Initiates litigation against the Department related to the contract; or
(E) Authorizes in writing its release.

Upon the giving of written notice of intent to file a claim, filing a written claim, filing a written and verified claim, or the initiation of litigation by the Design-Build Team against the Department, or receipt of a letter from the Design-Build Team authorizing release, the Department may obtain the release and custody of the bid documentation.

The Proposer certifies and agrees that the sealed container placed in escrow contains all of the bid documentation used to determine the Price Proposal and that no other bid documentation

shall be relevant or material in litigation over claims brought by the Design-Build Team arising out of this contract.

Release of Bid Documentation to the Contractor

If the bid documentation remains in escrow 60 calendar days after the time the Design-Build Team receives the final estimate and the Design-Build Team has not filed a written claim, filed a written and verified claim, or has not initiated litigation against the Department related to the contract, the Department will instruct the Escrow Agent to release the sealed container to the Prime Contractor.

The Prime Contractor will be notified by certified letter from the Escrow Agent that the bid documentation will be released to the Prime Contractor. The Prime Contractor or his representative shall retrieve the bid documentation from the Escrow Agent within 30 days of the receipt of the certified letter. If the Prime Contractor does not receive the documents within 30 days of the receipt of the certified letter, the Department will contact the Prime Contractor to determine final dispersion of the bid documentation.

Payment

The cost of the escrow will be borne by the Department. There will be no separate payment for all costs of compilation of the data, container, or verification of the bid documentation. Payment at the various contract unit or lump sum prices in the contract will be full compensation for all such costs.

TWELVE-MONTH GUARANTEE

(7-15-03) DB1 G145

(A) The Design-Build Team 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 and shall replace such defective materials and workmanship without cost to the Department. The Design-Build Team will not be responsible for damage due to 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 Design-Build Team shall be responsible for invoking the warranted repair work with the manufacturer. The Design-Build Team's responsibility shall be limited to the terms of the manufacturer's guarantee. NCDOT shall 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 Design-Build Team would be wholly responsible for under the terms of the contract. Examples include pavement structures, bridge components, and sign structures. This provision will not be used as a mechanism to force the Design-Build Team to return to the project to make repairs or perform additional work that the Department would normally compensate the Design-Build

Team for. In addition, routine maintenance activities (i.e. mowing grass, debris removal, ruts in earth shoulders, etc.) are not parts of this guarantee.

Appropriate provisions of the payment and / or performance bonds shall cover this guarantee for the project. In addition, failure on the part of the responsible entity(ies) of the Design-Build Team to perform guarantee work within the terms of this provision shall be just cause to remove the responsible entity(ies) from the Department's corresponding prequalified list. The Design-Build Team shall be removed for a minimum of six months and will be reinstated only after all work has been corrected and the Design-Build Team requests reinstatement in writing.

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.

PERMANENT VEGETATION ESTABLISHMENT

(6-11-15) (Rev. 8-30-17) 104 DB01 G160

Establish permanent vegetation stands of the Long Term Stabilization mixtures identified in the Erosion and Sedimentation Control Scope of Work found elsewhere in this RFP. During the period between initial vegetation planting and final project acceptance, perform all work necessary to establish 80% coverage of permanent vegetation within the project limits, as well as, in borrow and waste pits. This work shall include erosion control device maintenance and installation, repair seeding and mulching, supplemental seeding and mulching, mowing, and fertilizer topdressing, as directed. All work shall be performed in accordance with the Erosion and Sedimentation Control Scope of Work found elsewhere in this RFP and the applicable sections of the 2018 *Standard Specifications for Roads and Structures*.

Once the Engineer has determined that 80% coverage of permanent vegetation has been established, the Design-Build Team will be notified to remove the remaining erosion control devices that are no longer needed. The Design-Build Team shall be responsible for, and shall correct, any areas disturbed by operations performed in permanent vegetation establishment and the removal of temporary erosion control measures, whether occurring prior to or after placing traffic on the project.

EROSION & SEDIMENT CONTROL / STORMWATER CERTIFICATION

(1-16-07) (Rev. 10-26-20) 105-16, 225-2, 16 DB1 G180

General

Schedule and conduct construction activities in a manner that will minimize soil erosion and the resulting sedimentation and turbidity of surface waters. Comply with the requirements herein regardless of whether or not a National Pollutant Discharge Elimination System (NPDES) permit for the work is required.

Establish a chain of responsibility for operations and subcontractors' operations to ensure that the *Erosion and Sediment Control / Stormwater Pollution Prevention Plan* is implemented and maintained over the life of the contract.

(A) *Certified Supervisor* - Provide a certified Erosion and Sediment Control / Stormwater (E & SC / SW) Supervisor to manage the Design-Build Team and subcontractor(s) operations, ensure compliance with Federal, State and Local ordinances and regulations, and manage the Quality Control Program.

(B) *Certified Foreman* - Provide a certified, trained foreman for each construction operation that increases the potential for soil erosion or the possible sedimentation and turbidity of surface waters.

(C) *Certified Installer* - Provide a certified installer to install or direct the installation for erosion or sediment / stormwater control practices.

(D) *Certified Designer* - Provide a certified designer for the design of the erosion and sediment control / stormwater component of reclamation plans and, if applicable, for the design of the project erosion and sediment control / stormwater plan.

Roles and Responsibilities

(A) *Certified Erosion and Sediment Control / Stormwater Supervisor* - The Certified Supervisor shall be Level II and shall be responsible for ensuring the erosion and sediment control / stormwater plan is adequately implemented and maintained on the project and for conducting the quality control program. The Certified Supervisor shall be on the project within 24 hours notice from initial exposure of an erodible surface to the project's final acceptance. The Certified Supervisor shall perform the following duties:

(1) Manage Operations - Coordinate and schedule the work of subcontractors so that erosion and sediment control / stormwater measures are fully executed for each operation and in a timely manner over the duration of the contract.

(a) Oversee the work of subcontractors so that appropriate erosion and sediment control / stormwater preventive measures are conformed to at each stage of the work.
(b) Prepare the required National Pollutant Discharge Elimination System (NPDES) Inspection Record and submit to the Engineer.
(c) Attend all weekly or monthly construction meetings to discuss the findings of the NPDES inspection and other related issues.
(d) Implement the erosion and sediment control / stormwater site plans requested.
(e) Provide any needed erosion and sediment control / stormwater practices for the Design-Build Team's temporary work not shown on the plans developed by the Design-Build Team, such as, but not limited to, work platforms, temporary construction, pumping operations, plant and storage yards, and cofferdams.
(f) Acquire applicable permits and comply with requirements for borrow pits, dewatering and any temporary work conducted by the Design-Build Team in jurisdictional areas.

(g) Conduct all erosion and sediment control / stormwater work in a timely and workmanlike manner.

(h) Fully perform and install erosion and sediment control / stormwater work prior to any suspension of the work.

(i) Coordinate with Department, Federal, State and Local Regulatory agencies on resolution of erosion and sediment control / stormwater issues due to the Design-Build Team's operations.

(j) Ensure that proper cleanup occurs from vehicle tracking on paved surfaces and / or any location where sediment leaves the right of way.

(k) Have available a set of erosion and sediment control / stormwater plans that are initialed and include the installation date of Best Management Practices. These practices shall include temporary and permanent groundcover and be properly updated to reflect necessary plan and field changes for use and review by Department personnel, as well as regulatory agencies.

(2) Requirements set forth under the NPDES Permit - The Department's NPDES Stormwater Permit (NCS000250) outlines certain objectives and management measures pertaining to construction activities. The permit references *NCG010000, General Permit to Discharge Stormwater* under the NPDES, and states that the Department shall incorporate the applicable requirements into its delegated Erosion and Sediment Control Program for construction activities disturbing one or more acres of land. The Department further incorporates these requirements on all contracted bridge and culvert work at jurisdictional waters, regardless of size. Some of the requirements shall be, but are not limited to:

(a) Control project site waste to prevent contamination of surface or ground waters of the state, e.g. from equipment operations / maintenance construction materials, concrete washout, chemicals, litter, fuels, lubricants, coolants, hydraulic fluids, any other petroleum products, and sanitary waste.

(b) Inspect erosion and sediment control / stormwater devices and stormwater discharge outfalls at least once every seven calendar days, and within 24 hours after a rainfall event equal to or greater than 1.0 inch that occurs within a 24-hour period. At the discretion of Division of Water Resources personnel, additional monitoring may be required if the receiving stream is 303(d) listed for turbidity and the project has had documented problems managing turbidity.

(c) Maintain an onsite rain gauge or use the Department's Multi-Sensor Precipitation Estimate website to maintain a daily record of rainfall amounts and dates.

(d) Maintain erosion and sediment control / stormwater inspection records for review by Department and Regulatory personnel upon request.

(e) Implement approved reclamation plans on all borrow pits, waste sites and staging areas.

(f) Maintain a log of turbidity test results as outlined in the Department's Procedure for Monitoring Borrow Pit Discharge.

(g) Provide secondary containment for bulk storage of liquid materials.
(h) Provide training for employees concerning general erosion and sediment control / stormwater awareness, the Department's NPDES Stormwater Permit NCS000250 requirements, and the applicable requirements of the General Permit, NCG010000.
(i) Report violations of the NPDES Permit to the Engineer immediately who will notify the NC Department of Environmental Quality Regional Office within 24 hours of becoming aware of the violation.

(3) Quality Control Program - Maintain a quality control program to control erosion, prevent sedimentation and follow provisions / conditions of permits. The quality control program shall:

(a) Follow permit requirements related to the Design-Build Team and subcontractors' construction activities.
(b) Ensure that all operators and / or subcontractor(s) on site have the proper erosion and sediment control / stormwater certification.
(c) Notify the Engineer when the required certified erosion and sediment control / stormwater personnel are not available on the job site when needed.
(d) Conduct the inspections required by the NPDES Permit.
(e) Take corrective actions in the proper timeframe as required by the NPDES Permit for problem areas identified during the NPDES inspections.
(f) Incorporate erosion control into the work in a timely manner and stabilize disturbed areas with mulch / seed or vegetative cover on a section-by-section basis.
(g) Use flocculants approved by state regulatory authorities where appropriate and where required for turbidity and sedimentation reduction.
(h) Ensure proper installation and maintenance of temporary erosion and sediment control devices.
(i) Remove temporary erosion or sediment control devices when they are no longer necessary as agreed upon by the Engineer.
(j) The Design-Build Team's quality control and inspection procedures shall be subject to review by the Engineer. Maintain NPDES inspection records and make records available at all times for verification by the Engineer.

(B) *Certified Foreman* - At least one Certified Foreman shall be onsite for each type of work listed herein during the respective construction activities to control erosion, prevent sedimentation and follow permit provisions:

(1) Foreman in charge of grading activities
(2) Foreman in charge of bridge or culvert construction over jurisdictional areas
(3) Foreman in charge of utility activities

The Design-Build Team may request to use the same person as the Level II Supervisor and Level II Foreman. This person shall be onsite whenever

construction activities, as described above, are taking place. This request shall be approved by the Engineer prior to work beginning.

The Design-Build Team may request to name a single Level II Foreman to oversee multiple construction activities on small bridge or culvert replacement projects. This request shall be approved by the Engineer prior to work beginning.

(C) *Certified Installers* - Provide at least one onsite, Level I Certified Installer for each of the following erosion and sediment control / stormwater crew:

(1) Seeding and Mulching
(2) Temporary Seeding
(3) Temporary Mulching
(4) Sodding
(5) Silt fence or other perimeter erosion / sediment control device installations
(6) Erosion control blanket installation
(7) Hydraulic tackifier installation
(8) Turbidity curtain installation
(9) Rock ditch check / sediment dam installation
(10) Ditch liner / matting installation
(11) Inlet protection
(12) Riprap placement
(13) Stormwater BMP installations (such as, but not limited to, level spreaders, retention / detention devices)
(14) Pipe installations within jurisdictional areas

If a Level I *Certified Installer* is not onsite, the Design-Build Team may substitute a Level II Foreman for a Level I Installer, provided the Level II Foreman is not tasked to another crew requiring Level II Foreman oversight.

(D) *Certified Designer* - Include the certification number of the Level III Certified Designer on the erosion and sediment control / stormwater component of all reclamation plans and if applicable, the certification number of the Level III Certified Designer on the design of the project erosion and sediment control / stormwater plan.

Preconstruction Meeting

Furnish the names of the Certified Erosion and Sediment Control / Stormwater Supervisor, Certified Foremen, Certified Installers and Certified Designers and notify the Engineer, in writing, of changes in certified personnel over the life of the contract within two days of change.

Ethical Responsibility

Any company performing work for the North Carolina Department of Transportation has the ethical responsibility to fully disclose any reprimand or dismissal of an employee resulting from improper testing or falsification of records.

Revocation or Suspension of Certification

Upon recommendation of the Chief Engineer to the certification entity, certification for Supervisor, Certified Foremen, Certified Installer and Certified Designer may be revoked or suspended with the issuance of an Immediate Corrective Action (ICA), Notice of Violation (NOV), or Cease and Desist Order for erosion and sediment control / stormwater related issues.

The Chief Engineer may recommend suspension or permanent revocation of certification due to the following:

(A) Failure to adequately perform the duties as defined within this certification provision
(B) Issuance of an ICA, NOV, or Cease and Desist Order
(C) Failure to fully perform environmental commitments as detailed within the permit conditions and specifications
(D) Demonstration of erroneous documentation or reporting techniques
(E) Cheating or copying another candidate's work on an examination
(F) Intentional falsification of records
(G) Directing a subordinate under direct or indirect supervision to perform any of the above actions
(H) Dismissal from a company for any of the above reasons
(I) Suspension or revocation of one's certification by another entity

Suspension or revocation of a certification will be sent by certified mail to the certificant and the Corporate Head of the company that employs the certificant.

A certificant has the right to appeal any adverse action which results in suspension or permanent revocation of certification by responding, in writing, to the Chief Engineer within ten calendar days after receiving notice of the proposed adverse action.

Chief Engineer
1536 Mail Service Center
Raleigh, NC 27699-1536

Failure to appeal within ten calendar days shall result in the proposed adverse action becoming effective on the date specified on the certified notice. Failure to appeal within the time specified shall result in a waiver of all future appeal rights regarding the adverse action taken. The certificant will not be allowed to perform duties associated with the certification during the appeal process. The Chief Engineer will hear the appeal and make a decision within seven days of hearing the appeal. The decision of the Chief Engineer shall be final and will be made in writing to the certificant.

If a certification is temporarily suspended, the certificant shall pass any applicable written examination and any proficiency examination, at the conclusion of the specified suspension period, prior to having the certification reinstated.

Measurement and Payment

Certified Erosion and Sediment Control / Stormwater Supervisor, Certified Foremen, Certified Installers and Certified Designers will be incidental to the project for which no direct compensation will be made.

PROCEDURE FOR MONITORING BORROW PIT DISCHARGE

(1-22-13) (Rev. 9-7-17) DB1 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 Design-Build Team 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 DWR 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 for Roads and Structures*, the Design-Build Team 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 shall 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 Design-Build Team's test results, an immediate test shall be performed jointly with the results superseding the previous test results of both the Department and the Design-Build Team.

To plan, design, construct, and maintain BMPs to address water quality standards, the Design-Build Team shall use the NCDOT *Turbidity Reduction Options for Borrow Pits Matrix*, available at the website noted below:

https://connect.ncdot.gov/resources/roadside/FieldOperationsDocuments/TurbidityReductionOptionSheet.pdf

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 DWR'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 Design-Build Team 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 Design-Build Team may use cation exchange capacity (CEC) values from proposed site borings to plan and develop the Price Proposal 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.

CLEARING AND GRUBBING

(9-1-11)(Rev. 8-18-15) DB2 R01

Except as required otherwise below, perform clearing on this project to the limits established by Method "III" shown on Roadway Standard Drawing No. 200.03.

Excluding areas with Permanent Utility Easements, perform clearing to the limits established by Method "II" shown on Roadway Standard Drawing No. 200.02 for the following locations:

- I-40 eastbound from Station 438+00 -L- to Station 467+00 -L-
- I-40 eastbound and westbound from Station 510+00 -L- to Station 532+00 -L-
- I-40 eastbound and westbound from Station 352+00 -L- to Station 390+00 -L-, including all ramps and loops
- All -Y- Lines

In areas with Permanent Utility Easements, clearing shall extend to the right of way limits.

BUILDING AND APPURTENANCE REMOVAL / DEMOLITION

(9-1-11) (Rev. 9-7-17) DB2 R12B

Unless otherwise as agreed upon by the Department, seal all wells and remove or demolish all buildings and appurtenances, in their entirety, that are located either partially or completely within the project's right of way limits or are located outside the project's right of way limits but within property purchased as an uneconomical remnant in accordance with Sections 205, 210 and 215 of the 2018 *Standard Specifications for Roads and Structures.*

The Department will perform all assessment, removal and disposal of asbestos. Once the Design-Build Team has acquired a parcel and all buildings and appurtenances have been vacated, the Design-Build Team shall immediately notify the Division Right of Way Agent in writing. Upon receipt of the written notification, the Department then requires 60 days to assess and remove any asbestos prior to the Design-Build Team demolishing any building or appurtenance.

In the unlikely event that the Design-Build Team encounters unknown contaminated materials, these materials shall be handled in accordance with Article 107-25 of the 2018 *Standard Specifications for Roads and Structures*.

MANUFACTURED QUARRY FINES IN EMBANKMENTS

(11-30-16) (Rev. 9-7-17) 235 DB02 R72

Description

This specification addresses the use of manufactured quarry fines that are not classified as select materials. The specification allows the Design-Build Team an option, with the approval of the Engineer, to use manufactured quarry fines (MQFs) in embankments as a substitute for conventional borrow material. Furnish and place geotextile for pavement stabilization in accordance with the *Geotextile for Pavement Stabilization* Project Special Provision found elsewhere in this RFP and the detail developed by the Design-Build Team. Geotextile for pavement stabilization shall be required to prevent pavement cracking and provide separation between the subgrade and pavement section at embankment locations where manufactured quarry fines are utilized and as directed by the Engineer.

Manufactured Quarry Fines (MQF)

Site specific approval of MQFs material shall be required prior to beginning construction as detailed in the preconstruction requirements of this provision.

The following MQFs are unacceptable:

(A) Frozen material
(B) Material with a maximum dry unit weight of less than 90 pounds per cubic foot when tested in accordance with AASHTO T-99 Method A or C
(C) Material with greater than 80% by weight Passing the #200 sieve

Collect and transport MQFs in a manner that will prevent nuisances and hazards to public health and safety. Moisture condition the MQFs as needed and transport in covered trucks to prevent dusting. If MQFs are blended with natural earth material, follow Borrow Criteria in Section 1018 of the 2018 NCDOT *Standard Specifications for Roads and Structures.*

Geotextiles

In embankment areas where MQFs are incorporated, Geotextile for Pavement Stabilization shall be used. The Geotextile for Pavement Stabilization shall adhere to all requirements of the *Geotextile for Pavement Stabilization* Project Special Provision found elsewhere in this RFP except the notification of subgrade elevation, sampling and waiting period required in the Construction Methods section.

Preconstruction Requirements

When MQFs are to be used as a substitute for earth borrow material, request written approval from the Engineer at least ninety (90) days in advance of the intent to use MQFs and include the following details:

(A) Description, purpose and location of project
(B) Estimated start and completion dates of project
(C) Estimated volume of MQFs to be used on project with specific locations and construction details of the placement
(D) The names, addresses and contact information for the generator of the MQFs
(E) Physical location of the site at which the MQFs were generated

The Engineer will forward this information to the State Materials Engineer for review and material approval prior to incorporation.

Construction Methods

Place MQFs in the core of the embankment section with at least four feet of earth cover to the outside limits of the embankments or subgrade.

Construct embankments by placing MQFs in level uniform lifts with no more than a lift of ten inches and compacted to at least a density of 95 percent as determined by test methods in AASHTO T-99, Determination of Maximum Dry Density and Optimum Moisture Content, Method A or C depending upon particle size of the product. Provide a moisture content at the time of compaction of within 4.0 percent of optimum but not greater than one percent above optimum as determined by AASHTO T-99, Method A or C.

REINFORCED CONCRETE PIPE DESIGN

(9-1-11) (Rev. 9-8-17) DB3 R006

Description

This work consists of the design and manufacture of reinforced concrete pipes which require fills greater than 40 feet and less than or equal to 80 feet.

Materials

(A) Design

When the design of a reinforced concrete pipe is required on the plans developed by the Design-Build Team, design the reinforced concrete pipe in accordance with the current edition of the AASHTO LRFD Bridge Design Specifications. Provide the diameter of pipe as indicated on the plans developed by the Design-Build Team and manufacture the pipe in accordance with ASTM C 1417. Provide a reinforced concrete pipe that meets the requirements of Section 1032-6, Section 1077 and any other applicable parts of the 2018 *Standard Specifications for Roads and Structures*.

The design of the reinforced concrete pipe shall be the Design-Build Team's responsibility and shall be subject to review, comments and approval. Submit two sets of detailed plans for review and acceptance. Include all details in the plans, including the size and spacing of the required reinforcement necessary to fabricate the reinforced concrete pipe. Include checked design calculations for the reinforced concrete pipe. Have a North Carolina Registered Professional Engineer seal the plans and design calculations. After the plans are reviewed and, if necessary, all corrections made, submit one set of reproducible tracings on 22" x 34" sheets to become part of the plans developed by the Design-Build Team.

(B) Reinforced Concrete Pipe Sections

(1) Class

Reinforced concrete pipe sections manufactured in accordance with this Project Special Provision shall be designated by inside pipe diameter and design earth cover.

(2) Design Criteria

The design of the reinforced concrete pipe shall be in accordance with Article 12.10.4.2 "Direct Design Method" of the current edition of the AASHTO LRFD Bridge Design Specifications. The following assumptions shall be used in the design calculations:

NCDOT Criteria for Direct Design Method
Process and Material Factors Radial Tension, F_{rp}=1.0 Shear Strength, F_{vp}=1.0
Design Concrete Strength - f'_c 5,000 psi < f'c < 7,000 psi
Heger Pressure Distribution - Type 2 Installation Vertical Arching Factor = 1.40 Horizontal Arching Factor = 0.40
Soil Unit Weight = 120 lb / ft^3
Depth of Fluid = Inside Pipe Diameter
Minimum Concrete Cover = 1.00"
Crack Control = 0.90 (maximum)

(C) Joints

Produce the reinforced concrete pipe sections with spigot and bell ends. Design and form the ends of the pipe section so, when the sections are laid together, they make a continuous line of pipe with a smooth interior free of appreciable irregularities in the flow line, and compatible with the permissible variations given in the 2018 *Standard Specifications for Roads and Structures* and ASTM C 1417.

(D) Manufacture

In addition to the requirements of the 2018 *Standard Specifications for Roads and Structures* and ASTM C 1417, devices or holes are permitted in each pipe section for the purpose of handling and placement. Submit details of handling devices or holes for approval and do not cast any concrete until approval is granted. Remove all handling devices flush with concrete surfaces as directed. Fill holes in a neat and workmanlike manner with an approved non-metallic non-shrink grout, concrete or plug.

DRAINAGE PIPE

(9-1-11) DB3 R36

Description

Where shown in the plans developed by the Design-Build Team, the Design-Build Team shall use Reinforced Concrete Pipe, Welded Steel Pipe, Corrugated Aluminum Alloy Pipe, Aluminized Corrugated Steel Pipe, Corrugated Polyethylene Pipe (HDPE Pipe) or Polyvinyl-Chloride Pipe (PVC Pipe) in accordance with the following requirements:

- All pipe types shall be subject to the maximum and minimum fill height requirements as found on Roadway Standard Drawing No. 300.01 - Sheet 3 of 3, the North Carolina Division of Highways *Guidelines for Drainage Studies and Hydraulics Design* or the *NCDOT Pipe Material Selection Guide*. In case of conflicting design parameters in the resources noted above, the maximum and minimum fill heights shall adhere to the most conservative values. The appropriate Reinforced Concrete Pipe class and the appropriate

gage thickness for Welded Steel Pipe, Corrugated Aluminum Alloy Pipe and Aluminized Corrugated Steel Pipe shall be selected based on fill height.

- Site specific conditions may limit a particular material beyond what is identified in this Project Special Provision. These conditions include, but are not limited to, abrasion, environmental, soil resistivity and pH, high ground water and special loading conditions. The Design-Build Team shall determine if additional restrictions are necessary.

- Slope drains shall be Corrugated Aluminum Alloy Pipe, Aluminized Corrugated Steel Pipe, Corrugated Polyethylene Pipe (HDPE Pipe) or Polyvinyl-Chloride Pipe (PVC Pipe).

- Excluding pipes installed by trenchless construction methods, transverse median drains, storm drainage system pipes, and open-ended cross drains shall be Reinforced Concrete Pipe unless the pipe slope is greater than 10%, in which case the pipe shall be either Corrugated Aluminum Alloy Pipe or Aluminized Corrugated Steel Pipe. Pipes installed by trenchless construction methods shall be Welded Steel Pipe.

PRICE ADJUSTMENTS FOR ASPHALT BINDER

(9-1-11) (Rev. 8-23-18) DB6 R25

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

The base price index for asphalt binder for plant mix is $**499.55** per ton.

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

PRICE ADJUSTMENTS - ASPHALT CONCRETE PLANT MIX

(9-1-11) (Rev. 9-8-17) DB6 R26

Revise the 2018 *Standard Specifications for Roads and Structures* as follows:

Page 6-15, Article 609-11 and Page 6-31, Article 610-14

Add the following paragraph before the first paragraph:

The "Asphalt Price" used to calculate any price adjustments set forth in this section shall be $40.00 per theoretical ton. This price shall apply for all mix types.

FIELD OFFICE

(6-1-07) (Rev. 6-22-15) DB 08-01

Description

This work consists of furnishing, erecting, equipping, and maintaining a field office for the exclusive use of Department Engineers and Inspectors at a location on the project approved by

the Engineer. Provide a field office that complies with the current A.D.A. Design and Accessibility Standards, the National Electric Code, local, state, and federal regulations, and the following:

Procedures

The field office and equipment shall remain the property of the Design-Build Team upon completion of the contract. The field office must be separated from buildings and trailers used by the Design-Build Team and shall be erected and functional as an initial operation. Failure to have the field office functional when work first begins on the project shall result in withholding payment of the Design-Build Team's monthly progress estimate. The field office must be operational throughout the duration of the project and be removed upon completion and final acceptance of the project.

Provide a field office that is weatherproof, tightly floored and roofed, constructed with an air space above the ceiling for ventilation, supported above the ground, has a width of at least ten feet, and a floor-to-ceiling height that is at least seven feet six inches. Provide inside walls and a ceiling that are constructed of plywood, fiber board, gypsum board, or other suitable materials. Have the exterior walls, ceiling, and floor insulated.

Provide a field office with a minimum floor space of 500 square feet and that is equipped with the following:

Number	Item
1	Double-pedestal desk (approximately 60 by 34 inches, at least 2,000 square inches)
1	Plan and drafting table (approximately 30 by 96 inches) with adjustable stool
1	Computer table having a minimum size of 48 by 30 by 29 inches
1	Plan rack for 24-inch by 36-inch drawings with six plan clamps
1	Printing calculator
2	Two-drawer fire protection file, 15-inch drawer width, minimum UL rating of Class 350
6	Office chairs with a minimum of two having casters
2	Wastebaskets
1	Pencil sharpener
1	Copy machine (8-inch x 11-inch copies)
1	Telephone
1	Fax Machine
1	Answering machine
1	Internet Connection Service (modem for Wi-Fi)

Windows and Doors

Provide a field office with at least three windows, with blinds, each having an area of at least 540 square inches, capable of being easily opened and secured from the inside and having at least two exterior passage doors. Provide doors at least 30 inches in width and 78 inches in

height. Provide screens for windows and doors. Equip exterior passage door(s) with lock(s), and furnish at least two keys to the Engineer or inspector.

Steps

Provide accessibility in compliance with the current A. D. A. Design and Accessibility Standards, and the State Building Code and maintain them free from obstructions.

Storage Facility for Nuclear Gage

Furnish the field office with an outside storage facility for the Department's nuclear gage. The storage facility shall not be located within ten feet of any other structure including the field office.

Lighting, Heating, and Air Conditioning

The field office must have satisfactory lighting, electrical outlets, heating equipment, an exhaust fan, and an air conditioner connected to an operational power source. Provide at least one fluorescent light fixture over the plan and drafting table. Furnish electrical current and fuel for heating equipment.

Fire Extinguishers

Furnish and maintain one fire extinguisher for each required exterior passage door. Fire extinguisher(s) may be chemical or dry powder. UL Classification 10-B:C (minimum), suitable for Type A:B:C: fires. Mount and maintain fire extinguisher(s) in accordance with OSHA Safety and Health Standards.

Toilets

Provide a toilet conforming to the requirements of the state and local boards of health or other bodies or courts having jurisdiction in the area. When separate facilities for men and women are not available, place a sign with the words "Rest Room" (with letters at least one-inch in height) over the doorway, and provide an adequate positive locking system on the inside of the doorway. Maintain responsibility for the water and sewer connections or the installation and connection of a water well and septic tank and drain field. These facilities must conform to all local and state permits.

Utilities

Except for telephone service, make arrangement for necessary internet and utility connections, maintain internet and utilities, pay internet and utility service fees and bills, and make arrangements for final disconnection of internet and utilities. Furnish a telephone in each field office and permit the work necessary to install it. Installation and service fees for the telephone will be paid for by the Department.

Storage Facility for Test Equipment

Provide the field office with a storage facility, separate from the office for storage of test equipment, other than the nuclear gage. Provide a facility that has a minimum floor space of 64 square feet, is weatherproof, tightly floored and roofed, and has a tamper resistant key operated lock.

Miscellaneous Items

The field office must also include the following:

1. A certification that the office is free of asbestos and other hazardous materials.
2. A broom, dust pan, mop and bucket, and general cleaning supplies.
3. Provide and maintain an all-weather parking area for six vehicles, including graveled access to the paved surface.

DYNAMIC MESSAGE SIGN (DMS)

DESCRIPTION

To ensure compatibility with the existing DMS Control Software deployed in the State, furnish NTCIP compliant DMSs that are fully compatible with Daktronics, Inc. Vanguard V4 or latest version software (also referred to hereinafter as the "Control Software"). Contact the engineer to inquire about the current version being used.

Furnish and install DMSs compliant with UL standards 48, 50 and 879.

Add and configure the new DMSs in the system using the Control Software and computer system. Furnish, install, test, integrate and make fully operational the new DMSs at locations shown in the plans developed by the Design-Build Team.

Furnish operating Dynamic Message Signs, not limited to, the following types. Dimensions represent DMS sizes commonly used by the Department, other size DMS may be specified in the plans developed by the Design-Build Team.

DMS Naming Convention	
Type	**Color**
Type 1 - Front Access	A - Amber - 66mm
Type 2 - Walk-in	C - Full Color - 20mm
Type 3 - Embedded	
Type 4 - Lane Control	

- **DMS Type 1A** - Front Access Amber 66mm - 27 pixels high by 60 pixels wide
    - 3 lines, 10 characters per line, using 18” high characters.
- **DMS Type 1C** - Front Access Full Color 20mm - 96 pixels high by 208 pixels wide
    - 3 lines, 11 characters per line, using 18” high characters.
- **DMS Type 2A** - Walk-in Amber 66mm - 27 pixels high by 90 pixels wide
    - 3 lines, 15 characters per line, using 18” high characters.
- **DMS Type 2C** - Walk-in Full Color 20mm - 96 pixels high by 288 pixels wide
    - 3 lines, 15 characters per line, using 18” high characters.
- **DMS Type 3A** - Embedded Front Access Tri-color 66mm - 7 pixels high by 35 pixels wide
    - 1 line, 7 characters per line, using 18” high characters.
- **DMS Type 3C** - Embedded Front Access Full Color 20mm - 24 pixels high by 160 pixels wide
    - 1 line, 8 characters per line, using 18” high characters.
- **DMS Type 4C** - Lane Control Sign Full Color 20mm - 48- or 64-pixels square
    - 48 pixels high by 48 pixels wide
        - 1 line, 2 characters per line using 18” high characters
    - 64 pixels high x 64 pixel wide
        - 2 lines, 3 characters per line using 18” high characters

Use only UL listed and approved electronic and electrical components in the DMS system.

Use only approved DMS models listed on the NCDOT Qualified Products List (QPL) at the time of construction. NCDOT Qualified Products List can be accessed via official website at

https://apps.ncdot.gov/products/qpl/

MATERIALS

Environmental Requirements

Construct the DMS and DMS controller cabinet so the equipment within is protected against moisture, dust, corrosion, and vandalism.

Design the DMS system to comply with the requirements of Section 2.1 (Environmental and Operating Standards) of NEMA TS 4-2016.

Viewing Requirements for all DMS

Each line of text should be clearly visible and legible to a person with 20 / 20 corrected vision from a distance of 900 feet in advance of the DMS at an eye height of 3.5 feet along the axis.

Any line must display equally spaced and equally sized alphanumeric individual characters. Each character must be at least 18 inches in height (unless otherwise noted in the plans developed by the Design-Build Team) and composed from a luminous dot matrix.

Housing Requirements for all DMS

Construct the external skin of the sign housing out of aluminum alloy 5052 H32 that is a minimum of 1/8 inches thick for all walk-in DMS and 0.090-inch-thick for all front access or embedded DMS. Ensure the interior structure is constructed of aluminum. Ensure that no internal frame connections or external skin attachments rely upon adhesive bonding or rivets. Ensure the sign housing meets the requirements of Section 3 of NEMA TS 4-2016.

Ensure that all drain holes and other openings in the sign housing are screened to prevent the entrance of insects. Design and construct the DMS unit for continuous usage of at least 20 years. Ensure that the top of the housing includes multiple steel lifting eyebolts or equivalent hoisting points. Ensure hoist points are positioned such that the sign remains level when lifted. Ensure that the hoist points and sign frame allow the sign to be shipped, handled, and installed without damage. Ensure all external assembly and mounting hardware, including but not limited to; nuts, bolts, screws, and locking washers are corrosion resistant galvanized steel and are sealed against water intrusion. Ensure all exterior housing surfaces, excluding the sign face, and all interior housing surfaces are a natural aluminum mill finish. Ensure signs are fabricated, welded, and inspected in accordance with the requirements of the current ANSI/AWS Structural Welding Code-Aluminum. Do not place a manufacturer name, logo, or other information on the front face of the DMS or shield visible to the motorist. Provide power supply monitoring circuitry to detect power failure in the DMS and to automatically report this fault to the Control Software. This requirement is in addition to reporting power failure at the controller cabinet. Do not paint the stainless-steel bolts on the Z-bar assemblies used for mounting the enclosure.

Housing Requirements for Walk-in type DMS

Ensure the sign housing meets the requirements of Section 3.2.8 of NEMA TS 4-2016. Ensure that exterior seams and joints, except the finish coated face pieces, are continuously welded using an inert gas welding method. Stitch weld the exterior housing panel material to the internal structural members to form a unitized structure. Ensure that exterior mounting assemblies are fabricated from aluminum alloy 6061-T6 extrusions a minimum of 3/16 inches thick. Ensure housing access is provided through an access door at each end of the sign enclosure that meets the requirements of NEMA TS 4-2016, Section 3.2.8.1. Ensure the access doors include a keyed tumbler lock and a door handle with a hasp for a padlock. Ensure the doors include a closed-cell neoprene gasket and stainless-steel hinges. Install one appropriately sized fire extinguisher within 12 inches of each maintenance door. Ensure the sign housing meets the requirements of NEMA TS 4-2016, Section 3.2.8.3 for service lighting. All service lighting should be LED, incandescent and fluorescent lamps are not permitted. Ensure that the sign housing includes LED emergency lighting that automatically illuminates the interior when the door is open in the event

of a power outage. Emergency lighting must be capable of operation without power for at least 90 minutes. Ensure the sign housing meets the requirements of NEMA TS 4-2016, Section 3.2.9 for convenience outlets.

Housing Requirements for Front Access DMS

Comply with the requirements of Section 3.2.5 and 3.2.6 of NEMA TS 4-2016 as it applies to front access enclosures. The following requirements complement TS 4-2016. Ensure access door does not require specialized tools or excessive force to open. Provide multiple access doors that allow maintenance personnel access to 2 or 3 sign modules at a time. Vertically hinge the doors and design to swing out from the face to provide access to the enclosure interior. Extend each door the full height of the display matrix. Provide a retaining latch mechanism for each door to hold the door open at a 90-degree angle. Each door will form the face panel for a section of the sign. Mount the LED modules to the door such that they can be removed from the door when in the open position. Other sign components can be located inside the sign enclosure and be accessible through the door opening. Provide for each door a minimum of two (2) screw-type captive latches to lock them in the closed position and pull the door tight and compress a gasket located around the perimeter of each door. Install the gasket around the doors to prevent water from entering the cabinet.

Housing Face Requirements for all DMS

Ensure the sign face meets the requirements of NEMA TS 4-2016, Section 3.1.3. Protect the DMS face with contiguous, weather-tight, removable panels. The DMS front face shall be constructed with multiple rigid panels, each of which supports and protects a full-height section of the LED display matrix. The panels shall be fabricated using aluminum sheeting on the exterior and polycarbonate sheeting on the interior of the panel. These panels must be a polycarbonate material that is ultraviolet protected and have an antireflection coating. Prime and coat the front side of the aluminum mask, which faces the viewing motorists, with automotive-grade semi-gloss black acrylic enamel paint or an approved equivalent. Guarantee all painted surfaces provide a minimum outdoor service life of 20 years. Design the panels so they will not warp nor reduce the legibility of the characters. Differential expansion of the DMS housing and the front panel must not cause damage to any DMS component or allow openings for moisture or dust. Glare from sunlight, roadway lighting, commercial lighting, or vehicle headlights must not reduce the legibility or visibility of the DMS. Install the panels so that a maintenance person can easily remove or open them for cleaning.

Housing Face Requirements for Walk-in type DMS

The DMS front face shall be constructed with multiple rigid panels, each of which supports and protects a full-height section of the LED display matrix.

No exposed fasteners are allowed on the housing face. Ensure that display modules can be easily and rapidly removed from within the sign without disturbing adjacent display modules.

Housing Face Requirements for Front Access type DMS

The DMS front face shall be constructed with multiple vertically hinged rigid door panels, each of which contains a full-height section of the LED display matrix.

Any exposed fasteners on the housing face must be the same color and finish as the housing face. Only captive fasteners may be used on the housing face.

Housing Face Requirements for Embedded Front Access type DMS

Front Face shall be constructed with a single, horizontally hinged rigid face panel which contains a full-height section of the LED display matrix.

Any exposed fasteners on the housing face must be the same color and finish as the housing face. Only captive fasteners may be used on the housing face.

Sign Housing Ventilation System for all DMS

Install a minimum of one (1) temperature sensor that is mounted near the top of the DMS interior. The sensor(s) will measure the temperature of the air in the enclosure over a minimum range of -40º F to +176º F. Ensure the DMS controller will continuously monitor the internal temperature sensor output and report to the DMS control software upon request.

Design the DMS with systems for enclosure ventilation, face panel fog and frost prevention, and safe over-temperature shutdown.

Design the DMS ventilation system to be thermostatically controlled and to keep the internal DMS air temperature lower than +140º F, when the outdoor ambient temperature is +115º F or less.

The ventilation system shall consist of two or more air intake ports located near the bottom of the DMS rear wall. Cover each intake port with a filter that removes airborne particles measuring 500 microns in diameter and larger. Mount one or more ball bearing-type ventilation fans at each intake port. These fans shall positively pressure the DMS enclosure.

Design the ventilation fans and air filters to be removable and replaceable from inside the DMS housing. To ease serviceability, mount the ventilation fans no more than four (4) feet from the floor of the DMS enclosure. Position ventilation fans so they do not prevent removal of an LED pixel board or driver board.

Provide each ventilation fan with a sensor to monitor its rotational speed, measured in revolutions per minute and report this speed to the sign controller upon request.

The ventilation system shall move air across the rear of the LED modules in a manner such that heat is dissipated from the LED's. Design the airflow system to move air from the bottom of the enclosure towards the top to work with natural convection to move heat away from the modules.

Install each exhaust port near the top of the rear DMS wall. Provide one exhaust port for each air intake port. Screen all exhaust port openings to prevent the entrance of insects and small animals.

Cover each air intake and exhaust port with an aluminum hood attached to the rear wall of the DMS. Thoroughly seal all intakes and exhaust hoods to prevent water from entering the DMS.

Provide a thermostat near the top of the DMS interior to control the activation of the ventilation system.

The DMS shall automatically shut down the LED modules to prevent damaging the LEDs if the measured internal enclosure air temperature exceeds a maximum threshold temperature. The threshold temperature shall be configurable and shall have a default factory setting of 140º F. The DMS shall provide an output to the controller to notify the Vanguard client when the DMS shuts down due to high temperature.

Sign Housing Ventilation System for Walk-in DMS

Ensure the sign includes a fail-safe ventilation subsystem that includes a snap disk thermostat that is independent of the sign controller. Preset the thermostat at 140° F. If the sign housing's interior reaches 140° F, the thermostat must override the normal ventilation system, bypassing the sign controller and turning on all fans. The fans must remain on until the internal sign housing temperature falls below 115° F.

Sign Housing Photoelectric sensors

Install three photoelectric sensors with ½ inch minimum diameter photosensitive lens inside the DMS enclosure. Use sensors that will operate normally despite continual exposure to direct sunlight. Place the sensors so they are accessible and field adjustable. Point one sensor north or bottom of the sign. Place the other two, one on the back wall and one on the front wall of the sign enclosure. Alternate designs maybe accepted, provided the sensor assemblies that are accessible and serviceable from inside the sign enclosure.

Provide controls so that the Engineer can field adjust the following:

- The light level emitted by the pixels in each Light Level Mode,
- The ambient light level at which each Light Level Mode is activated.

Display Modules

Manufacture each display module with a standard number of pixels which can be easily removed. Assemble the modules onto the DMS assemblies contiguously to form a continuous matrix to display the required number of lines, characters, and character height.

Design display modules that are interchangeable, self-addressable, and replaceable without using special tools. Provide plug-in type power and communication cables to connect to a display module. Ensure that the sign has a full matrix display area as defined in NEMA TS 4-2016, Section 1.6.

Design each module to display:

- All upper- and lower-case letters,
- All punctuation marks,
- All numerals 0 to 9,
- Special user-created characters.

Display upper-case letters and numerals over the complete height of the module. Optimize the LED grouping and mounting angle within a pixel for maximum readability.

Design Type 3A and 3C DMS with at least the following message displays:

- A static display, green in color, reading “OPEN”
- A static display, red in color, reading “CLOSED”
- A static display, amber in color, with the ability to display a toll rate in the following format “$ XX.XX”

Furnish two (2) spare display modules per each DMS installed for emergency restoration.

Discrete LEDs

Provide discrete LEDs with a nominal viewing cone of 30 degrees with a half-power angle of 15 degrees measured from the longitudinal axis of the LED. Make certain, the viewing cone tolerances are as specified in the LED manufacturer’s product specifications and do not exceed +/- 3 degrees half-power viewing angle of 30 degrees.

Provide LEDs that are untinted, non-diffused, high output solid state lamps utilizing AlInGaP technology for Red and InGaN technology for Green and Blue. No substitutions will be allowed. Provide LEDs that emit a full color.

Provide LEDs with a MTBF (Mean Time Before Failure) of at least 100,000 hours of permanent use at an operating point of 140° F or below at a specific forward current of 20mA. Discrete LED failure is defined as the point at which the LED’s luminous intensity has degraded to 50% or less of its original level.

Obtain the LEDs used in the display from a single LED manufacturer. Obtain them from batches sorted for luminous output, where the highest luminosity LED is not more than fifty percent more luminous than the lowest luminosity LED when the LEDs are driven at the same forward current. Do not use more than two successive and overlapping batches in the LED display.

Individually mount the LEDs on circuit boards that are at least 1/16” thick FR-4 fiberglass, flat black printed circuit board in a manner that promotes cooling. Protect all exposed metal on both sides of the LED pixel board (except the power connector) from water and humidity exposure by a thorough application of acrylic conformal coating. Design the boards so bench level repairs to individual pixels, including discrete LED replacement and conformal coating repair is possible.

Operate the LED display at a low internal DC voltage not to exceed 24 Volts.

Design the LED display operating range to be –20° F to +140° F at 95% relative humidity, non-condensing.

Supply the LED manufacturer’s technical specification sheet with the material submittals.

LED Power Supplies

Power the LED Display by means of multiple regulated switching DC power supplies that operate from 120 volts AC input power and have an output of 24 volts DC or less. Wire the power supplies in a redundant parallel configuration that uses multiple power supplies per display. Provide the power supplies with current sharing capability that allows equal amounts of current to their portion of the LED display. Provide power supplies rated such that if one supply fails the remaining supplies will be able to operate their portion of the display under full load conditions (i.e. all pixels on at maximum brightness) and at a temperature of 140° F.

Provide power supplies to operate within a minimum input voltage range of +90 to +135 volts AC and within a temperature range of –22° F to 140° F. Power supply output at 140° F must not deteriorate to less than 65% of its specified output at 70° F. Provide power supplies that are overload protected by means of circuit breakers, that have an efficiency rating of at least 75%, a power factor rating of at least .95, and are UL listed. Provide all power supplies from the same manufacturer and with the same model number for each Type of DMS. Design the power driver circuitry to minimize power consumption.

Design the field controller to monitor the operational status (normal or failed) of each individual power supply and be able to display this information on the Client Computer screen graphically. Color code power supply status, red for failed and green for normal.

LED Pixels

A pixel is defined as the smallest programmable portion of a display module that consists of a cluster of closely spaced discrete LEDs. Design each pixel with either 66 mm or 20 mm spacing depending on the type of DMS called for in the plans developed by the Design-Build Team.

Construct the pixels with strings of LEDs. It is the manufacturer's responsibility to determine the number of LEDs in each string to produce the candela requirement as stated herein.

Use continuous current to drive the LEDs at the maximum brightness level. Design the light levels to be adjustable for each DMS / controller so the Engineer may set levels to match the luminance requirements at each installation site.

Ensure each pixel produces a luminous intensity of 40 Cd when driven with an LED drive current of 20 mA per string.

Power the LEDs in each pixel in strings. Use a redundant design so that the failure of an LED in one string does not affect the operation of any other string within the pixel and does not lower the luminous intensity of the pixel more than 25% of the 40 Cd requirement. Provide the sign controller with the ability to detect the failure of any LED string and identify which LED string has failed.

DMS Mini Controller

For Walk-In and Front Access DMS Types only, furnish and install a mini controller inside the DMS that is interconnected with the main controller using a fiber-optic cable. The mini controller will enable a technician to perform all functions available from the main controller.

Provide the mini controller with an LCD / keypad interface. Size the LCD display screen to allow preview of an entire one-page message on one screen. Provide a 4 X 4 keypad.

DMS Enclosure Structure Mounting

Mount the DMS enclosure and interconnect system securely to the supporting structures. Design the DMS enclosure supports and structure to allow full access to the DMS enclosure inspection door. Mount the DMS enclosure according to the manufacturer's recommendations.

Furnish and install U-bolt connections of hanger beams to truss chords with a double nut at each end of the U-bolt. Bring the double nuts tight against each other by the use of two wrenches.

Submit plans for the DMS enclosure, structure, mounting description and calculations to the Engineer for approval. Have such calculations and drawings approved by a Professional Engineer registered in the state of North Carolina, and bear his signature, seal, and date of acceptance.

Provide removable lifting eyes or the equivalent on the DMS enclosure rated for its total weight to facilitate handling and mounting the DMS enclosure.

Design the DMS structure to conform to the applicable requirements of the most recent version of the *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, currently in use by the Department and the section titled "DMS Assemblies" of these Project Special Provisions.

DMS / DMS Controller Interconnect

Furnish and install all necessary cabling, conduit, and terminal blocks to connect the DMS and the DMS controller located in the equipment cabinet. Use approved manufacturer's specifications and the plans developed by the Design-Build Team for cable and conduit types and sizes. Use fiber-optic cable to interconnect sign and controller. Install fiber-optic interconnect centers in the sign enclosure and cabinet to securely install and terminate the fiber-optic cable. Submit material submittal cut sheets for the interconnect center.

DMS Controller and DMS Cabinet

Furnish and install one DMS controller with accessories per DMS in a protective cabinet. Controlling multiple DMS with one controller is allowed when multiple DMS are mounted on the same structure. Mount the controller cabinet on the sign support structure. Install cabinet so that the height from the ground to the middle of the cabinet is four feet. Ensure a minimum of 3' x 3' level working surface under each cabinet that provides maintenance technicians with a safe working environment.

Provide the DMS controller as a software-oriented microprocessor and with resident software stored in non-volatile memory. The Control Software, controller and communications must comply with the NTCIP Standards identified in these Project Special Provisions. Provide sufficient non-volatile memory to allow storage of at least 500 multi-page messages and a test pattern program.

For DMS Type 4C installations provide a single controller that can control up to eight (8) signs simultaneously.

Furnish the controller cabinet with, but not limited to, the following:

- Power supply and distribution assemblies
- Power line filtering hybrid surge protectors
- Radio Interference Suppressor
- Communications surge protection devices
- Industrial-Grade UPS system and local disconnect
- Microprocessor based controller
- Display driver and control system (unless integral to the DMS)
- RJ45 Ethernet interface port for local laptop computer
- Local user interface
- Interior lighting and duplex receptacle
- Adjustable shelves as required for components
- Temperature control system
- All interconnect harnesses, connectors, and terminal blocks
- All necessary installation and mounting hardware

Furnish the DMS controller and associated equipment completely housed in a NEMA 3R cabinet made from 5052 H32 sheet aluminum at least 1/8” thick. Use natural aluminum cabinets. Perform all welding of aluminum and aluminum alloys in accordance with the latest edition of AWS D1.2, Structural Welding Code - Aluminum. Continuously weld the seams using Gas Metal Arc Welding (GMAW).

Slant the cabinet roof away from the front of the cabinet to prevent water from collecting on it.

Do not place a manufacturer name, logo, or other information on the faces of the controller cabinet visible to the motorist.

Provide cabinets capable of housing the components and sized to fit space requirement. Design the cabinet layout for ease of maintenance and operation, with all components easily accessible. Submit a cabinet layout plan for approval by the Engineer.

Locate louvered vents with filters in the cabinet to direct airflow over the controller and auxiliary equipment, and in a manner that prevents rain from entering the cabinet. Fit the inside of the cabinet, directly behind the vents, with a replaceable, standard size, commercially available air filter of sufficient size to cover the entire vented area.

Provide a torsionally rigid door with a continuous stainless-steel hinge on the side that permits complete access to the cabinet interior. Provide a gasket as a permanent and weather resistant seal at the cabinet door and at the edges of the fan / exhaust openings. Use a non-absorbent gasket material that will maintain its resiliency after long term exposure to the outdoor environment. Construct the doors so that they fit firmly and evenly against the gasket material when closed. Provide the cabinet door with louvered vents and air filters near the bottom as described in the paragraph above.

The cabinet shall contain a full-height standard EIA 19-inch rack. The rack shall be secured within the cabinet by mounts at the top and bottom.

The rack shall contain a minimum of one (1) pullout drawer. The drawer shall be suitable for storing manuals and small tools. The drawer shall be able to latch in the out position to function as a laptop / utility shelf.

Provide a convenient location on the inside of the door to store the cabinet wiring diagrams and other related cabinet drawings. Provide a Corbin #2 main door lock made of non-ferrous or stainless-steel material. Key all locks on the project alike and provide one key per lock to the Engineer. In addition, design the handle to permit padlocking.

Provide the interior of the cabinet with ample space for housing the controller and all associated equipment and wiring. Provide ample space in the bottom of the cabinet for the entrance and exit of all power, communications, and grounding conductors and conduit.

Arrange the equipment to permit easy installation of the cabling through the conduit so that they will not interfere with the operation, inspection, or maintenance of the unit. Provide adjustable metal shelves, brackets, or other support for the controller unit and auxiliary equipment. Leave a three-inch minimum clearance from the bottom of the cabinet to all equipment, terminals, and bus bars.

Provide power supply monitoring circuitry to detect power failure and to automatically report the occurrence to the Control Software.

Install two 15-watt fluorescent light strips with shields, one in the top of the cabinet and the other under the bottom shelf. Design both lights to automatically turn on when the cabinet door is opened and turn off when the door closes.

Mount and wire a 120V (+10%) GFCI duplex receptacle of the three-wire grounding type in the cabinet in a location that presents no electrical hazard when used by service personnel for the operation of power tools and work lights.

No cabinet resident equipment may utilize the GFCI receptacle. Furnish one spare non-GFCI duplex receptacle for future equipment.

Mount a bug-proof and weatherproof thermostatically controlled fan and safety shield in the top of the cabinet. Size the fan to provide at least for two air exchanges per minute. Fuse the fan at 125% of the capacity of the motor. The magnetic field of the fan motor must not affect the performance of the control equipment. Use a fan thermostat that is manually adjustable to turn on

between 80° F and 160° F with a differential of not more than 10° F between automatic turn on and turn off. Mount it in an easily accessible location, but not within six inches of the fan.

Install additional fans and / or heaters as needed to maintain the temperature inside the cabinet within the operating temperature range of the equipment within the cabinet as recommended by equipment manufacturer(s).

Wiring

The requirements stated herein apply wherever electrical wiring is needed for any DMS system assemblies and subassemblies such as controller cabinet, DMS enclosure, electrical panel boards etc.

Neatly arrange and secure the wiring inside the cabinet. Where cable wires are clamped to the walls of the control cabinet, provide clamps made of nylon, metal, plastic with rubber or neoprene protectors, or similar. Lace and jacket all harnesses or tie them with nylon tie wraps spaced at six inches maximum to prevent separation of the individual conductors.

Individually and uniquely label all conductors. Ensure all conductor labels are clearly visible without moving the conductor. Connect all terminal conductors to the terminal strip in right angles. Remove excess conductor before termination of the conductor. Mold the conductor in such a fashion as to retain its relative position to the terminal strip if removed from the strip. Do not run a conductor across a work surface with the exception of connecting to that work surface. No conductor bundles can be support by fasteners that support work surfaces. Install all connectors, devices and conductors in accordance to manufactures guidelines. Comply with the latest NEC guideline in effect during installation. No conductor or conductor bundle may hang loose or create a snag hazard. Protect all conductors from damage. Ensure all solder joints are completed using industry accepted practices and will not fail due to vibration or movement. Protect lamps and control boards from damage.

No splicing will be allowed for feeder conductors and communication cables from the equipment cabinet to the DMS enclosure.

Insulate all conductors and live terminals so they are not hazardous to maintenance personnel.

Route and bundle all wiring containing line voltage AC and / or shield it from all low voltage control circuits. Install safety covers to prevent accidental contact with all live AC terminals located inside the cabinet.

Use industry standard, keyed type connectors with a retaining feature for connections to the controller.

Label all equipment and equipment controls clearly.

Supply each cabinet with one complete set of wiring diagrams that identify the color-coding or wire tagging used in all connections. Furnish a water-resistant packet adequate for storing wiring diagrams, operating instructions, and maintenance manuals with each cabinet.

Power Supply and Circuit Protection

Design the DMS and controller for use on a system with a line voltage of 120V + 10% at a frequency of 60 Hz ± 3 Hz. Under normal operation, do not allow the voltage drop between no load and full load of the DMS and its controller to exceed 3% of the nominal voltage.

Blackout, brownout, line noise, chronic over-voltage, sag, spike, surge, and transient effects are considered typical AC voltage defects. Protect the DMS system equipment so that these defects do not damage the DMS equipment or interrupt their operation. Equip all cabinets with devices to protect the equipment in the cabinet from damage due to lightning and external circuit power and current surges.

Circuit Breakers

Protect the DMS controller, accessories, and cabinet utilities with thermal magnetic circuit breakers. Provide the controller cabinet with a main circuit breaker sized according to the NEC. Use appropriately sized branch circuit breakers to protect the controller, sign display and accessories and for servicing DMS equipment and cabinet utilities.

Provide a subpanel in the sign enclosure with a main and branch circuit breakers sized appropriately per NEC.

Provide a detailed plan for power distribution within the cabinet and the sign. Label all breaker and conductor with size and loads. Have the plans developed by the Design-Build Team signed and sealed by a NC registered PE and submit the plans for review and acceptance.

Surge Suppressor

Install and clearly label filtering hybrid power line surge protectors on the load side of the branch circuit breakers in a manner that permits easy servicing. Ground and electrically bond the surge protector to the cabinet within two inches.

Provide power line surge protector that meets the following requirements:

Peak surge current occurrences	20 minimum
Peak surge current for an 8 x 20 microsecond waveshape	50,000 Amperes
Energy Absorption	> 500 Joules
Clamp voltage	240 Volts
Response time	<1 nanosecond
Minimum current for filtered output	15 Amperes for 120VAC*
Temperature range	-40° F to +158° F

*Capable of handling the continuous current to the equipment

Transients and Emissions

DMS and DMS controller will be designed in such a way to meet the latest NEMA TS-4 for Transients and Emissions.

Transient Protection

The RS232 and Ethernet communication ports in the DMS sign controller shall be protected with surge protection between each signal line and ground. This surge protection shall be integrated internally within the controller.

Lightning Arrester

Protect the system with an UL approved lightning arrester installed at the main service disconnect that meets the following requirements:

Type of design	Silicon Oxide Varistor
Voltage	120/240 Single phase, 3 wires
Maximum current	100,000 Amps
Maximum energy	3000 Joules per pole
Maximum number of surges	Unlimited
Response time one milliamp test	5 nanoseconds
Response time to clamp 10,000 amps	10 nanoseconds
Response time to clamp 50,000 amps	25 nanoseconds
Leak current at double the rated voltage	None
Ground Wire	Separate

Uninterruptible Power Supply (UPS)

Provide the cabinet with an industrial grade power conditioning UPS unit to supply continuous power to operate the equipment connected to it if the primary power fails. **The UPS must continue to condition power supplied to the DMS controller in the event of battery failure within the UPS.** The UPS must detect a power failure and provide backup power within 20 milliseconds. Transition to the UPS source from primary power must not cause loss of data or damage to the equipment being supplied with backup power. Provide an UPS with at least three outlets for supplying conditioned AC voltage to the DMS controller. Provide a unit to meet the following requirements:

Input Voltage Range	120VAC +12%, -25%
Power Rating	1000 VA, 700 Watts
Input Frequency	45 to 65 Hz
Input Current	7.2A
Output Voltage	120VAC +/- 3%
Output Frequency	50/60 +/-1 Hz
Output Current	8.3A
Output Crest Factor Ratio	@ 50% Load Up to 4.8:1 @ 75% Load Up to 3.2:1 @ 100% Load Up to 2.4:1
Output THD	3% Max. (Linear) 5% Max. (Non-Linear)
Output Overload	110% for 10 min; 200% for 0.05 sec.
Output Dynamic Response	+/- 4% for 100% Step Load Change 0.5 ms Recovery Time.
Output Efficiency @ 100% Load	90% (Normal Mode)
Operating Temperature	-40° F to +165 ° F
Humidity	0% to 95% Non-condensing
Remote Monitoring Interface	RS-232
Protection	Input / Output Short Circuit Input / Output Overload Excessive Battery Discharge
Specifications	UL1778, FCC Class A, IEE 587

Provide the UPS unit capable of supplying **30 minutes** of continuous backup power to the cabinet equipment connected to it when the equipment is operating at full load.

Controller Communications Interface

Provide the controller with the following interface ports:

- An EIA/TIA-232E port for remote communication using NTCIP
- An 10/100 Ethernet port for remote communication using NTCIP
- An EIA/TIA-232E port for onsite access using a laptop
- An EIA/TIA-232E auxiliary port for communication with a field device such as a UPS

- Fiber-optic ports for communication with the sign
- RJ45 ports for communication with the sign using CAT-5 cable
- RJ45 ports for communication with mini controller located inside the sign enclosure

Controller Local User Interface

Provide the controller with a Local User Interface (LUI) for at least the following functions:

- On / Off Switch: controls power to the controller
- Control Mode Switch: for setting the controller operation mode to either remote or local mode
- LCD Display and Keypad: Allow user to navigate through the controller menu for configuration (display, communications parameter, etc.) running diagnostics, viewing peripherals status, message creation, message preview, message activation, etc. Furnish a LCD display with a minimum size of 240 x 64 dots with LED back light.

Protected access to the LUI with an alphanumeric and PIN passwords. Allow the user to select a preferred method of password protection. Default and hardcoded passwords are not allowed.

Controller Address

Assign each DMS controller a unique address. Preface all commands from the Control Software with a particular DMS controller address. The DMS controller compares its address with the address transmitted; if the addresses match, then the controller processes the accompanying data.

Controller Functions

Design the DMS controller to continuously control and monitor the DMS independent of the Control Software. Design the controller to display a message on the sign sent by the Control Software, a message stored in the sign controller memory, or a message created on site by an operator using the controller keypad.

Provide the DMS controller with a watchdog timer to detect controller failures and to reset the microprocessor, and with a battery backed up clock to maintain an accurate time and date reference. Set the clock through an external command from the Control Software or the Local User Interface.

DMS Controller Memory

Furnish each DMS controller with non-volatile memory. Use the non-volatile memory to store and reprogram at least one test pattern sequence and 500 messages containing a minimum of two pages of 45 characters per page. The Control Software can upload messages into and download messages from each controller’s non-volatile memory remotely.

Messages uploaded and stored in the controller's non-volatile memory may be erased and edited using the Control Software and the controller. New messages may be uploaded to and stored in the controller's non-volatile memory using the Control Software and the controller.

Equipment List

Provide a general description of all equipment and all information necessary to describe the basic use or function of the major system components. Include a general "block diagram" presentation. Include tabular charts listing auxiliary equipment, if any is required. Include the nomenclature, physical and electrical characteristics, and functions of the auxiliary equipment unless such information is contained in an associated manual; in this case include a reference to the location of the information.

Include a table itemizing the estimated average and maximum power consumption for each major piece of equipment.

Physical Description

Provide a detailed physical description of size, weight, center of gravity, special mounting requirements, electrical connections, and all other pertinent information necessary for proper installation and operation of the equipment.

Parts List

Provide a parts list that contains all information needed to describe the characteristics of the individual parts, as required for identification. Include a list of all equipment within a group and a list of all assemblies, sub-assemblies, and replacement parts of all units. Arrange this data in a table, in alpha numerical order of the schematic reference symbols, which gives the associated description, manufacturer's name, and part number, as well as alternate manufacturers and part numbers. Provide a table of contents or other appropriate grouping to identify major components, assemblies, etc.

Character Set Submittal

Submit an engineering drawing of the DMS character set including at a minimum, 26 upper case and lower case letters, 10 numerals, 9 punctuation marks (. , ! ? – ‘ “ ; :) 12 special characters (# & * + / ( ) [ ] < > @) and arrows at 0, 45, 90, 135, 180, 225, 270, and 315 degrees.

Wiring Diagrams

Provide a wiring diagram for each DMS and each controller cabinet, as well as interconnection wiring diagrams for the system as a whole.

Provide complete and detailed schematic diagrams to component level for all DMS assemblies and subassemblies such as driver boards, control boards, DMS controller, power supplies, and etc. Ensure that each schematic enables an electronics technician to successfully identify any component on a board or assemblies and trace its incoming and outgoing signals.

Routine of Operation

Describe the operational routine, from necessary preparations for placing the equipment into operation to securing the equipment after operation. Show appropriate illustrations with the sequence of operations presented in tabular form wherever applicable. Include in this section a total list of the test instruments, aids and tools required to perform necessary measurements and measurement techniques for each component, as well as set up, test, and calibration procedures.

Maintenance Procedures

Specify the recommended preventative maintenance procedures and checks at pre-operation, monthly, quarterly, semiannual, annual, and "as required" periods to assure equipment operates reliably. List specifications (including tolerances) for all electrical, mechanical, and other applicable measurements and / or adjustments.

Repair Procedures

Include in this section all data and step by step procedures necessary to isolate and repair failures or malfunctions, assuming the maintenance technicians are capable of analytical reasoning using the information provided in the section titled “Wiring Diagrams and Theory of Operation.”

Describe accuracy, limits, and tolerances for all electrical, physical, or other applicable measurements. Include instructions for disassembly, overhaul, and reassembly, with shop specifications and performance requirements.

Give detailed instructions only where failure to follow special procedures would result in damage to equipment, improper operation, danger to operating or maintenance personnel, etc. Include such instructions and specifications only for maintenance that specialized technicians and engineers in a modern electromechanical shop would perform. Describe special test set up, component fabrication, and the use of special tools, jigs, and test equipment.

Warranty

Ensure that the DMS system and equipment has a manufacturer’s warranty covering defects for a minimum of five (5) years from the date of final acceptance by the Engineer.

CONSTRUCTION METHODS

Description

This article establishes practices and procedures and gives minimum standards and requirements for the installation of DMS systems, auxiliary equipment and the construction of related structures.

Provide electrical equipment described in this specification that conforms to the standards of NEMA, UL, or Electronic Industries Association (EIA), wherever applicable. Provide connections between DMS equipment and DMS sign housing and electric utilities that conform to NEC standards.

Provide stainless steel screws, nuts, and locking washers in all external locations. Do not use self-tapping screws unless specifically approved by the Engineer. Use parts made of corrosion resistant materials, such as plastic, stainless steel, brass, or aluminum. Use construction materials that resist fungus growth and moisture deterioration. Separate dissimilar metals by an inert dielectric material.

Layout

The Design-Build Team shall determine the location of each DMS assembly and obtain the Engineer's approval of the locations prior to installation. It shall be the Design-Build Team's responsibility to ensure proper elevation, offset, and orientation of all DMS assemblies. The location of service poles as well as conduit lengths shown in the plans developed by the Design-Build Team, are approximate based on available project data. Make actual field measurements to place conduit and equipment at the required location.

Construction Submittal

When the work is complete, submit As-Built Plans, inventory sheets, and any other data required by the Engineer to show the details of actual construction and installation and any modifications made during installation.

The As-Built Plans shall show: the DMS, controller, and service pole locations; DMS enclosure and controller cabinet wiring layouts; and wire and conduit routing. Show all underground conduits and cables dimensioned from fixed objects.

Include detailed drawings that identify the routing of all conductors in the system by cable type, color code, and function. Clearly label all equipment in the DMS system, controller cabinet, and DMS enclosure.

Conduit

Install the conduit system in accordance with Section 1715 of the 2018 *Standard Specifications for Roads and Structures* and NEC requirements for an approved watertight raceway.

Make bends in the conduit so as not to damage it or change its internal diameter. Install watertight and continuous conduit with as few couplings as standard lengths permit.

Clean conduit before, during, and after installation. Install conduit in such a manner that temperature changes will not cause elongation or contraction that might damage the system.

Attach the conduit system to and install along the structural components of the DMS structure assemblies with beam clamps or stainless-steel strapping or inside the structure if there is available space. Install strapping according to the strapping manufacturer's recommendations and according to NEC requirements. Do not use welding or drilling to fasten conduit to structural components. Space the fasteners at no more than 4 feet for conduit 1.5 inches and larger or 6 feet for conduit smaller than 1.25 inches. Place fasteners no more than three feet from the center of bends, fittings, boxes, switches, and devices.

Flexible conduit will only be allowed when the conduits transition from the horizontal structure segment to the horizontal truss segment and from the horizontal truss segment to the rear entrance of the DMS when installing the DMS communications and feeder cables. The maximum length of flexible conduit allowed at each transition will be 5 feet.

Do not exceed the appropriate fill ratio on all cable installed in conduit as specified in the NEC.

Wiring Methods (Power)

Do not pull permanent wire through a conduit system until the system is complete and has been cleaned.

Color-code all conductors per the NEC. Use approved marking tape, paint, sleeves or continuous colored conductors for No.8 AWG and larger. Do not mark a white conductor in a cable assembly any other color.

Do not splice underground circuits unless specifically noted in the plans developed by the Design-Build Team.

Equipment and Cabinet Mounting

Mount equipment securely at the locations shown in the plans developed by the Design-Build Team, in conformance with the dimensions shown. Install fasteners as recommended by the manufacturer and space them evenly. Use all mounting holes and attachment points for attaching DMS enclosures and controller cabinets to the structures.

Drill holes for expansion anchors of the size recommended by the manufacturer of the anchors and thoroughly clean them of all debris.

Provide cabinets with all strapping hardware and any other necessary mounting hardware in accordance with this Project Special Provision and the plans developed by the Design-Build Team.

Seal all unused conduit installed in cabinets at both ends to prevent water and dirt from entering the conduit and cabinet with approved sealing material.

Install a ground bushing attached inside the cabinet on all metal conduits entering the cabinet. Connect these ground bushings to the cabinet ground bus.

Install a level concrete technician pad measuring a minimum 4 inches thick, 36 inches wide and 36 inches long at the front door of the DMS equipment cabinet as shown on the Typical Details sheet within the plans developed by the Design-Build Team.

Work Site Clean-Up

Clean the site of all debris, excess excavation, waste packing material, wire, etc. Clean and clear the work site at the end of each workday. Do not throw waste material in storm drains or sewers.

GENERAL TEST PROCEDURE

Test the DMS and its components in a series of functional tests and ensure the results of each test meet the specified requirements. These tests shall not damage the equipment. The Engineer will reject equipment that fails to fulfill the requirements of any test. Resubmit rejected equipment after correcting non-conformities and re-testing; completely document all diagnoses and corrective actions. Modify all equipment furnished under this contract, without additional cost to the Department, to incorporate all design changes necessary to pass the required tests.

Provide four copies of all test procedures and requirements to the Engineer for review and approval at least 30 days prior to the testing start date.

Only use approved procedures for the tests. Include the following in the test procedures:

- A step-by-step outline of the test sequence that demonstrates the testing of every function of the equipment or system tested
- A description of the expected nominal operation, output, and test results, and the pass / fail criteria
- An estimate of the test duration and a proposed test schedule
- A data form to record all data and quantitative results obtained during the test
- A description of any special equipment, setup, manpower, or conditions required by the test

Provide all necessary test equipment and technical support. Use test equipment calibrated to National Institute of Standards and Technology (NIST) standards. Provide calibration documentation upon request.

Conform to these testing requirements and the requirements of these specifications. It shall be the Design-Build Team's responsibility to ensure the system functions properly even after the Engineer accepts the CCTV test results.

Provide four copies of the quantitative test results and data forms containing all data taken, highlighting any non-conforming results and remedies taken, to the Engineer for approval. An authorized representative of the manufacturer must sign the test results and data forms.

COMPATIBILITY TESTS

DMS System

Compatibility Tests are applicable to DMS that the Design-Build Team wishes to furnish but are of a different manufacturer or model series than the existing units installed in the Region. If required, the Compatibility Test shall be completed and accepted by the Engineer prior to approval of the material submittal.

The Compatibility Test shall be performed in a laboratory environment at a facility chosen by the Engineer based on the type of unit being tested. Provide notice to the Engineer with the material

submitted that a Compatibility Test is requested. The notice shall include a detailed test plan that shows compatibility with existing equipment. The notice shall be given a minimum of 15 calendar days prior to the beginning of the Compatibility Test.

The Design-Build Team shall provide, install, and integrate a full-functioning unit to be tested. The Department will provide access to existing equipment to facilitate these testing procedures. The Engineer will determine if the Compatibility Test was acceptable for each proposed device. To prove compatibility the Design-Build Team shall be responsible for configuring the proposed equipment at the applicable Traffic Operations Center (TOC) with the accompaniment of an approved TOC employee.

OPERATIONAL FIELD TEST (ON-SITE COMMISSIONING)

DMS System

Final DMS locations must be field verified and approved by the Engineer. Perform the following local operational field tests at the DMS assembly field site in accordance with the test plans. The Design-Build Team shall be responsible for providing a laptop for camera control and positioning during the test. After completing the installation of the camera assemblies, including the camera hardware, power supply, and connecting cables, the Design-Build Team shall:

Local Field Testing

Furnish all equipment and labor necessary to test the installed camera and perform the following tests before any connections are made.

- Verify that physical construction has been completed
- Inspect the quality and tightness of ground and surge protector connections
- Check the power supply voltages and outputs, check connection of devices to power source
- Verify installation of specified cables and connection between the DMS and control cabinet
- Make sure cabinet wiring is neat and labeled properly; check wiring for any wear and tear; check for exposed or loose wires
- Perform the DMS assembly manufacturer’s initial power-on test in accordance with the manufacturer’s recommendation
- Set the DMS control address

Central Operations Testing

- Interconnect the DMS's communication interface device with one of the following methods as depicted on the plans developed by the Design-Build Team:
    - communication network's assigned Ethernet switch and assigned fiber-optic trunk cable and verify a transmit / receive LED is functioning and that the DMS is fully operational at the TOC.

    OR

    - to the DOT furnished cellular modem and verify a transmit / receive LED is functioning and that the DMS is fully operational at the TOC.
- Review DMS date and time and DMS controller information
- Run DMS diagnostics and review results
- Run DMS pixel test and review results
- Run test message
- Run test schedule
- Program burn-in scenario

Approval of Operational Field Test results does not relieve the Design-Build Team to conform to the requirements in these Project Special Provisions. If the DMS system does not pass these tests, document a correction or substitute a new unit as approved by the Engineer. Re-test the system until it passes all requirements.

NTCIP REQUIREMENTS

This section defines the NTCIP requirements for the DMSs covered by this Project Special Provision and the plans developed by the Design-Build Team.

References

A. Standards

This specification references several standards through their NTCIP designated names. The following list provides the full reference to the current version of each of these standards.

Implement the most recent version of the standard including any and all Approved or Recommended Amendments to these standards for each NTCIP Component covered by these project specifications. Refer to the NTCIP library at www.ntcip.org for information on the current status of NTCIP standards.

Abbreviated Number	Title
NTCIP 1201	*Global Object (GO) Definitions*
NTCIP 1203	*Object Definitions for Dynamic Message Signs*
NTCIP 2101	*SP-PMPP/232* *Subnet Profile for PMPP over RS-232*
NTCIP 2104	*SP-Ethernet* *Subnet Profile for Ethernet*
NTCIP 2201	*TP-Null* *Transport Profile*
NTCIP 2202	*Internet Transport Profile (TCP/IP and UDP/IP)*
NTCIP 2301	*AP for Simple Transportation Management Framework*

B. Features

Each DMS shall be required to support the following optional features, conformance groups and all functional requirements and objects that apply herein.

Feature	Reference
Time Management	NTCIP 1201 v3
Timebase Event Schedule	NTCIP 1201 v3
PMPP	NTCIP 1201 v3
Determine Sign Display Capabilities	NTCIP 1203 v03
Manage Fonts	NTCIP 1203 v03
Manage Graphics	NTCIP 1203 v03
Schedule Messages for Display	NTCIP 1203 v03
Change Message Display Based on and Internal Event	NTCIP 1203 v03
Control External Devices	NTCIP 1203 v03
Monitor Sign Environment	NTCIP 1203 v03
Monitor Door Status	NTCIP 1203 v03
Monitor Controller Software Operations	NTCIP 1203 v03
Monitor Automatic Blanking of Sign	NTCIP 1203 v03
Report	NTCIP 1103 v03

C. Objects

The following table represents objects that are considered optional in the NTCIP standards but are required by this specification. It also indicated modified objects value ranges for certain objects. Each DMS shall provide the full, standard object range support (FSORS) of all the objects required by these specifications unless otherwise stated below.

Object	Reference	Requirement
moduleTable	NTCIP 1201 - 2.2.3	Shall contain at least one row with moduleType equal to 3 (software) The moduleMake specifies the name of the manufacturer, the moduleModel specifies the manufacturer's name of the component and the moduleVersion indicates the model version number of the component.
maxTimeBaseScheduleEntries	NTCIP 1201 - 2.4.3.1	Shall be at least 28
maxDayPlans	NTCIP 1201 - 2.4.4.1	Shall be at least 20
maxDayPlanEvents	NTCIP 1201 - 2.4.4.2	Shall be at least 12
maxGroupAddresses	NTCIP 1201 - 2.7.1	Shall be at least 1
maxEventLogConfigs	NTCIP 1103 - A.7.4	Shall be at least 50
eventConfigMode	NTCIP 1103 - A.7.5.3	The DMS shall support the following Event Configurations: onChange, greaterThanValue, smallerThanValue
eventConfigLogOID	NTCIP 1103 - A.7.5.7	FSORS
eventConfigAction	NTCIP 1103 - A.7.5.8	FSORS
maxEventLogSize	NTCIP 1103 - A.7.6	Shall be at least 20
maxEventClasses	NCTIP 1103 - A.7.2	Shall be at least 16
eventClassDescription	NTCIP 1103 - A.7.3.4	FSORS
communityNamesMax	NTCIP 1103 - A.7.8	Shall be at least 3
numFonts	NTCIP 1203 - 5.4.1	Shall be at least 12
maxFontCharacters	NTCIP 1203 - 5.4.3	Shall be at least 255
defaultFlashOn	NTCIP 1203 - 5.5.3	The DMS shall support flash “on” times ranging from 0.1 to 9.9 seconds in 0.1 second increments
defaultFlashOnActive	NTCIP 1203 - 5.5.4	The DMS shall support flash “on” times ranging from 0.1 to 9.9 seconds in 0.1 second increments
defaultFlashOff	NTCIP 1203 - 5.5.5	The DMS shall support flash “off” times ranging from 0.1 to 9.9 seconds in 0.1 second increments
defaultFlassOffActive	NTCIP 1203 - 5.5.6	The DMS shall support flash “off” times ranging from 0.1 to 9.9 seconds in 0.1 second increments
defaultBackgroundColor	NTCIP 1203 - 5.5.2	The DMS shall support the black background color

defaultForegroundColor	NTCIP 1203 - 5.5.2	The DMS shall support the amber foreground color
defaultJustificationLine	NTCIP 1203 - 5.5.9	The DMS shall support the following forms of line justification: left, center, and right
defaultJustificationPage	NTCIP 1203 - 5.5.11	The DMS shall support the following forms of page justification: top, middle, and bottom
defaultPageOnTime	NTCIP 1203 - 5.5.13	The DMS shall support page “on” times ranging from 0.1 to 25.5 seconds in 0.1 second increments
defaultPageOffTime	NTCIP 1203 - 5.5.15	The DMS shall support page “off” times ranging from 0.0 to 25.5 seconds in 0.1 second increments
defaultCharacterSet	NTCIP 1203 - 5.5.21	The DMS shall support the eight bit character set
dmsMaxChangeableMsg	NTCIP 1203 - 5.6.3	Shall be at least 100.
dmsMessageMultiString	NTCIP 1203 - 5.6.8.3	The DMS shall support any valid MULTI string containing any subset of those MULTI tags listed in Table 3 (below)
dmsControlMode	NTCIP 1203 - 5.7.1	Shall support at least the following modes: local, central, and centralOverride
dmsSWReset	NTCIP 1203 - 5.7.2	FSORS
dmsMessageTimeRemaining	NTCIP 1203 - 5.7.4	FSORS
dmsShortPowerRecoveryMessage	NTCIP 1203 - 5.7.8	FSORS
dmsLongPowerRecoveryMessage	NTCIP 1203 - 5.7.9	FSORS
dmsShortPowerLossTime	NTCIP 1203 - 5.7.14	FSORS
dmsResetMessage	NTCIP 1203 - 5.7.11	FSORS
dmsCommunicationsLossMessage	NTCIP 1203 - 5.7.12	FSORS
dmsTimeCommLoss	NTCIP 1203 - 5.7.13	FSORS
dmsEndDurationMessage	NTCIP 1203 - 5.7.15	FSORS
dmsMultiOtherErrorDescription	NTCIP 1203 - 5.7.20	If the vendor implements any vendor-specific MULTI tags, the DMS shall provide meaningful error messages within this object whenever one of these tags generates an error
dmsIllumControl	NTCIP 1203 - 5.8.1	The DMS shall support the following illumination control modes: Photocell, and Manual

dmsIllumNumBrightLevels	NTCIP 1203 - 5.8.4	Shall be at least 100
dmsIllumLightOutputStatus	NTCIP 1203 - 5.8.9	FSORS
numActionTableEntries	NTCIP 1203 - 5.9.1	Shall be at least 200
watcdogFailureCount	NTCIP 1203 - 5.11.1.5	FSORS
dmsStatDoorOpen	NTCIP 1203 - 5.11.1.6	FSORS
fanFailures	NTCIP 1203 - 5.11.2.3.1	FSORS
fanTestActivation	NTCIP 1203 - 5.11.2.3.2	FSORS
tempMinCtrlCabinet	NTCIP 1203 - 5.11.4.1	FSORS
tempMaxCtrlCabinet	NTCIP 1203 - 5.11.4.2	FSORS
tempMinSignHousing	NTCIP 1203 -5.11.4.5	FSORS
tempMaxSignHousing	NTCIP 1203 -5.11.4.6	FSORS

D. MULTI Tags

Each DMS shall support the following message formatting MULTI tags. The manufacturer may choose to support additional standard or manufacturer specific MULTI tags.

Code	Feature
f1	field 1 - time (12hr)
f2	field 2 - time (24hr)
f8	field 8 - day of month
f9	field 9 - month
f10	field 10 - 2 digit year
f11	field 11 - 4 digit year
fl (and /fl)	flashing text on a line by line basis with flash rates controllable in 0.5 second increments.
fo	Font
jl2	Justification - line - left
jl3	Justification - line - center
jl4	Justification - line - right
jl5	Justification - line - full
jp2	Justification - page - top
jp3	Justification - page - middle
jp4	Justification - page - bottom
mv	moving text
nl	new line
np	new page, up to 2 instances in a message (i.e., up to 3 pages / frames in a message counting first page)
pt	page times controllable in 0.5 second increments.

E. Documentation

Supply software with full documentation, including a CD-ROM containing ASCII versions of the following MIB files in Abstract Syntax Notation 1 (ASN.1) format:

- The relevant version of each official standard MIB Module referenced by the device functionality.
- If the device does not support the full range of any given object within a Standard MIB Module, a manufacturer specific version of the official Standard MIB Module with the supported range indicated in ASN.1 format in the SYNTAX and / or DESCRIPTION fields of the associated OBJECT TYPE macro. Name this file identical to the standard MIB Module, except that it will have the extension ".man".
- A MIB Module in ASN.1 format containing any and all manufacturer-specific objects supported by the device with accurate and meaningful DESCRIPTION fields and supported ranges indicated in the SYNTAX field of the OBJECT-TYPE macros.
- A MIB containing any other objects supported by the device.

Allow the use of any and all of this documentation by any party authorized by the Department for systems integration purposes at any time initially or in the future, regardless of what parties are involved in the systems integration effort.

F. NTCIP Acceptance Testing

Test the NTCIP requirements outlined above by a third-party testing firm. Submit to the Engineer for approval a portfolio of the selected firm. Include the name, address, and a history of the selected firm in performing NTCIP testing along with references. Also provide a contact person's name and phone number. Submit detailed NTCIP testing plans and procedures, including a list of hardware and software, to the Engineer for review and approval ten days in advance of a scheduled testing date. Develop test documents based on the NTCIP requirements of these Project Special Provisions. The acceptance test will use the NTCIP Exerciser, and / or other authorized testing tools and will follow the guidelines established in the ENTERPRISE Test Procedures. Conduct the test in North Carolina on the installed system in the presence of the Engineer. Document and certify the results of the test by the firm conducting the test and submit the Engineer for review and approval. In case of failures, remedy the problem and have the firm retest in North Carolina. Continue process until all failures are resolved. The Department reserves the right to enhance these tests as deemed appropriate to ensure device compliance.

DMS PEDESTAL STRUCTURE

DESCRIPTION

This section includes all design, fabrication, furnishing, and erection of the DMS pedestal structure, platforms, walkways, ladders for access to the DMS inspection doors, and attachment of the DMS enclosures to the structure in accordance with the requirements of this Project

Special Provision and the plans developed by the Design-Build Team. Fabricate the supporting DMS assemblies from tubular steel. Furnish pedestal type DMS assemblies as shown in the plans developed by the Design-Build Team.

Provide pedestal DMS structures with a minimum of 25 feet clearance from the high point of the road to the bottom of the DMS enclosure.

Design the new DMS assemblies (including footings), DMS mounting assemblies, maintenance platforms, and access ladders and submit shop drawings for approval. A Professional Engineer that is registered in the state of North Carolina shall prepare such computations and drawings. These must bear his signature, seal, and date of acceptance.

The provisions of Section 900 of the 2018 *Standard Specifications for Roads and Structures* apply to all work covered by this section.

The Standard Provisions SP09R005 and SP09R007 found at the link below apply to all work covered by this section.

https://connect.ncdot.gov/resources/Specifications/Pages/2018-Specifications-and-Special-Provisions.aspx

It shall be the Design-Build Team's responsibility to verify DMS S-dimension elevation drawings for the DMS locations and provide them with the DMS shop drawings for the Engineer's approval.

MATERIALS

Use materials that meet the requirements of:

- Section 906 of the 2018 *Standard Specification for Roads and Structures*
- Standard Provision SP09R005 Foundations and Anchor Rod Assemblies for Metal Poles
- Standard Provision SP09R007 Overhead and Dynamic Message Sign Foundations

CONSTRUCTION METHODS

General

Construct DMS structures and assemblies in accordance with the requirements of:

- Section 906 of the 2018 *Standard Specification for Roads and Structures*
- Standard Provision SP09R005 Foundations and Anchor Rod Assemblies for Metal Poles
- Standard Provision SP09R007 Overhead and Dynamic Message Sign Foundations

DMS Maintenance Platform (Walkway)

Provide a maintenance platform (walkway), a minimum of three feet wide with open skid resistant surface and safety railing on the DMS assemblies for access to one of the DMS inspection doors as shown on the plans developed by the Design-Build Team. Provide platforms with fixed safety railings along both sides from the beginning of the platform to the inspection door. No gap will be allowed between walkway and inspection door or along any part of the safety rails.

Ensure the design, fabrication and installation of the access platforms on new DMS structures complies with the following:

A. The top of the platform grading surface is vertically aligned with the bottom of the DMS door.

B. The DMS door opens 90-degrees from its closed position without any obstruction from the platform or safety handrails.

C. The platform is rigidly and directly connected to the walkway brackets and there is no uneven surface between sections.

D. Install a 4” x 4” safety angle parallel to and along both sides of the platform and extend it the entire length of the platform. Design the safety angle to withstand loading equivalent to the platform.

E. Ensure the platform design allows full access to the DMS enclosure inspection door with no interference or obstructions.

DMS Access Ladder

Provide a fixed ladder, of the same material as the pedestal structures, leading to and ending at the access platform. Access to the ladder shall not be obstructed by the DMS foundation. Equip the ladder with a security cover (ladder guard) and lock to prohibit access by unauthorized persons. Furnish the lock to operate with a Corbin #2 key and furnish two keys per lock. Design the rungs on 12-inch center to center typical spacing. Start the first ladder rung no more than 18 inches above the landing pad. Attach the security cover approximately six feet above the concrete landing pad. Design the ladder and security cover as a permanent part of the DMS assembly and include complete design details in the DMS assembly shop drawings. Fabricate the ladder and cover to meet all OSHA requirements and applicable state and local codes, including but not limited to providing a ladder cage.

Furnish and install a level concrete pad a minimum of four inches deep, 24 inches wide, and 36 inches long to service as a landing pad for accessing the ladder. Design the landing pad to be directly below the bottom rung. Provide pre-formed or cast-in place concrete pads.

DIGITAL CCTV CAMERA ASSEMBLY

DESCRIPTION

Furnish and install a Digital CCTV Camera Assembly as described in these Project Special Provisions. All new CCTV cameras shall be fully compatible with the video management

software currently in use by the Region and the Statewide Traffic Operations Center (STOC). Provide a Pelco Spectra Enhanced low light 30X minimum zoom, Axis Dome Network Camera low light 30X minimum zoom or an approved equivalent that meets the requirements of this Project Special Provision.

Materials

A. General

Furnish and install new CCTV camera assembly at the locations shown on the plans developed by the Design-Build Team and as approved by the Engineer. Each assembly shall consist of the following:

- One dome CCTV color digital signal processing camera unit with zoom lens, filter, control circuit, and accessories in a single enclosed unit
- A NEMA-rated enclosure constructed of aluminum with a clear acrylic dome or approved equal Camera Unit housing.
- Motorized pan, tilt, and zoom
- Built-in video encoder capable of H.264/MPEG-4 compression for video-over IP transmission
- Pole-mount camera attachment assembly
- A lightning arrestor installed in-line between the CCTV camera and the equipment cabinet components.
- All necessary cable, connectors and incidental hardware to make a complete and operable system.

B. Camera and Lens

Cameras

Furnish a new CCTV camera that utilizes charged-coupled device (CCD) technology or Complementary Metal-Oxide-Semiconductor (CMOS) technology. The camera shall meet the following minimum requirements:

- Video Resolution: Minimum 1920x1080 (HDTV 1080p)
- Aspect Ratio: 16:9
- Overexposure protection: The camera shall have built-in circuitry or a protection device to prevent any damage to the camera when pointed at strong light sources, including the sun
- Low light condition imaging
- Wide Dynamic Range (WDR) operation
- Electronic Image Stabilization (EIS)
- Automatic focus with manual override

Zoom Lens

Furnish each camera with a motorized zoom lens that is a high-performance integrated dome system or approved equivalent with automatic iris control with manual override and neutral density spot filter. Furnish lenses that meet the following optical specifications:

- 30X minimum optical zoom, and 12X minimum digital zoom
- Preset positioning: minimum of 128 presets

The lens shall be capable of both automatic and remote manual control iris and focus override operation. The lens shall be equipped for remote control of zoom and focus, including automatic movement to any of the preset zoom and focus positions. Mechanical or electrical means shall be provided to protect the motors from overrunning in extreme positions. The operating voltages of the lens shall be compatible with the outputs of the camera control.

Communication Standards

The CCTV camera shall support the appropriate NTCIP 1205 communication protocol (version 1.08 or higher), ONVIF Profile G protocol, or approved equal.

Networking Standards

- Network Connection: 10/100 Mbps auto-negotiate
- Frame Rate: 30 to 60 fps
- Data Rate: scalable
- Built-in Web Server
- Unicast & multicast support
- Two simultaneous video streams (Dual H.264 and MJPEG):
    - Video 1: H.264 (Main Profile, at minimum)
    - Video 2: H.264 or MJPEG
- Supported Protocols: DNS, IGMPv2, NTP, RTSP, RTP, TCP, UDP, DHCP, HTTP, IPv4, IP6
- 130 db Wide Dynamic Range (WDR)

The video camera shall allow for the simultaneous encoding and transmission of the two digital video streams, one in H.264 format (high-resolution) and one in H.264 or MJPEG format (low- resolution).

Initially use UDP/IP for video transport and TCP/IP for camera control transport unless otherwise approved by the Engineer.

The 10/100BaseTX port shall support half-duplex or full-duplex and provide auto negotiation and shall be initially configured for full-duplex.

The camera unit shall be remotely manageable using standard network applications via web browser interface administration. Telnet or SNMP monitors shall be provided.

C. Camera Housing

Furnish new dome style enclosure for the CCTV assembly. Equip each housing with mounting assembly for attachment to the CCTV camera pole. The enclosures shall be equipped with a sunshield and be fabricated from corrosion resistant aluminum and finished in a neutral color of weather resistant enamel. The enclosure shall meet or exceed NEMA 4X ratings. The viewing area of the enclosure shall be tempered glass. The pendant shall meet NEMA Type 4X, IP66 rating and use 1-1/2-inch NPT thread. The sustained operating temperature shall be -50 to 60C (-58 to 144F), condensing temperature 10 to 100% Relative Humidity (RH).

D. Pan and Tilt Unit

Equip each new dome style assembly with a pan and tilt unit. The pan and tilt unit shall be integral to the high-performance integrated dome system. The pan and tilt unit shall be rated for outdoor operation, provide dynamic braking for instantaneous stopping, prevent drift, and have minimum backlash. The pan and tilt units shall meet or exceed the following specifications:

- Pan: continuous 360 Degrees rotation
- Tilt: up / down +2 to -90 degrees minimum
- Motors: Two-phase induction type, continuous duty, instantaneous reversing
- Preset Positioning: minimum of 128 presets
- Low latency for improved Pan and Tilt Control
- FCC, Class A; UL/cUL Listed

E. Video Ethernet Encoder

Furnish cameras with a built-in digital video Ethernet encoder to allow video-over-IP transmission. The encoder units shall be built into the camera housing and require no additional equipment to transmit encoded video over IP networks.

Encoders shall have the following minimum features:

- Network Interface: Ethernet 10/100Base-TX (RJ-45 connector)
- Protocols: IPv4, Ipv6, HTTP, UpnP, DNS, NTP, RTP, RTSP, TCP, UDP, IGMP, and DHCP
- Security: SSL, SSH, 802.1x, HTTPS encryption with password-controlled browser interface
- Video Streams: Minimum 2 simultaneous streams, user configurable
- Compression: H.264 (MPEG-4 Part 10/AVC)
- Resolution Scalable: NTSC-compatible 320x176 to 1920x1080 (HDTV 1080p
- Aspect Ratio: 16:9
- Frame Rate: 1-30 FPS programmable (full motion)
- Bandwidth: 30 kbps - 6 Mbps, configurable depending on resolution
- Edge Storage: SD/SDHC/SDXC slot supporting up to 64GB memory card

F. Control Receiver / Driver

Provide each new camera unit with a control receiver / driver that is integral to the CCTV dome assembly. The control receiver / driver will receive serial asynchronous data initiated from a camera control unit, decode the command data, perform error checking, and drive the pan / tilt unit, camer \ controls, and motorized lens. As a minimum, the control receiver / drivers shall provide the following functions:

- Zoom in / out
- Automatic focus with manual override
- Tilt up / down
- Automatic iris with manual override
- Pan right / left
- Minimum 128 preset positions for pan, tilt, and zoom, 16 Preset Tours, 256 Dome Presets
- Up to 32 Window Blanks.

In addition, each control receiver / driver shall accept status information from the pan / tilt unit and motorized lens for preset positioning of those components. The control receiver / driver will relay pan, tilt, zoom, and focus positions from the field to the remote camera control unit. The control receiver / driver shall accept "goto" preset commands from the camera control unit, decode the command data, perform error checking, and drive the pan / tilt and motorized zoom lens to the correct preset position. The preset commands from the camera control unit will consist of unique values for the desired pan, tilt, zoom, and focus positions.

G. Electrical

The camera assembly shall support Power-over-Ethernet (PoE) in compliance with IEEE 802.3. Provide any external power injector that is required for PoE with each CCTV assembly.

H. CCTV Camera Attachment to Pole

Furnish and install an attachment assembly for the CCTV camera unit. Use stainless steel banding approved by the Engineer.

Furnish CCTV attachments that allow for the removal and replacement of the CCTV enclosure as well as providing a weatherproof, weather tight, seal that does not allow moisture to enter the enclosure.

Furnish a CCTV Camera Attachment Assembly that can withstand wind loading at the maximum wind speed and gust factor called for in this Project Special Provisions and can support a minimum camera unit dead load of 45 pounds (20.4 kg).

I. Riser

Furnish material meeting the requirements of Section 1091-3 and 1098-4 of the 2018 *Standard Specifications for Roads and Structures*. Furnish a one-inch riser with weatherhead for instances where the riser is only carrying an Ethernet cable. For installations where fiber optic cable is

routed to the cabinet through a two-inch riser with heat shrink tubing the Design-Build Team may elect to install the Ethernet cable in the same riser with the fiber cable.

J. Data line Surge Suppression

Furnish data line surge protection devices (SPD) shall meet the following minimum requirements:

- UL497B
- Service Voltage: < 60 V
- Protection Modes: L-G (All), L-L (All)
- Response Time: <5 nanoseconds
- Port Type: Shielded RJ-45 IN / Out
- Clamping Level: 75 V
- Surge Current Rating: 20 kA/Pair
- Power Handling: 144 Watts
- Data Rate: up to 10 GbE
- Operating Temperature: -40º F to + 158º F
- Standards Compliance: Cat-5e, EIA/TIA 568A and EIA/TIA 568B
- Warranty: Minimum of 5-year limited warranty

The data line surge protector shall be designed to operate with Power Over Ethernet (POE) devices. The SPD shall be designed such that when used with shielded cabling, a separate earth ground is not required. It shall be compatible with Cat-5e, Cat 6, and Cat-6A cablings.

Protect the electrical and Ethernet cables from the CCTV unit entering the equipment cabinet with surge protection. Provide an integrated unit that accepts unprotected electrical and Ethernet connections and outputs protected electrical and Ethernet connections.

K. POE Injector

Furnish POE Injectors meeting the following minimum performance requirements and that is compatible with the CCTV Camera and Ethernet Switch provided for the project.

- Working temp / humidity: 14º F to 131º F / maximum 90%, non-condensing
- Connectors: Shielded RJ-45, EIA 568A and EIA 568B
- Input Power: 100 to 240 VAC, 50 to 60 Hz
- Pass Through Data Rates: 10/100/1000 Mbps
- Regulatory: IEEE 802.3at (POE)
- Number of Ports: 1 In and 1 Out
- Safety Approvals: UL Listed

Ensure the POE Injector is designed for Plug-and-Play installation, requiring no configurations and supports automatic detection and protection of non-standard Ethernet Terminal configurations.

CONSTRUCTION METHODS

General

Obtain approval of the camera locations and orientation from the Engineer prior to installing the CCTV camera assembly.

Mount CCTV camera units at a height to adequately see traffic in all directions and as approved by the Engineer. The maximum attachment height shall be 45 feet above ground level unless specified elsewhere or directed by the Engineer.

Mount the CCTV camera units such that a minimum five feet of clearance is maintained between the camera and the top of the pole.

Mount CCTV cameras on the side of poles nearest intended field of view. Avoid occluding the view with the pole.

Install the data line surge protection device and POE Injector in accordance with the manufacturer's recommendations.

Install the riser in accordance with Section 1722-3 of the 2018 *Standard Specifications for Roads and Structures*. Install the Ethernet cable in the riser from the field cabinet to the CCTV camera.

Electrical and Mechanical Requirements

Install an "Air Terminal and Lightning Protections System" in accordance with the Air Terminal and Lightning Protection System Specification for the CCTV Camera Assembly. Ground all equipment as called for in the Standard Specifications, these Special Provisions, and the plans developed by the Design-Build Team.

Install surge protectors on all ungrounded conductors entering the CCTV enclosure.

GENERAL TEST PROCEDURE

Test the CCTV Camera and its components in a series of functional tests and ensure the results of each test meet the specified requirements. These tests shall not damage the equipment. The Engineer will reject equipment that fails to fulfill the requirements of any test. Resubmit rejected equipment after correcting non-conformities and re-testing; completely document all diagnoses and corrective actions. Modify all equipment furnished under this contract, without additional cost to the Department, to incorporate all design changes necessary to pass the required tests.

Provide four copies of all test procedures and requirements to the Engineer for review and approval at least 30 days prior to the testing start date.

Only use approved procedures for the tests. Include the following in the test procedures:

- A step-by-step outline of the test sequence that demonstrates the testing of every function of the equipment or system tested

- A description of the expected nominal operation, output, and test results, and the pass / fail criteria
- An estimate of the test duration and a proposed test schedule
- A data form to record all data and quantitative results obtained during the test
- A description of any special equipment, setup, manpower, or conditions required by the test

Provide all necessary test equipment and technical support. Use test equipment calibrated to National Institute of Standards and Technology (NIST) standards. Provide calibration documentation upon request.

Conform to these testing requirements and the requirements of these specifications. It shall be the Design-Build Team's responsibility to ensure the system functions properly even after the Engineer accepts the CCTV test results.

Provide four copies of the quantitative test results and data forms containing all data taken, highlighting any non-conforming results and remedies taken, to the Engineer for approval. An authorized representative of the manufacturer shall sign the test results and data forms.

COMPATIBILITY TESTS

A. CCTV System

Compatibility Tests shall be applicable to CCTV cameras that the Design-Build Team wishes to furnish but are of a different manufacturer or model series than the existing units installed in the Region. If required, the Compatibility Test shall be completed and accepted by the Engineer prior to approval of the material submittal.

The Compatibility Test shall be performed in a laboratory environment at a facility chosen by the Engineer based on the type of unit being tested. Provide notice to the Engineer with the material submitted that a Compatibility Test is requested. The notice shall include a detailed test plan that will show compatibility with existing equipment. The notice shall be given a minimum of 15 calendar days prior to the beginning of the Compatibility Test.

The Design-Build Team shall provide, install, and integrate a full-functioning unit to be tested. The Department will provide access to existing equipment to facilitate these testing procedures. The Engineer will determine if the Compatibility Test was acceptable for each proposed device. To prove compatibility the Design-Build Team shall be responsible for configuring the proposed equipment at the applicable Traffic Operations Center (TOC) with the accompaniment of an approved TOC employee.

OPERATIONAL FIELD TEST (ON-SITE COMMISSIONING)

B. CCTV System

Final CCTV locations shall be field verified and approved by the Engineer. Perform the following local operational field tests at the camera assembly field site in accordance with the test plans. The Design-Build Team shall be responsible for providing a laptop for camera control and positioning during the test. After completing the installation of the camera assemblies, including the camera hardware, power supply, and connecting cables, the Design-Build Team shall:

Local Field Testing

Furnish all equipment and labor necessary to test the installed camera and perform the following tests before any connections are made.

- Verify that physical construction has been completed.
- Inspect the quality and tightness of ground and surge protector connections.
- Check the power supply voltages and outputs, check connection of devices to power source.
- Verify installation of specified cables and connection between the camera, PTZ, camera control receiver, and control cabinet.
- Make sure cabinet wiring is neat and labeled properly; check wiring for any wear and tear; check for exposed or loose wires.
- Perform the CCTV assembly manufacturer's initial power-on test in accordance with the manufacturer's recommendation.
- Set the camera control address.
- Exercise the pan, tilt, zoom, and focus operations along with preset positioning, and power on / off functions.
- Demonstrate the pan, tilt and zoom speeds and movement operation meet all applicable standards, specifications, and requirements.
- Define, test and / or change presets.
- Ensure camera field of view is adjusted properly and there are no objects obstructing the view.
- Ensure camera lens is dust-free.
- Ensure risers are bonded and conduits entering cabinets are sealed properly.
- Lightning arrestor bonded correctly.

Central Operations Testing

- Interconnect the CCTV Camera's communication interface device with one of the following methods as depicted on the plans developed by the Design-Build Team:
    - communication network's assigned Ethernet switch and assigned fiber-optic trunk cable and verify a transmit / receive LED is functioning and that the CCTV camera is fully operational at the TOC.

    OR

    - to the DOT furnished cellular modem and verify a transmit / receive LED is functioning and that the CCTV camera is fully operational at the TOC.
- Exercise the pan, tilt, zoom, and focus operations along with preset positioning, and power on / off functions.
- Demonstrate the pan, tilt and zoom speeds and movement operation meet all applicable standards, specifications, and requirements.
- Define, test and / or change presets.

Approval of Operational Field Test results does not relieve the Design-Build Team to conform to the requirements in these Project Special Provisions. If the CCTV system does not pass these tests, document a correction or substitute a new unit as approved by the Engineer. Re-test the system until it passes all requirements.

CCTV FIELD EQUIPMENT CABINET

DESCRIPTION

For standalone CCTV Camera installations, furnish 336S pole mounted cabinets to house CCTV control and transmission equipment. The cabinets shall consist of a cabinet housing, 19-inch EIA mounting cage, and power distribution assembly (PDA #3 as described in the CALTRANS TSCES).

The cabinet housing shall conform to Sections 6.2.2 (Housing Construction), 6.2.3 (Door Latches and Locks), 6.2.4 (Housing Ventilation), and 6.2.5 (Hinges and Door Catches) of the CALTRANS TSCES. Do not equip the cabinet housings with a police panel.

The cabinet cage shall conform to Section 6.3 of the CALTRANS TSCES.

Terminal blocks on the PDA #3 Assembly have internal wiring for the Model 200 switch pack sockets. Do not use terminal blocks on PDA #3 as power terminals for cabinet devices. Do not furnish cabinet with "Input Panels" described in Section 6.4.7.1 of the TSCES. Do furnish cabinet with "Service Panels" as described in Section 6.4.7.1 of the TSCES and as depicted on drawing TSCES-9 in the TSCES. Use service panel #2.

Do not furnish cabinets with C1, C5, or C6 harness, input file, output file, monitor units, model 208 unit, model 430 unit, or switch packs.

Furnish terminal blocks for power for cabinet CCTV and communications devices as needed to accommodate the number of devices in the cabinet.

Furnish all conduits, shelving, mounting adapters, and other equipment as necessary to route cabling, mount equipment and terminate conduit in the equipment cabinet.

MATERIALS

A. Shelf Drawer

Provide a pull out, hinged-top drawer, having sliding tracks, with lockout and quick disconnect feature, such as a Vent-Rak Retractable Writing Shelf, #D-4090-13 or equivalent in the equipment cabinet. Furnish a pullout drawer that extends a minimum of 14 inches that is capable of being lifted to gain access to the interior of the drawer. Minimum interior dimensions of the drawer are to be one inch high, 13 inches deep, and 16 inches wide. Provide drawers capable of supporting a 40-pound device or component when fully extended.

B. Cabinet Light

Each cabinet shall include two (2) fluorescent lighting fixtures (one front, one back) mounted horizontally inside the top portion of the cabinet. The fixtures shall include a cool white lamp and shall be operated by normal power factor UL-listed ballast. A door-actuated switch shall be installed to turn on the applicable cabinet light when the front door or back door is opened. The lights shall be mounted not to interfere with the upper door stay.

C. Surge Protection for System Equipment

Each cabinet shall be provided with devices to protect the CCTV and communications equipment from electrical surges and over voltages as described below.

Main AC Power Input

Each cabinet shall be provided with a hybrid-type, power line surge protection device mounted inside the power distribution assembly. The protector shall be installed between the applied line voltage and earth ground. The surge protector shall be capable of reducing the effect of lighting transient voltages applied to the AC line. The protector shall be mounted inside the Power Distribution Assembly housing facing the rear of the cabinet. The protector shall include the following features and functions:

- Maximum AC line voltage: 140 VAC
- Twenty pulses of peak current, each of which shall rise in 8 microseconds and fall in 20 microseconds to ½ the peak: 20000 Amperes
- The protector shall be provided with the following terminals:
    - Main Line (AC Line first stage terminal)
    - Main Neutral (AC Neutral input terminal)
    - Equipment Line Out (AC line second state output terminal, 19 amps)

- Equipment Neutral Out (Neutral terminal to protected equipment)
- GND (Earth connection)

- The Main AC line in and the Equipment Line out terminals shall be separated by a 200 Microhenry (minimum) inductor rated to handle 10 AMP AC Service.
- The first stage clamp shall be between Main Line and Ground terminals.
- The second stage clamp shall be between Equipment Line Out and Equipment Neutral.
- The protector for the first and second stage clamp shall have an MOV or similar solid state device rated at 20 KA and shall be of a completely solid-state design (i.e., no gas discharge tubes allowed).
- The Main Neutral and Equipment Neutral Out shall be connected together internally and shall have an MOV similar solid-state device or gas discharge tube rated at 20 KA between Main Neutral and Ground terminals.
- Peak Clamp Voltage: 350 volts at 20 KA. (Voltage measured between Equipment Line Out and Equipment Neutral Out terminals. Current applied between Main Line and Ground Terminals with Ground and Main Neutral terminals externally tied together).
- Voltage shall never exceed 350 volts.
- The Protector shall be epoxy-encapsulated in a flame-retardant material.
- Continuous service current: 10 Amps at 120 VAC RMS.
- The Equipment Line Out shall provide power to cabinet CCTV and communications equipment.

Ground Bus

Provide a neutral bus that is not connected to the earth ground or the logic ground anywhere within the cabinet. Ensure that the earth ground bus and the neutral ground bus each have ten compression type terminals, each of which can accommodate wires ranging from number 14 through number 4 AWG.

Uninterruptible Power Supply (UPS)

Furnish and install one rack mounted UPS in each new cabinet that meet the following minimum specifications:

Output

• Output Power Capacity	480 Watts / 750 VA
• Max Configurable Power	480 Watts / 750 VA
• Nominal Output Voltage	120V
• Output Voltage Distortion	Less than 5% at full load
• Output Frequency (sync to mains)	57 - 63 Hz for 60 Hz nominal

- Crest Factor up to 5:1
- Waveform Type Sine wave
- Output Connections (4) NEMA 5-15R

Input

- Nominal Input Voltage 120V
- Input Frequency 50/60 Hz +/- 3 Hz (auto sensing)
- Input Connections NEMA 5-15P
- Cord Length 6 feet
- Input voltage range for main operations 82 - 144V
- Input voltage adjustable range for mains operation 75 -154 V

Battery Type

- Maintenance-free sealed Lead-Acid battery with suspended electrolyte, leak- proof.
- Typical recharge time 2 hours

Communications & Management

- Interface Port(s) DB-9 RS-232, USB
- Control panel LED status display with load and battery bar-graphs

Surge Protection and Filtering

- Surge energy rating 480 Joules

Environmental

- Operating Environment -32 - 104 °F
- Operating Relative Humidity 0 - 95%
- Storage Temperature 5 - 113 °F
- Storage Relative Humidity 0 - 95%

Conformance

- Regulatory Approvals FCC Part 15 Class A, UL 1778

CONSTRUCTION METHODS

A. General

For each field equipment cabinet installation, use stainless steel banding or other methods approved by the Engineer to fasten the cabinet to the pole. Install field equipment cabinets so that the height to the middle of the enclosure is four feet from ground level. No risers shall enter the top or sides of the equipment cabinet.

Install all conduits, condulets, and attachments to equipment cabinets in a manner that preserves the minimum bending radius of cables and creates waterproof connections and seals.

Install a UPS in each cabinet and power all CCTV cameras from the UPS.

**** NOTE **** Deleted *CCTV Wood Pole* Project Special Provision

ETHERNET CABLE

DESCRIPTION

The Design-Build Team shall furnish and install Ethernet cable to serve as interconnect between Ethernet switches, PoE injectors, Signal Controllers and ITS devices.

MATERIALS

Furnish CAT6 Ethernet cable or better that complies with ANSI / TIA Standards for Balanced Twisted-Pair Telecommunications Cabling and Components Standards. Furnish cable that is suitable for outdoor installation with UV stabilization and meets or exceeds the following:

- Meets ANSI/TIA 568C.2 Networking Standard
- Supports 10/100/1,000/10,000 Mbps
- 1,000 Mbps @ 300 Meter Cable Length
- 10,000 Mpbs @ 50 Meter Cable Length
- 4 twisted pair cables
- 23 AWG (minimum) solid bare copper conductors (Copper clad aluminum is not allowed)
- 2+ twists per centimeter
- Nylon Spline to reduce cross talk
- Gel Filled High-density polyethylene insulation, PVC jacket
- Ascending / Descending Sequential Foot Markings
- Compliant with EIA/TIA standards
- UL/CSA listed
- UV Stabilized PE Jacket

Meets the following Minimum Electrical Operating Characteristics:

- Frequency Bandwidth: 1 - 250 MHz
- Attenuation (Insertion Loss): 19.8 dB
- Characteristic Impedance: 100 Ohms +/- 15
- Near-End Cross Talk - NEXT (Min.): 44.3 dB
- Power Sum Near-End Cross Talk PS-NEXT (Min.): 42.3 dB
- Equal-Level Far End Crosstalk (ELFEXT): 27.8 dB
- Power Sum Equal-Level Far End Crosstalk (PS-ELFEX): 24.8 dB
- Return Loss: 20.1 dB
- Delay Skew: 45 ns
- Connector Type: RJ45

The Ethernet cable shall be factory tested on reels for each pair's mutual capacitance, crosstalk loss, insulation resistance, and conductor resistance. Furnish the Engineer with a certified factory report for each reel showing compliance with this Project Special Provision, the factory test results, and the manufactured date of the cable. The Design-Build Team shall not use Ethernet cable manufactured more than one year before the date of installation.

Provide RJ-45 connectors with gold conductors that are terminated according to EIA/TIA 568 standards. Provide connectors with eight contacts. Furnish connectors appropriately rated for the cable being installed.

Ethernet patch cables used to interconnect equipment inside of a cabinet or equipment rack shall be factory terminated. Ethernet cables which run outside of the cabinet may be field terminated. Ethernet cables installed inside of buildings to interconnect switching rack equipment shall bare the Low Smoke / Zero Halogen (LSZH) designation. Ethernet cables installed inside of buildings and passes from one equipment room to another may be field terminated. For Ethernet patch cables used to connect equipment inside an equipment rack cabinet provide factory preterminated jumpers that minimize excessive slack that shall be dressed inside the cabinet but provides sufficient slack to make neat runs.

CONSTRUCTION METHODS

Install Ethernet cable in conduits, cabinets, junction boxes, risers, and on aerial messenger cable at locations shown in the plans developed by the Design-Build Team. Allow a minimum of ten feet of cable slack in the cabinet.

Ethernet cables shall not be spliced. Ethernet cables should not exceed lengths of 100 meters or 328 feet. In cases where the Ethernet cables exceed lengths of 100 meters or 328 feet a signal regenerator or Ethernet extender shall be used. All Ethernet cables shall be labeled with waterproof, smear resistant labels. The labels shall denote the equipment cabinets or housing they are routed from and the device and device identifier they are connected to.

The Design-Build Team shall not exceed 80 percent of the manufacturer's maximum pulling tension when installing underground Ethernet cable. Use a clutch device (dynamometer) so as not to exceed the allowable pulling tension if the cable is pulled by mechanical means. Do not use a motorized vehicle to generate cable-pulling forces.

Keep tension on the cable reel and the pulling line at the start of each pull. Do not release the tension in the cable if the pulling operation is halted. Restart the pulling operation by gradually increasing the tension until the cable is in motion.

PORTABLE CCTV CAMERA and TRAILER

DESCRIPTION

The Design-Build Team shall furnish, install, operate, maintain, relocate and remove a Portable CCTV Camera, designed to be towed by a ½ ton and ¾ ton pickup truck and erected in work zones and on roadside right of ways for remote video monitoring and incident management. Ensure the CCTV Camera equipment is fully compatible with all features of the existing video management software (Protronix Video Pro) currently in use by NCDOT in this region and at the Statewide Traffic Operations Center (STOC).

Furnish, deploy, install, test, integrate and make fully operational the new Portable CCTV Camera assembly at the location described or shown in the plans developed by the Design-Build Team and / or as directed by the Engineer. Contact the Engineer to confirm the Portable CCTV Camera assembly location prior to deploying in the field.

Each unit shall be new, and of the latest design of a model in current production or an update of an existing model. Prototype equipment shall not be acceptable. Each unit shall be furnished with identical and interchangeable equipment, options and features. It shall be furnished completely assembled, fully serviced, and ready for immediate operation.

The Department will provide a cellular modem to establish the communications link between the Portable CCTV Camera and the State Traffic Operations Center (STOC).

Trailer

The trailer shall be specifically designed to support and secure the Portable CCTV assembly, photovoltaic power source and other systems both in a deployed and travel position. It shall be capable of being towed at 65 miles per hour over extensive distances. Provide trailers that comply with Federal Motor Safety Regulations 393.

Trailer Construction

The frame including the trailer tongue shall be designed, constructed, and rated for the full capacity of the trailer. The frame shall be constructed of 3” x 3” and 3” x 5” square steel tubing (ASTM A36) with a minimum of 3/16 inch wall thickness and welded in accordance with applicable American Welding Society (AWS) standards. If counterweights are required, they shall be incorporated as an integral part of the frame. Provide a mast support assembly that shall safely support the camera mount and CCTV Camera when they are not deployed, and the trailer is in travel mode and when the camera mount and CCTV Camera are deployed. Provide the trailer with heavy-duty fenders capable of supporting a minimum of 200 lbs. Ensure the fenders are designed to minimize road surface water and debris from being thrown up on to the trailer equipment when being transported.

The towing tongue or drawbar shall be removable and shall include a two-inch ball hitch. The trailer shall tow level when attached to a two-inch ball mounted 18" high. Ensure the trailer tongue is removable and that no tools are required to remove or re-install the tongue. Provide an electrical connector for separation of the trailer safety lighting system where the trailer tongue connects to the trailer. Ensure the trailer tongue is rated for 6,000 lbs. Provide a tongue jack stand shall be heavy-duty; swivel mount castor wheel type design with a 1,200 lb. capacity (minimum). Ensure the tongue jack stand can be swiveled up and out of the way and held in place by a locking mechanism for transporting the trailer.

Safety chains shall be provided, of adequate length, meeting SAE J-697 Standard, latest edition. Chain shall be a minimum of 5/16", and meet the National Association of Chain Manufacturer’s (NACM) welded chain standard rating of Grade 70 with a Working Load Limit of 4700 lbs.

The trailer, springs and axels shall be rated for 2,500 lbs. and supplied with 15” (minimum) radial tires. Total combined load rating of the tires and wheels shall exceed the GVWR of the

unit. Load ratings shall be determined by reference to the current yearbook of the Tire and Rim Association, Inc., or the manufacturer's published load rating. Tire ratings shall be calculated at 65 mph.

Trailer GVWR shall not exceed 2,500 lbs. so a trailer braking system shall not be required. The trailer shall not require any special towing package, electric brakes or specialized heavy-duty truck to tow.

The trailer shall include a leveling system to allow for the trailer to be in a stable and level position when the jack legs are deployed. The trailer shall be equipped with (4) four crank style leveling jacks, one at each corner of the trailer that extend straight down with adequate lifting capacity and a large steel footpad to level and stabilize the trailer. Ensure the leveling jacks can be swiveled up and out of the way and held in place by a locking mechanism for transporting the trailer.

Lights / Reflectors and Safety Markings

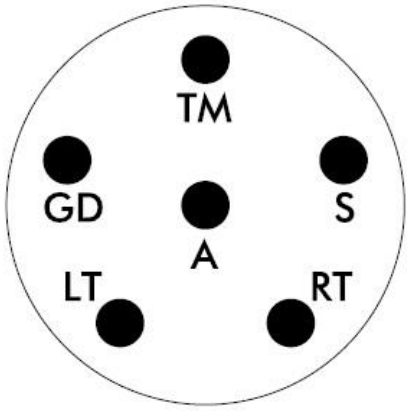
The trailer shall be equipped with lights and reflectors in compliance with applicable North Carolina motor vehicle laws and the Federal Motor Safety Carrier Regulations, including turn signals, dual taillights, and brake lights.

An illuminated license plate holder shall be mounted so that a license plate is protected and does not extend past sides of fenders.

The trailer sides and rear shall be marked with continuous red / white striped retroreflective tape in a pattern meeting applicable NHTSA (DOT) regulations using certified retroreflective material meeting ASTM D4956. The tape shall be three inches wide and installed in a repeating pattern of 11 inches long (red) followed by seven inches long (white).

Provide a standard six-way plug and receptacle connector, equal to and interchangeable with a Velvac 055049 assembly, and a heavy-duty jacketed multi-conductor cable shall be furnished for connecting the truck and trailer wiring system. All wiring shall be properly protected and secured. The receptacle shall be furnished loose, while the cable and plug shall be attached to the trailer in sufficient length to reach a truck-mounted receptacle, additionally provide an intermediate electrical connector where the wiring harness leaves the removeable tongue and the trailer body. The plug shall be connected to the trailer wiring system in accordance with the following drawing:

6–Way Trailer Connection



Letter Code	Trailer Color Code
GD – Brake Wire Ground	WHITE
TM – Tail & Marker Lamp	BLACK
S – Stop Lamp	RED
RT – Right Turn Signal	GREEN
LT – Left Turn Signal	YELLOW
A – Live Brake Wire	BROWN

Solar Power System

The CCTV Camera shall be powered by a photovoltaic system consisting of photovoltaic panels, deep-cycle batteries, solar charge controller and ancillary equipment and wiring. Under normal conditions, the power system should automatically recharge the battery system with no manual intervention. A motorized power supply requiring fossil fuels (i.e. gas, diesel generators, etc.) is not acceptable, however the system shall be designed and supplied with a NEMA L6-20 locking receptacle in an outdoor rated enclosure to allow for use of a stand-by generator or land-power (120V, single phase) when necessary. Land-Power can be used to charge the batteries when the units are in storage.

The unit shall satisfactorily operate in all weather conditions between -40 degrees F and +165 degrees F.

A bank of batteries forming a 12 VDC system shall power the unit during standard operations. The battery bank shall consist of 6 VDC deep cycle heavy duty lead / acid batteries wired in series / parallel as to form a 12 VDC system. Warranty service for the power source batteries shall be locally available on a nationwide basis.

The charging system for a trailer mounted device shall be solar, consisting of a photovoltaic array supplying electrical energy to the batteries through a solar regulator. The system shall provide “on demand” charging consistent with battery condition and with the ambient solar luminance at the photovoltaic array. The trailer shall also be equipped with a standard 120 VAC receptacle as well as a temperature-stable 120 VAC battery trickle charger and ammeter. The 120 VAC charging system shall initiate charging automatically when 120 VAC service is connected and shall be capable of completely charging the battery pack within a 24 to 48 - hour time period. The actual charging time will vary depending upon conditions and state of charge / discharge of the batteries.

A Maximum Power Point Tracking (MPPT) solar charge controller shall be provided and solar charging circuitry shall include voltage regulators and automatic battery temperature compensation control circuitry components to prevent battery overcharging. Batteries shall be of the, deep-cycle golf cart type / acid batteries (BCI Group GC-2) type. Ensure the battery capacity is adequate to operate the CCTV Camera continuously for at least 20 days with no external

charging (no sunlight). Additionally, provide a trickle charger circuitry to allow for standby generator or Land-Power operation when necessary. The system shall have the ability to remotely disconnect the power to the camera load when the available operating power falls below a specified threshold voltage.

The photovoltaic panels shall be mounted to the trailer structure in a rigid steel frame. The photovoltaic panel assembly shall be designed with tilt and rotation capabilities. For travel, ensure that the photovoltaic panel assemble is mounted so as not to interfere with the mast and camera. The panels and panel assembly shall be attached using anti-theft fasteners. Panels shall have tempered glass faces and be sealed.

The vendor, upon request, shall provide solar panel specifications including dimensions, voltage, wattage and the number of panels and cells to be used. Additionally, the vendor shall provide load calculations for the photovoltaic power system to operate the CCTV Camera and its supporting components in accordance with these specifications.

Loads for NCDOT furnished equipment are shown below. The solar and load calculations shall be performed and certified by a certified NABCEP Solar PV Installation Professional. The Manufacturer shall specify the power requirements for each component of the system including the camera, digital cellular modem and any other electrical loads present during normal operation.

The trailer shall include a NEMA 4X hinged, lockable enclosure to contain the power system control components to operate the CCTV Camera system, unless these components are located in a separate compartment within the battery compartment. The battery enclosure shall be lockable to prevent unauthorized access to the battery(s) and control components. All locks shall be keyed to accept a Corbin #2 key.

Additionally, a separate 12 x 12 x 6 (minimum) NEMA 4X hinged, lockable enclosure shall be provided to install switches, cellular communications modules, and control equipment for the CCTV Camera assembly.

The power system including solar panels shall be mounted onto the trailer and shall not exceed the dimensions of the trailer or cause the trailer GVWR (2,500 lb.) to be exceeded.

Equipment Variables (Typical) for Power Usage Calculations

1) Sierra Wireless Modem (Typical) - Provided by NCDOT
   Transmit / Receive (Typical/Max) - 230 mA/440mA @12 VDC
   Idle - 180 mA @ 12VDC

Camera Mast

The camera shall be mounted on a self-supporting mast allowing a camera to be raised to a height of 30 feet. The mast shall be made from galvanized steel and shall allow for telescoping action.

The unit shall satisfactorily operate in all weather conditions including up to a 100 mph wind load with the vertical post fully extended per the ASHTO Wind Load Standard. The mast may be raised and lowered by a single individual using a manual winch. In the raised position the camera mast shall be capable of being rotated 360 degrees. The mast shall mechanically lock in the raised position.

Once lowered, the mast may rotate down to be secured for transport. The mast shall mechanically lock in the lowered position for transport without removing the installed camera.

The vendor shall provide a drawing that shows camera mounting provisions provided. Camera wiring shall spiral around the mast to allow the mast to raise and lower. A two-inch diameter minimum (or acceptable equivalent) grommeted entrance way shall be provided to feed wiring through mount into camera.

Data Plaques and Serial Number

Each unit shall be provided with data plaque containing the manufacturer's serial number, model number and other manufacturer’s data unique to each unit, permanently attached and easily identified. The serial number shall be used by the Department and the manufacturer to identify units for recall, to aid in the recovery of stolen units, to establish ownership, and for other similar reasons. At a minimum, the serial number shall contain 17 characters and shall conform to Federal Vehicle Identification Numbering Standards (49 CFR 565).

A permanent data plaque shall be attached to each unit indicating serial number and model number using block lettering. Decals are not permitted.

Safety Plaques or Details

Product safety plaques or decals shall be furnished and affixed at the operator's station and at any hazardous area. The safety plaques or decals shall describe the nature of the hazard, level of hazard seriousness, how to avoid the hazard, and the consequence of human interaction with the hazard.

Permanent plaques mechanically attached are preferred to decals. Type, size and location of product safety plaques or decals shall be in accordance with current ANSIZ 535.4, or latest revision thereto.

Color

Each unit shall be thoroughly cleaned and prime coated with a rust preventative paint with a final coat that is either painted or powder coated meeting Federal Standard 595C Color Chip ID #12473 with a minimum paint thickness of 2.5 mils. Paint and primers used shall be leadfree. All data data plaques and safety decals / plaques shall be protected from being painted over.

CCTV Camera

Furnish and install CCTV assemblies described in these Project Special Provisions. All new CCTV cameras shall be fully compatible with the video management software (Protronix Video Pro) currently in use by NCDOT at the STOC.

Materials

Furnish and install a new CCTV camera assembly per portable trailer. Each assembly consists of the following:

- One dome CCTV color digital signal processing camera unit with zoom lens, filter, control circuit, and accessories in a single enclosed unit
- A NEMA-rated enclosure constructed of aluminum with a clear acrylic dome or approved equal Camera Unit housing
- Motorized pan, tilt, and zoom
- Built-in video encoder capable of H.264/MPEG-4 compression for video-over IP transmission
- Pole-mount camera attachment assembly
- A lightning arrestor installed in-line between the CCTV camera and the equipment cabinet components
- All necessary cable, connectors and incidental hardware to make a complete and operable system

Camera

Furnish new 1/3-inch charged-coupled device (CCD) color cameras. The sensors shall use Complementary Metal-Oxide-Semiconductor (CMOS) technology. The camera shall meet the following minimum requirements:

- Sensor size: 2 megapixels
- Video Resolution: 1920x1080 (HDTV 1080p)
- Aspect Ratio: 16:9
- Overexposure protection: The camera shall have built-in circuitry or a protection device to prevent any damage to the camera when pointed at strong light sources, including the sun
- Low light condition imaging
- Wide Dynamic Range (WDR) operation
- Electronic image stabilization
- Automatic focus with manual override
- Incoming session IP logging allows the monitoring of excess data usage.

Lens

Furnish each camera with a motorized zoom lens that is high performance integrated dome system or approved equivalent with automatic iris control with manual override and neutral density spot filter. Furnish lenses that meet the following optical specifications:

- 30X optical zoom, and 12X electronic zoom
- Preset positioning: 64 Presets

The lens shall be capable of both automatic and remote manual control iris and focus override operation. The lens shall be equipped for remote control of zoom and focus, including automatic movement to any of the preset zoom and focus positions. Mechanical or electrical means shall be provided to protect the motors from overrunning in extreme positions. The operating voltages of the lens shall be compatible with the outputs of the camera control.

Communications Standards

The CCTV camera shall support the appropriate NTCIP 1205 communication protocol (version 1.08 or higher), ONVIF, or approved equal.

Networking Standards

- Network Connection: 10/100 Mbps auto-negotiate
- Frame Rate: 30 to 60 fps
- Data Rate: scalable
- Built-in Web Server
- Unicast & multicast support
- Two simultaneous video streams (Dual H.264 and MJPEG):
    - Video 1: H.264 (Main Profile, at minimum)
    - Video 2: H.264 or MJPEG
- Supported Protocols: DNS, IGMPv2, NTP, RTSP, RTP, TCP, UDP, DHCP, HTTP, IPv4

The video camera shall allow for the simultaneous encoding and transmission of the two digital video streams, one in H.264 format (high-resolution) and one in H.264 or MJPEG format (low- resolution).

Initially use UDP/IP for video transport and TCP/IP for camera control transport unless otherwise approved by the Engineer.

The 10/100 BaseTX port shall support half-duplex or full-duplex and provide auto negotiation and shall be initially configured for full-duplex.

The camera unit shall be remotely manageable using standard network applications via web browser interface administration. Telnet or SNMP monitors shall be provided.

Camera Housing

Furnish new dome style enclosure for the CCTV assemblies. Equip each housing with mounting assembly for attachment to the CCTV camera telescoping pole. The enclosures shall be equipped with a sunshield and be fabricated from corrosion resistant aluminum and finished in a neutral color of weather resistant enamel. The enclosure shall meet or exceed NEMA 4X ratings. The viewing area of the enclosure shall be tempered glass.

Pan and Tilt Unit

Equip each new dome style assembly with a pan and tilt unit. The pan and tilt unit shall be integral to the high-performance integrated dome system. The pan and tilt unit shall be rated for outdoor operation, provide dynamic braking for instantaneous stopping, prevent drift, and have minimum backlash. The pan and tilt units shall meet or exceed the following specifications:

- Pan: continuous 360 Degrees
- Tilt: up / down +2 to -90 degrees minimum
- Motors: Two-phase induction type, continuous duty, instantaneous reversing
- Preset Positioning: 64 PTZ presets per camera

Video Ethernet Encoder

Furnish cameras with a built-in digital video Ethernet encoder to allow video-over-IP transmission. The encoder units shall be built into the camera housing and require no additional equipment to transmit encoded video over IP Networks.

Encoders shall have the following minimum features:

- Network Interface: Ethernet 10/100 Base-T (RJ-45 connector)
- Protocols: IPv4, IPv6, HTTP, HTTPS, SSL, QoS, FTP, SMTP, UPnP, SNMP v2c/v3, DNS, NTP, RTSP, RTP, TCP, UDP, IGMP, and DHCP
- Security: SSL, SSH, 802.1x, HTTPS encryption with password-controlled browser interface
- Video Streams: Minimum 2 simultaneous streams, user configurable
- Compression: H.264 (MPEG-4 Part 10/AVC)
- Resolution Scalable: NTSC-compatible 320x176 to 1920x1080 (HDTV 1080p, 16:9 aspect ratio)
- Frame Rate: 1-30 FPS programmable (full motion)
- Bandwidth: 30 kbps - 6 Mbps, configurable depending on resolution
- Edge Storage: SD/SDHC/SDXC slot supporting up to 64GB memory card

Central Receiver / Driver

Provide each new camera unit with a control receiver / driver that is integral to the CCTV dome assembly. The control receiver / driver shall receive serial asynchronous data initiated from a camera control unit, decode the command data, perform error checking, and drive the pan / tilt

unit, camera controls, and motorized lens. As a minimum, the control receiver / drivers shall provide the following functions:

- Zoom in / out
- Automatic focus with manual override
- Tilt up / down
- Automatic iris with manual override
- Pan right / left
- Minimum 64 preset positions for pan, tilt, and zoom

In addition, each control receiver / driver shall accept status information from the pan / tilt unit and motorized lens for preset positioning of those components. The control receiver / driver shall relay pan, tilt, zoom, and focus positions from the field to the remote camera control unit. The control receiver / driver shall accept "goto" preset commands from the camera control unit, decode the command data, perform error checking, and drive the pan / tilt and motorized zoom lens to the correct preset position. The preset commands from the camera control unit shall consist of unique values for the desired pan, tilt, zoom, and focus positions.

Surge Protection

Protect all equipment with metal oxide varistors connecting each power conductor to ground.

Protect the electrical and Ethernet cables from the CCTV unit entering the equipment cabinet with surge protection. Provide an integrated unit that accepts unprotected electrical and Ethernet connections and outputs protected electrical and Ethernet connections. Ethernet connections shall be RJ45 with full gigabit Ethernet transmission speeds and electrical connections shall be #22 - #14 AWG screw terminals. The surge protection unit shall comply with EIA/TIA568A and EIA/TIA568B standards for data transmission and automatically reset.

Wiring Diagrams

Provide a wiring diagram for each Portable CCTV assembly detailing the power system, including but not limited to, Solar charge controller, photovoltaic panels, batteries, stand-by generator / land power hook up, trickle charger circuitry and cellular modem. Ensure the wiring diagram references connections for CCTV Camera and controller and all other supporting devices and systems that comprise the whole system.

Routine Operations

Describe the operational routine, from necessary preparations for placing the equipment into operation to securing the equipment after operation. Show appropriate illustrations with the sequence of operations presented in tabular form wherever applicable. Include in this section a total list of the test instruments, aids and tools required to perform necessary measurements and measurement techniques for each component, as well as set-up, test, and calibration procedures.

TRAINING

A minimum one day of on-site training shall be conducted at the time of delivery or at a time as approved by the Engineer by representatives of the manufacturer's technical service personnel or factory trained authorized representative.

Training Materials

In conjunction with the delivery of each unit, the Design-Build Team shall supply one complete set of video operator training materials (DVD format preferred). This material shall adequately cover the safe and correct operation of the equipment.

CONSTRUCTION METHODS

Description

This article establishes practices and procedures and gives minimum standards and requirements for the installation of Portable CCTV camera and trailers and auxiliary equipment. Provide electrical equipment described in this specification that conforms to the standards of NEMA, UL, or Electronic Industries Association (EIA), wherever applicable.

Provide stainless steel screws, nuts, and locking washers in all external locations. Do not use self-tapping screws unless specifically approved by the Engineer. Use parts made of corrosion-resistant materials, such as plastic, stainless steel, brass, or aluminum. Use construction materials that resist fungus growth and moisture deterioration. Separate dissimilar metals by an inert dielectric material.

Mount the camera to the pole mount camera attachment assembly and secure to the assembly to the camera mast. Ensure camera wiring spirals around the mast to allow mast to raise and lower. A two-inch diameter minimum (or acceptable equivalent) grommeted entrance way shall be provided to feed wiring through mount into camera.

Deployment

The Department will establish the location of each Portable CCTV camera trailer assembly to be deployed on the Preliminary Incident Management Routes provided by the Department. The Department will approve the location of each Portable CCTV camera trailer assembly recommended to be deployed on the alternate Incident Management Route Plans developed by the Design-Build Team. It shall be the Design-Build Team's responsibility to ensure proper elevation, leveling, offset, and orientation of all Portable CCTV camera trailer assemblies. (Reference the Transportation Management Scope of Work found elsewhere in this RFP)

Construction Submittal

When the work is complete, submit As-Built Plans, inventory sheets, and any other data required by the Engineer to show the details of actual location and any modifications made during installation.

The As-Built Plans shall show each Portable CCTV camera trailer assembly location on a map with GPS coordinates, and dimensioned from fixed objects or intersecting roadways.

WARRANTY

Units shall be warranted against defects in materials and workmanship for a period of not less than twelve (12) months. The warranty period start date shall begin on the date of deployment and acceptance by the Engineer.

The unit shall be furnished with a copy of the warranty statement and any necessary cards, booklets, or certificates needed to receive warranty repairs at a dealership. Provide a list of approved factory-authorized part, service and warranty facilities.

PORTABLE CHANGEABLE MESSAGE SIGN FOR INCIDENT MANAGEMENT

Description

The Design-Build Team shall furnish, install, operate, maintain, relocate and remove Portable Changeable Message Signs that operate off a photovoltaic power source, that can be deployed as part of an Incident Management System, herein after referenced as a PCMS(IM). Furnish PCMS(IM) assemblies that are trailer mounted and designed to be towed by a ½ ton and ¾ ton pickup truck and erected in work zones and / or on roadside right of ways to relay Traffic Incident Management messages to the motoring public via a cellular interface.

PCMS(IM)s used for incident management on the State Highway System shall be compatible with the existing DMS Vanguard V4 Software deployed in the State. Furnish NTCIP compliant PCMS(IM)s that are fully compatible with Daktronics, Inc. Vanguard V4 software (also referred to hereinafter as the "Vanguard V4 Software").

Deploy and configure the new PCMS(IM) in accordance with the Incident Management Plan using the Vanguard V4 Software and computer system. Furnish, install, test, integrate and make fully operational the new PCMS(IM)at the location described or shown in the plans developed by the Design-Build Team and / or as directed by the Engineer. Contact the Engineer to confirm the PCMS(IM)location prior to deploying in the field.

Each unit shall be new, and of the latest design of a model in current production or an update of an existing model. Prototype equipment shall not be acceptable. Each unit shall be furnished with identical and interchangeable equipment, options and features. It shall be furnished completely assembled, fully serviced, and ready for immediate operation.

The Department will provide a cellular modem to establish the communications link between the PCMS(IM) and the Statewide Traffic Operations Center (STOC).

TRAILER

The trailer shall be specifically designed to support and secure the PCMS(IM) assembly, photovoltaic power source and other systems both in a deployed and travel position. It shall be

capable of being towed at 65 miles per hour over extensive distances. Provide trailers that comply with Federal Motor Safety Regulations 393.

Trailer Construction

The frame including the tongue shall be designed, constructed, and rated for the full capacity of the trailer. The frame shall be constructed of 3” x 3” and 3” x 5” square steel tubing (ASTM A36) with a minimum of 3/16 inch wall thickness and welded in accordance with the applicable American Welding Society (AWS) standards. If counterweights are required, they shall be incorporated as an integral part of the frame. Provide four (4) tie down rings with one (1) located near each corner. Provide the trailer with heavy-duty fenders capable of supporting a minimum of 200 lbs. Ensure the fenders are designed to minimize road surface water and debris from being thrown up on to the trailer equipment when being transported.

The towing tongue or drawbar shall be removable and incorporate a hydraulic surge braking system and shall include a two-inch ball hitch. The trailer shall tow level when attached to a two-inch ball mounted 18" high. Ensure the trailer tongue is removable and that no tools are required to remove or re-install the tongue. Furnish a hydraulic surge braking system built into the tongue with a manual lockout leaver or pin that shall allow the trailer to be backed up. Ensure the lockout leaver, if it is designed to fall out when the vehicle is in a forward motion shall be kept secure to the trailer by a lanyard. Ensure that during removal and reinstallation of the trailer tongue that the hydraulic brake lines can be connected / disconnected using hydraulic connectors and that upon reinstalling the tongue that the braking system does not have to be bled to provide normal braking operations. Additionally, provide an electrical connector for separation of the trailer safety lighting system where the trailer tongue connects to the trailer. Ensure the trailer tongue is rated for 6,000 lbs.

Provide a tongue jack stand that is of a heavy-duty design with a swivel mount castor wheel designed to support a 1,200 lb. capacity (minimum). Ensure the tongue jack stand can be swiveled up and out of the way and held in place by a locking mechanism for transporting the trailer.

Safety chains shall be provided, of adequate length, meeting SAE J-697 Standard, latest edition. Chain shall be a minimum of 5/16", and meet the National Association of Chain Manufacturer’s (NACM) welded chain standard rating of Grade 70 with a Working Load Limit of 4700 lbs.

The trailer, springs and axels shall be rated for 3,500 lbs. and supplied with 15” (minimum) radial tires. Total combined load rating of the tires and wheels shall exceed the GVWR of the unit. Load ratings shall be determined by reference to the current yearbook of the Tire and Rim Association, Inc., or the manufacturer’s published load rating. Tire ratings shall be calculated at 65 mph.

The trailer shall include a leveling system to allow for the trailer to be in a stable and level position when the sign’s jack legs, and auxiliary support legs are deployed. The trailer shall be equipped with (4) four crank style leveling jacks, one at each corner of the trailer that extend straight down with adequate lifting capacity and a large steel footpad to level and stabilize the trailer. Ensure the leveling jacks can be swiveled up and out of the way and held in place by a locking mechanism for transporting the trailer.

Provide additional stability by providing four stability legs, one attached in each corner that forms a 45-degree angle with the trailer and extend outward away from the trailer. Ensure the stability legs have means to lock the legs into place at one-inch increments along the entire length of the support leg. Each support leg shall extend a minimum of four feet laterally away from the trailer and each support leg shall have a large steel footpad to aid in stabilization. Ensure each stability leg can be locked into place for travel. Other options, such as swing out arms that rotate out a minimum of four feet away from the trailer with drop down stability legs is acceptable. Swing arms shall be able to be locked into multiple positions as they swing out from the trailer to accommodate obstructions encounter along the roadway.

Lights / Reflectors and Safety Markings

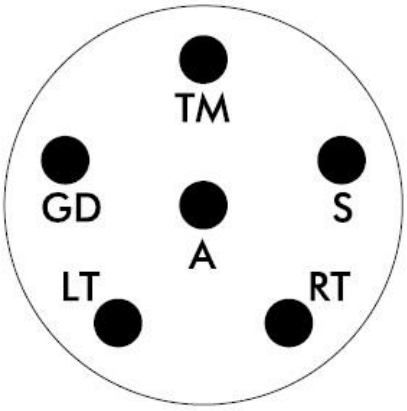
The trailer shall be equipped with lights and reflectors in compliance with applicable North Carolina motor vehicle laws and the Federal Motor Safety Carrier Regulations, including turn signals, dual taillights, and brake lights.

An illuminated license plate holder shall be mounted so that a license plate is protected and does not extend past sides of fenders.

The trailer sides and rear shall be marked with continuous red / white striped retroreflective tape in a pattern meeting applicable NHTSA (DOT) regulations using certified retroreflective material meeting ASTM D4956. The tape must be three inches wide and installed in a repeating pattern of 11 inches long (red) followed by seven inches long (white).

Provide a standard 6-way plug and receptacle connector, equal to and interchangeable with a Velvac 055049 assembly, and a heavy-duty jacketed multi-conductor cable shall be furnished for connecting the truck and trailer wiring system. All wiring shall be properly protected and secured. The receptacle shall be furnished loose, while the cable and plug shall be attached to the trailer in sufficient length to reach a truck-mounted receptacle, additionally provide an intermediate electrical connector where the wiring harness leaves the removeable tongue and the trailer body. The plug shall be connected to the trailer wiring system in accordance with the following drawing:

6–Way Trailer Connection



Letter Code	Trailer Color Code
GD – Brake Wire Ground	WHITE
TM – Tail & Marker Lamp	BLACK
S – Stop Lamp	RED
RT – Right Turn Signal	GREEN
LT – Left Turn Signal	YELLOW
A – Live Brake Wire	BROWN

Solar Power System

The PCMS(IM) shall be powered by a photovoltaic system consisting of photovoltaic panels, deep-cycle batteries, solar charge controller and ancillary equipment and wiring. Under normal conditions, the power system should automatically recharge the battery system with no manual intervention. A motorized power supply requiring fossil fuels (i.e. gas, diesel generators, etc.) is not acceptable, however the system shall be designed and supplied with a NEMA L6-20 locking receptacle in an outdoor rated enclosure to allow for use of a stand-by generator or land-power (120V, single Phase) when necessary. Land-Power can be used to charge the batteries when the units are in storage.

The unit shall satisfactorily operate in all weather conditions between -40 degrees F and +165 degrees F.

A bank of batteries forming a 12 VDC system shall power the unit during standard operations. The battery bank shall consist of 6 VDC deep cycle heavy duty lead / acid batteries wired in series / parallel as to form a 12 VDC system. Warranty service for the power source batteries shall be locally available on a nationwide basis.

The charging system for a trailer mounted device shall be solar, consisting of a photovoltaic array supplying electrical energy to the batteries through a solar regulator. The system shall provide “on demand” charging consistent with battery condition and with the ambient solar luminance at the photovoltaic array. The trailer shall also be equipped with a standard 120 VAC receptacle as well as a temperature-stable 120 VAC battery trickle charger and ammeter. The 120 VAC charging system shall initiate charging automatically when 120 VAC service is connected and shall be capable of completely charging the battery pack within a 24 to 48 - hour time period. The actual charging time will vary depending upon conditions and state of charge / discharge of the batteries.

A Maximum Power Point Tracking (MPPT) solar charge controller shall be provided and solar charging circuitry shall include voltage regulators and automatic battery temperature compensation control circuitry components to prevent battery overcharging. Batteries shall be of the, deep-cycle golf cart type / acid batteries (BCI Group GC-2) type. Ensure the battery capacity is adequate to operate the PCMS(IM) continuously for at least 20 days with no external charging (no sunlight). Additionally, provide a trickle charger circuitry to allow for standby generator or Land-Power operation when necessary. The system shall have the ability to remotely disconnect the power to the PCMS(IM) load when the available operating power falls below a specified threshold voltage.

The photovoltaic panels shall be mounted to the trailer or top of the sign structure in a rigid steel frame. The photovoltaic panel assembly shall be designed with tilt and rotation capabilities. Ensure that the photovoltaic panel assembly does not obstruct the sign face when rotated or tilted. The panels and panel assembly shall be attached using anti-theft fasteners. Panels must have tempered glass faces and be sealed.

Design the field controller to monitor the operational status (normal or failed) of the power system and be able to display this information on the Client Computer screen.

The vendor, upon request, must provide solar panel specifications including dimensions, voltage, wattage and the number of panels and cells to be used. Additionally, the vendor shall provide load calculations for the photovoltaic power system to operate the sign and its supporting components in accordance with these specifications.

Loads for NCDOT furnished equipment are shown below. The solar and load calculations shall be performed and certified by a certified NABCEP Solar PV Installation Professional. The Manufacturer must specify the power requirements for each component of the system including the cellular modem and any other electrical loads present during normal operation.

The trailer shall include a NEMA 4X hinged, lockable enclosure to contain the power system control components to operate the PCMS(IM) system, unless these components are located in a separate compartment within the battery compartment. The battery enclosure shall be lockable to prevent unauthorized access to the battery(s) and control components. All locks shall be keyed to accept a Corbin #2 key.

Additionally, a separate 12 x 12 x 6 (minimum) NEMA 4X hinged, lockable enclosure shall be provided to install switches, cellular communications modules, and control equipment for the PCMS(IM) assembly.

The power system including solar panels shall be mounted onto the trailer and shall not exceed the dimensions of the trailer or cause the trailer GVWR (5,500 lb.) to be exceeded.

Equipment Variables (Typical) for Power Usage Calculations

1) Sierra Wireless Modem (Typical) - Provided by NCDOT
   Transmit / Receive (Typical / Max) - 230 mA/440mA @ 12 VDC
   Idle - 180 mA @ 12 VDC

Sign Mast

The sign shall be mounted on a self-supporting mast of either square or tube steel meeting ASTM A 513 requirements. Design the mast such that it can raise and lower the sign by having one section of the support slide inside of the other support. Ensure the mast design allows the sign (at its maximum height) to be raised such that the bottom of the sign is no less than seven feet above grade. Mount the sign in a vertical position for transporting. Ensure the sign and trailer are supplied with a positive locking device to secure the sign in position when it is in travel mode or operational mode.

The unit shall satisfactorily operate in all weather conditions including up to a 100 mph wind load with the vertical post fully extended per the ASHTO Wind Load Standard. Provide a mast lowering and raising system that uses and electrically powered hydraulic pump with a manual backup system should the electric pump become disabled. The sign shall be capable of being rotated 360 degrees in the raised position. It is permissible for the mast to be rotated 360 degrees to meet this requirement.

Data Plaques and Serial Number

Each unit shall be provided with data plaque containing the manufacturer's serial number, model number and other manufacturer's data unique to each unit, permanently attached and easily identified. The serial number shall be used by the Department and the manufacturer to identify units for recall, to aid in the recovery of stolen units, to establish ownership, and for other similar reasons. At a minimum the serial number shall contain 17 characters and shall conform to Federal Vehicle Identification Numbering Standards (49 CFR 565).

A permanent data plaque shall be attached to each unit indicating serial number and model number using block lettering. Decals are not permitted.

Safety Plaques or Details

Product safety plaques or decals shall be furnished and affixed at the operator's station and at any hazardous area. The safety plaques or decals shall describe the nature of the hazard, level of hazard seriousness, how to avoid the hazard, and the consequence of human interaction with the hazard.

Permanent plaques mechanically attached are preferred to decals. Type, size and location of product safety plaques or decals shall be in accordance with current ANSIZ 535.4, or latest revision thereto.

Color

Each unit shall be thoroughly cleaned and prime coated with a rust preventative paint with a final coat that is either painted or powder coated meeting Federal Standard 595C Color Chip ID #12473 with a minimum paint thickness of 2.5 mils. Paint and primers used shall be leadfree. All data plaques and safety decals/plaques shall be protected from being painted over.

CHANGEABLE MESSAGE SIGN

Furnish and install sign assemblies described in this Project Special Provision. All new signs and sign controllers shall be NTCIP compliant and shall be fully compatible with the DMS Vanguard V4 Software deployed in the State.

General

Construct the PCMS(IM) and controller cabinet so the equipment within is protected against moisture, dust, corrosion, and vandalism. Ensure the completed sign assembly and trailer meets the following minimum requirements:

- Height (Raised) not to exceed 182 inches.
- Height (Travel Mode) not to exceed 113 inches
- Completed Display Panel Size not to exceed 83 inches tall by 145 inches long.
- Trailer weigh of complete assembly including the sign assembly: 2060 pounds (approximate)

Sign

Construct the PCCMS(IM) to display messages that are visible from ½ mile away and legible with three lines of text to a person with 20/20 corrected vision from a distance of 1000 feet in advance of the PCMS(IM) at an eye height of 3.5 feet along the axis.

Provide a continuous matrix sign that is capable of displaying three (3) lines of text, each line must display at least nine (9) equally spaced and equally sized 18-inch-high individual alphanumeric characters. Ensure each character is scalable up to a maximum of 18 inches in height. Provide a message sign panel that consists of a minimum of 30 pixels high and 56 pixels wide.

Discrete LED's

Provide LED's that utilize an aluminum indium gallium phosphide (AlInGaP) substrate material that emit a true amber color at a wavelength of 590 ± 5 nm. Provide LED's with a MTBF (Mean Time Before Failure) of at least 100,000 hours of permanent use at an operating point of 140° F or below at a specific forward current of 20mA.

Pixel Compilation

Design each pixel to consist of a cluster of four (4) or more LED's and produces a minimum luminous intensity of 40 candles.

Display Modules

- Display modules shall be 100% solid state with no moving parts and shall be identical to, and mutually interchangeable with, all other modules.
- No field hardware or programming modifications shall be required to exchange or replace individual display modules. Display modules shall be self-addressing within the matrix.
- Each display module shall contain the LED driver circuitry necessary to operate its associated LED's.
- There shall be no separate driver boards between the display modules and the CPU.
- Each individual module shall have the following layout characteristics specific to the sign type:

    - Pixel layout per module - 35 Standard, 7 Rows X 5 Columns
    - Pixel spacing (maximum) - 2.70" Wide (row) x 2.80" High (column)
    - LED angularity - 30 degrees

- Display modules shall be designed for plug and play operation.
- Furnish two (2) spare display modules per each PCMS(IM) for emergency restoration. Provide storage and a means to protect them from damage that could be experienced during sign transport.

Message Sign Panel Matrix

Ensure the full matrix panel consists of a minimum of 28 to 30 pixels long x 50 to 56 pixels tall. Ensure the sign panel is scalable to provide as a minimum of the following:

- 3 lines of text with 9 characters per line (5 by 7 font)
- 3 lines of text with 12 characters per line (3 by 7 font)

Each panel matrix has built in circuitry to monitor and determine pixel failure and that the host software and local control system can identify the location of the failed pixel.

Sign Case

Ensure the sign display face is covered by a clear polycarbonate material.

Protect the sign display face with multiple contiguous, weather-tight, removable panels. The panels must be a polycarbonate material that is ultraviolet protected, have an antireflection coating, and is a minimum of 3/16 inch thick.

Furnish polycarbonate panels with the following characteristics:

- Tensile Strength, Ultimate: 10,000 PSI
- Tensile Strength, Yield: 9,300 PSI
- Tensile Strain at Break: 125%
- Tensile Modulus: 330,000 PSI
- Flexural Modulus: 330,000 PSI
- Impact Strength, Izod (1/8”, notched): 17 ft-lbs./inch of notch
- Rockwell Hardness: M75, R118
- Heat Deflection Temperature Under Load: 264 PSI at 270F and 66 PSI at 288F
- Coefficient of Thermal Expansion: 3.9X10-5 in/in/F
- Specific Heat: 0.30 BTU/lb./F
- Initial Light Transmittance: 85% minimum
- Change in Light Transmittance, 3 years exposure in a Southern latitude: 3%
- Change in Yellowness Index, 3 years exposure in a Southern latitude: less than 5%

Ensure the border around the sign face is painted flat black to reduce glare so as not to effect viewing of the message caused by ambient solar illumination or from vehicle headlights. Construct the sign case support structure out of extruded aluminum meeting ASTM B 209 6063-T5 and 6061-T6 standards and aluminum panels / sheet material meeting ASTM 3003-H14 standards. Ensure all exterior housing surfaces, excluding the sign face, and all interior housing surfaces are a natural aluminum mill finish. Ensure signs are fabricated, welded, and inspected in accordance with the requirements of the current ANSI/AWS Structural Welding Code-Aluminum.

Over all dimensions of the completed sign case assembly shall not exceed 140” wide by 82’ tall by 6 ½” thick.

Sign Control System

The operator's control console including all remote entry keyboard / keypad systems shall consist of the following:

- Keyboard / keypad
- Keyboard / keypad authorization key switch or password protected graphic touchscreen controller
- Three (3) line color LCD display which exactly duplicates the actual sign display
- Power start and stop
- Sign raise and lower
- Sign message selection
- Message flash rate
- Event time clock
- Battery voltage gauge
- Monitor the operational status (normal or failed) of the power system
- Messages shall be generated through the keyboard / keypad
- The keyboard / keypad shall enable the user to generate an infinite number of messages
- An electronic automatic dimming device shall be provided which senses ambient light conditions and automatically dims the brightness of LED pixels.
- A manual dimmer switch shall be provided to override the automatic dimming device
- Ensure the system can determine and identify via the host software and local control system software any pixel failures.
- Sign shall be capable of displaying all alphanumeric characters (numbers and letters), full size chevrons, dynamic moving arrows (left and right), small directional arrows, and 26 symbol messages as per Part VI of the MUTCD.

NTCIP Compliance / Compatibility

The portable Changeable Message Sign controller hardware / firmware and Vanguard V4 Software shall comply with the most recent revision of the AASHTO-ITE-NEMA Joint Committee standards for NTCIP at the time of delivery:

(1) 1201 - NTCIP Global Object Definitions
(2) 1203 - NTCIP Object Definitions for Dynamic Message Signs
(3) 2101 - NTCIP Subnet Profile for PMPP over RS-232
(4) 2104 - NTCIP Subnet Profile for Ethernet
(5) 2201 - NTCIP Transport Profile
(6) 2202 - NTCIP Internet Transport Profile
(7) 2301 - Simple Transportation Management Framework

All mandatory objects applicable to portable PCMS(IM) operations including battery status shall be implemented with Full Standardized Object Range Support (FSORS).

A complete list of all objects to be implemented shall be submitted for review and approval to NCDOT prior to any PCMS(IM) delivery.

Functions

- Message editing / input into memory from a remote location utilizing a computer, application software and any method described in the section above.
- The sign controller shall be equipped with at least two (2) 10/100bT Ethernet ports and one (1) RS-232 port to allow for on-site and remote access using a communication method defined in section above.
- A Department supplied cellular modem shall be furnished with a cell antenna, GPS antenna and surge protection. Ensure the equipment enclosure provides for mounting the cellular modem inside the cabinet and means of egress for the antennas.
- The sign controller shall have the capability to store 230 three page pre-programmed and user generated messages with a 5-year battery backup.
- The sign controller shall be located inside the sign control cabinet and all its communications ports shall be readily accessible.
- Design the controller to display a message on the sign sent by the Vanguard V4 Software, a message stored in the sign controller memory, or a message created on site by an operator using the controller keypad.

Sign Controller Address

Assign the PCMS(IM) controller a unique address. Preface all commands from the Vanguard V4 Software with a particular PCMS(IM) controller address. The PCMS(IM) controller compares its address with the address transmitted; if the addresses match, then the controller processes the accompanying data. IP address shall support IPv4 and IPv6.

Wiring Diagrams

Provide a wiring diagram for each PCMS(IM) detailing the power system, including but not limited to, Solar charge controller, photovoltaic panels, batteries, standby generator / land power hook up, trickle charger circuitry and cellular modem. Ensure the wiring diagram includes the sign controller and all other supporting devices and systems that comprise the whole system.

Provide complete and detailed schematic diagrams to component level for all PCMS(IM) assemblies and subassemblies such as driver boards, control boards, PCMS(IM) controller, power supplies, LED display modules and etc. Ensure that each schematic enables an electronics technician to successfully identify any component on a board or assemblies and trace its incoming and outgoing signals.

Routine Operation

Describe the operational routine, from necessary preparations for placing the equipment into operation to securing the equipment after operation. Show appropriate illustrations with the

sequence of operations presented in tabular form wherever applicable. Include in this section a total list of the test instruments, aids and tools required to perform necessary measurements and measurement techniques for each component, as well as set-up, test, and calibration procedures.

TRAINING

A minimum one day of on-site training shall be conducted at the time of delivery or at a time as approved by the Engineer. Trainers shall be representatives of the manufacturer's technical service personnel or a factory trained authorized representative.

Training Materials

In conjunction with the delivery of each unit, Design-Build Team shall supply one complete set of video operator training materials (DVD format preferred). This material shall adequately cover the safe and correct operation of the equipment.

CONSTRUCTION METHODS

Description

This article establishes practices and procedures and gives minimum standards and requirements for the installation of Portable Changeable Message Signs for incident Management activities along with auxiliary equipment requirements. Provide electrical equipment described in this specification that conforms to the standards of NEMA, UL, or Electronic Industries Association (EIA), wherever applicable.

Provide stainless steel screws, nuts, and locking washers in all external locations. Do not use self-tapping screws unless specifically approved by the Engineer. Use parts made of corrosion-resistant materials, such as plastic, stainless steel, brass, or aluminum. Use construction materials that resist fungus growth and moisture deterioration. Separate dissimilar metals by an inert dielectric material.

Deployment

The Department will establish the location of each PCMS(IM) assembly to be deployed on the Preliminary Incident Management Routes provided by the Department. The Department will approve the location of each PCMS(IM) assembly recommended to be deployed on the alternate Incident Management Route Plans developed by the Design-Build Team. It shall be the Design-Build Team's responsibility to ensure proper elevation, leveling, offset, and orientation of all PCMS(IM) assemblies. (Reference the Transportation Management Scope of Work found elsewhere in this RFP)

Construction Submittal

When the work is complete, submit As-Built Plans, inventory sheets, and any other data required by the Engineer to show the details of actual location and any modifications made during installation.

The As-Built Plans shall show the PCMS(IM) location on a map with GPS coordinates, and dimensioned from fixed objects or intersecting roadways.

WARRANTY

Units shall be warranted against defects in materials and workmanship for a period of not less than twelve (12) months. The warranty period start date shall begin on the date of delivery and acceptance by the Engineer.

The unit shall be furnished with a copy of the warranty statement and any necessary cards, booklets, or certificates needed to receive warranty repairs at a dealership. Provide a list of approved factory-authorized part, service and warranty facilities.

AIR TERMINAL & LIGHTNING PROTECTION SYSTEM

DESCRIPTION

Furnish an air terminal and lightning protection system that is comprised of items meeting UL 96 and UL 467 product standards for lightning protection and installed to be compliant with the National Fire Protection Association 780 Standards for Lightning Protection Systems. The lightning protection system shall consist of, as a minimum, an Air Terminal, vertical Air Terminal Base (wood pole) or Air Terminal Rod Clamps (metal pole), 28-Strand bare-copper lightning conductor, 4-point grounding systems (grounding electrodes), #4 AWG copper bonding conductors, marker tape and other miscellaneous hardware.

Materials

General

Reference the following Typical Details where applicable:

CCTV Camera Installation for Metal Pole with Aerial Electrical Service

- CCTV Camera Installation for Metal Pole with Underground Electrical Service
- CCTV Camera Installation for Wood Pole with Aerial Electrical Service
- CCTV Camera Installation for Wood Pole with Underground Electrical Service

The above details can be found at the following website:

https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

Wood Pole

Furnish a UL Listed Class II, copper clad minimum 48” long by ½” diameter air terminal. Ensure the air terminal has a tapered tip with a rounded point on one end and is threaded on the connection end with standard Unified Coarse (UNC) 13 threads per inch.

Furnish a copper vertical air terminal base that has internal threading to accept a ½" diameter air terminal with UNC 13 threads per inch. Provide a base that allows for a minimum ¼" mounting hole to secure the base to the vertical side of a wood pole. Ensure the air terminal base includes (2) 5/16" cap screws to secure the bare copper lightning conductor. Additionally, provide (2) ½" copper tube straps (conduit clamps) to secure the air terminal and bare copper lightning conductor to the pole.

Metal Pole

Furnish a UL Listed Class II, stainless steel minimum 48" long by ½" diameter air terminal with a tapered tip with a rounded point on one end. No threading is required on the opposing end.

Furnish an air terminal rod clamp manufactured out of 304 stainless steel. Ensure the air terminal rod clamp has two horizontal support arms that are 2" wide by 3/16" thick and design to offset the air terminal approximately 8" away from the metal pole. Ensure the support arms at the point where the air terminal is to be installed has an internal crease to secure the air terminal along with four (4) bolts to provide the clamping action between the two support arms. Provide two (2) stainless steel banding clamps to secure the air terminal rod clamp's base plate to the metal pole.

Copper Lightning Conductor and Ground Rods

Furnish a Class II rated copper lightning conductor which consists of 28 strands (minimum) of 15 AWG copper wires to form a rope-lay bare copper lightning conductor. Furnish 5/8" diameter, 10-foot long copper-clad steel ground rods with a 10-mil thick copper cladding to serve as an integral part of the 4-point grounding system. Furnish irreversible mechanical clamps to secure the 28-strand lightning conductor, #4 AWG bare copper ground wires and grounding electrodes together to complete the grounding system.

Construction Methods

Wood Pole

Install the vertical air terminal base approximately 12" below the top of the wood pole and install the air terminal to the threaded connection on the base. Install a ½" copper tube strap (conduit clamp) over the air terminal, 6" from the top of the pole. Additionally, secure the copper lightning conductor under both 5/16" diameter cap screws located on the base. Install an additional ½" copper tube strap (conduit clamp) over the bare copper lightning conductor, 6" below the air terminal base. Locate the ¼" mounting hole on the vertical air terminal base and install a ¼" by 3" (minimum) long lag bolt through the base and into the wood pole to support the air terminal assembly.

Route the bare copper lightning conductor to maintain maximum horizontal separation from any risers that traverse up the pole. Secure the bare copper lightning conductor to the pole on 24" centers using copper cable clips. From the bottom of the pole (ground level) install a 2" by 10' long PVC U-Guard over the bare copper lightning conductor to protect the cable from vandalism.

Metal Pole

Install two (2) stainless steel air terminal rod clamps to the side of the metal pole structure starting at 6" below the top of the pole with the second air terminal clamp 12" from the top of the pole (approximately 6" of separation between the 2 clamps). Secure each air terminal rod clamp to the pole structure with two (2) stainless steel banding clamps. Install the air terminal between the horizontal support arms on each air terminal rod clamp and tighten the bolts to provide a secure connection.

Copper Lightning Conductor and Ground Rods

Install the 4-point grounding system by installing a central grounding electrode that is surrounded by a minimum of three (3) additional grounding electrodes spaced approximately 20 feet away from the central grounding electrode and approximately 120 degrees apart. Interconnect each grounding electrode using a #4 AWG bare copper conductor back to the central grounding electrode using irreversible mechanical crimps. Additionally, using an irreversible mechanical crimp, connect the bare copper lightning conductor to the central grounding electrode. Install each grounding electrode and its corresponding #4 AWG bare copper grounding wire and 28 strand copper lightning conductor such that the wires are 24" below grade. Install marker tape 12" below grade and above all grounding conductors.

In instances where right of way does not allow for ground rod spacing as required above, reference the 2018 Roadway Standard Drawings - Section 1700.02 "Electrical Service Grounding" for "Limited Shoulder" or "Restricted Space" installation alternatives.

Prior to connecting the lightning protection system to an electrical service, perform a grounding electrode test on the lightning protection system to obtain a maximum of 20 ohms or less. Install additional grounding electrodes as need to obtain the 20 ohms or less requirement. The grounding electrode resistance test shall be verified or witnessed by the Engineer or the Engineer's designated representative.

Follow test equipment's procedures for measuring grounding electrode resistance. When using clamp-type ground resistance meters, readings of less than one ohm typically indicate a ground loop. Rework bonding and grounding circuits as necessary to remove ground loop circuits and retest. If a ground loop cannot be identified and removed to allow the proper use of a clamp-type ground resistance meter, use the three-point test method. Submit a completed inductive Loop & Grounding Test Form available on the Department's website.

CELLULAR MODEMS FOR COMMUNICATIONS

DESCRIPTION

For equipment cabinets designated to communicate via an NCDOT furnished cellular modem, install cellular modems provided by the Department to establish a communications link to the NCDOT Triad Regional Traffic Management Center and the Statewide Traffic Operations Center.

MATERIALS

Obtaining Cellular Modem

To obtain cellular modems in a timely manner make request to the Engineer a minimum of 8 (eight) weeks in advance of deployment. Cellular modems will be provided with all necessary network configuration data and IP addressing for plug-and-play operations. Cellular modems will be supplied with a power supply, antenna with coaxial cabling, nuts and washers for installation by the Design-Build Team.

Cellular Modem Antenna Mounting Bracket

Fabricate, furnish and install an L-Shaped mounting bracket to be secured to the outside of the cabinet to hold the cellular modem antenna. Design the L-Shape bracket out of 5052-H32 aluminum that is 0.125" thick by 3" wide by 6" long. Place a 90-degree bend along the 6" axis at ½ its length. Provide two ¼" mounting holes on one side of the L-Bend and provide 1/4'' stainless-steel bolts, washers and nuts, for mounting the L-Bracket to the outside of the cabinet. On the other half of the bracket provide a 5/8" hole centered in the plate to accept the cellular antenna and coaxial cable.

CONSTRUCTION METHODS

Cellular Modem

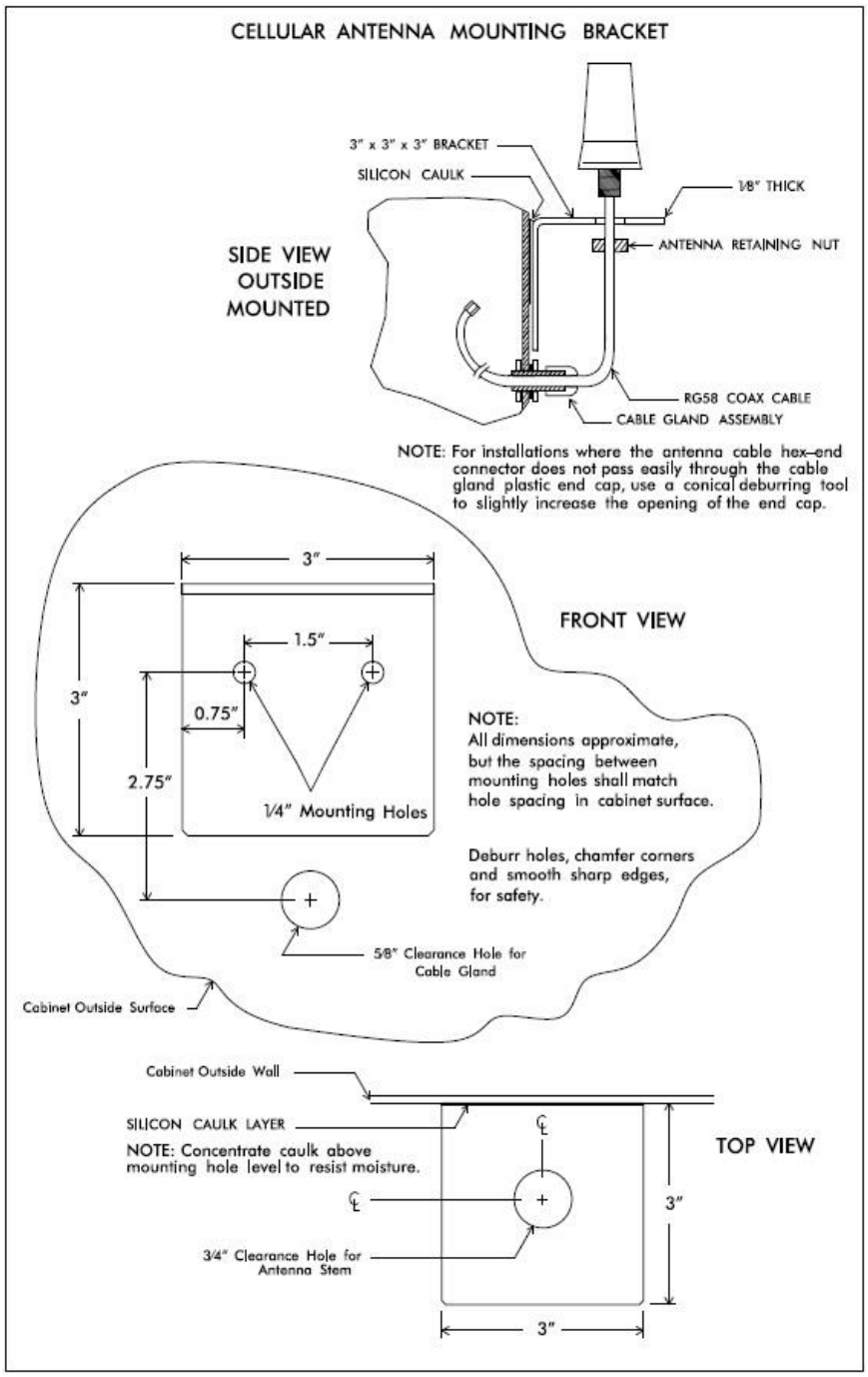
Mount the modem in the cabinet so as not to interfere with access or visually inspecting other equipment located in the cabinet. Arrange all cables (power, antenna and network cables) in a neat workmanship like manner. Use zip ties or other means to neatly route and secure the various cables so they are not subject to becoming pinched in the cabinet doors or be subject to fraying as they bend around objects in the cabinet interior. Secure the modem in a manner approved by the Engineer.

Cellular Modem Antenna Mounting Bracket

Filed drill mounting holes in the cabinet to match up with the bracket mounting holes. Drill one (1) additional 5/8" hole centered under the bracket into the side of the cabinet to provide an entryway for the antenna's coaxial cable. For all drilling operations that require field manufacturing of holes in a cabinet shell, ensure caution is taken to not allow metal shavings to fall into or on equipment inside the cabinet.

Prior to mounting the L-Bracket to the cabinet, run a ¼" bead of silicon calk near the back-top area of the L-Bracket and around each field drilled ¼" cabinet mounting holes. Install stainless steel bolts, washers and nuts and secure the bracket to the cabinet. Install the coaxial antenna cable through the cable gland (Bud Industries - Nylon Cable Gland: Part No: NG-9512, or equivalent) and into the cabinet. If necessary, lightly ream the nylon compression nut opening for insertion of the RG-58 antennae hex nut and coaxial cable. Tighten the cable gland to the cabinet shell and tighten the compression nut on the nylon cable gland to provide a water-tight seal around the coaxial antenna cable.

Reference the drawing below for additional details regarding the Mounting Bracket construction and mounting.



ELECTRICAL SERVICE

DESCRIPTION

The Design-Build Team shall install new or modify existing electrical service equipment as shown in the plans developed by the Design-Build Team and / or as directed by the Engineer. The first item of work on this project shall be the installation of all electrical service poles and

meter base / disconnect combination panels to expedite the power service connections. Comply with the National Electrical Code (NEC), the National Electrical Safety Code (NESC), the 2018 NCDOT *Standard Specifications for Roads and Structures*, the Project Special Provisions, and all local ordinances. All work involving electrical service shall be coordinated with the appropriate utility company and the Engineer.

MATERIAL

Meter Base / Disconnect Combination Panel

Furnish and install new meter base / disconnect combination panels as shown in the plans developed by the Design-Build Team and / or as directed by the Engineer. Provide meter base / disconnect combination panels that have a minimum of eight (8) spaces in the disconnect. Furnish a single pole 15A circuit breaker for CCTV camera locations. Furnish a double pole 70A circuit breaker for DMS & CCTV camera combination locations. Furnish a double pole 50A circuit breakers at DMS locations. Furnish each with a minimum of 10,000 RMS symmetrical amperes short circuit current rating in a lockable NEMA 3R enclosure. Ensure meter base / disconnect combination panel is listed as meeting UL Standard UL-67 and marked as being suitable for use as service equipment. Ensure circuit breakers are listed as meeting UL-489. Fabricate enclosure from galvanized steel and electrostatically apply dry powder paint finish, light gray in color, to yield a minimum thickness of 2.4 mils. All exterior surfaces shall be powder coated steel. Provide ground bus and neutral bus with a minimum of four terminals and a minimum wire capacity range of number 8 through number 3/0 AWG.

Furnish NEMA Type 3R combinational panels rated 100 Ampere minimum for overhead services and 200 Ampere minimum for underground services that meet the requirements of the local utility. Provide meter base with sockets' ampere rating based on sockets being wired with a minimum of 167 degrees F insulated wire. Furnish 4 terminal, 600 volt, single phase, 3-wire meter bases that comply with the following:

- Line, Load, and Neutral Terminals accept 4/0 AWG and smaller Copper / Aluminum wire
- With or without horn bypass
- Made of galvanized steel
- Listed as meeting UL Standard US-414
- Overhead or underground service entrance specified.

Furnish 1.5" watertight hub for threaded rigid conduit with meter base.

At the main service disconnect, furnish and install UL-approved lightning arrestors that meet the following requirements:

Type of design	Silicon Oxide Varistor
Voltage	120/240 Single Phase, 3 wire
Maximum current	100,000 amps
Maximum energy	3000 joules per pole
Maximum number of surges	Unlimited
Response time one milliamp test	5 nanoseconds
Response time to clamp 10,000 amps	10 nanoseconds
Response time to clamp 50,000 amps	25 nanoseconds
Leak current at double the rated voltage	None
Ground wire	Separate

Equipment Cabinet Disconnect

Provide new equipment cabinet disconnects at the locations shown in the plans developed by the Design-Build Team and / or as directed by the Engineer. Furnish double pole 50A circuit breakers at DMS locations. Furnish single pole 15A circuit breaker at CCTV camera locations. Furnish panels that have a minimum of four (4) spaces in the disconnect. Furnish circuit breakers with a minimum of 10,000 RMS symmetrical amperes short circuit current rating in a lockable NEMA 3R enclosure. Ensure meter base / disconnect combination panel is listed as meeting UL Standard UL-67 and marked as being suitable for use as service equipment. Ensure circuit breakers are listed as meeting UL-489. Fabricate enclosure from galvanized steel and electrostatically apply dry powder paint finish, light gray in color, to yield a minimum thickness of 2.4 mils. All exterior surfaces shall be powder coated steel. Provide ground bus and neutral bus with a minimum of four terminals and a minimum wire capacity range of number 8 through number 3/0 AWG.

3-Wire Copper Service Entrance Conductors

Furnish 3-wire stranded copper service entrance conductors with THWN rating. Provide conductors with black, red, and white insulation that are intended for power circuits at 600 Volts or less and comply with the following:

- Listed as meeting UL Standard UL-83
- Meets ASTM B-3 and B-8 or B-787 standards.

See the plans developed by the Design-Build Team for wire sizes and quantities.

4-Wire Copper Feeder Conductors

Furnish 4-wire stranded copper feeder conductors with THWN rating for supplying power to DMS field equipment cabinets. Provide conductors with black, red, white, and green insulation that are intended for power circuits at 600 Volts or less and comply with the following:

- Listed as meeting UL Standard UL-83
- Meets ASTM B-3 and B-8 or B-787 standards.

See the plans developed by the Design-Build Team for wire sizes and quantities.

3-Wire Copper Feeder Conductors

Furnish 3-wire stranded copper feeder conductors with THWN rating for supplying power to CCTV field equipment cabinets. Provide conductors with black or red, white, and green insulation that are intended for power circuits at 600 Volts or less and comply with the following:

- Listed as meeting UL Standard UL-83
- Meets ASTM B-3 and B-8 or B-787 standards.

See the plans developed by the Design-Build Team for wire sizes and quantities.

Grounding System

Furnish 5/8”x10’ copper clad steel grounding electrodes (ground rods), #4 AWG solid bare copper conductors, and exothermic welding kits for grounding system installations. Comply with the NEC, 2018 NCDOT *Standard Specifications for Roads and Structures*, these Project Special Provisions, and the plans developed by the Design-Build Team and / or as directed by the Engineer.

CONSTRUCTION METHODS

General

Coordinate with the Engineer and the utility company to de-energize the existing service temporarily prior to starting any modifications.

Permanently label cables at all access points using nylon tags labeled with permanent ink. Ensure each cable has a unique identifier. Label cables immediately upon installation. Use component name and labeling scheme approved by the Engineer.

Meter Base / Disconnect Combination Panel

Install meter base / disconnect combination panels with lightning arrestors as called for in the plans developed by the Design-Build Team and / or as directed by the Engineer. At all new DMS locations, route the feeder conductors from the meter base / disconnect to the DMS equipment cabinet in conduit. At all new CCTV camera locations, route the feeder conductors from the meter base / disconnect to the CCTV equipment cabinet in conduit. Provide rigid galvanized conduit for above ground and PVC for below ground installations.

Electrical Service Disconnect

Install equipment cabinet disconnects and circuit breakers as called for in the plans developed by the Design-Build Team and / or as directed by the Engineer. Install THWN stranded copper

feeder conductors as shown in plans developed by the Design-Build Team between the electrical service disconnect and the equipment cabinet disconnect. Route the conductors from the equipment cabinet disconnect to the equipment cabinet in rigid galvanized steel conduit. Bond the equipment cabinet disconnect in accordance with the NEC. Ensure that the grounding system complies with the grounding requirements of these Project Special Provisions, the 2018 NCDOT *Standard Specifications for Roads and Structures* and the plans developed by the Design-Build Team.

3-Wire Copper Service Entrance Conductors

At locations shown in the plans developed by the Design-Build Team, furnish and install 3-wire THWN stranded copper service entrance conductors in 1.25 inch rigid galvanized risers as shown in the plans developed by the Design-Build Team. Install a waterproof hub on top of the electrical service disconnect for riser entrance / exit. Size the conductors as specified in the plans developed by the Design-Build Team. Comply with the 2018 NCDOT *Standard Specifications for Roads and Structures* and 2018 Roadway Standard Drawings and all applicable electrical codes.

4-Wire Copper Feeder Conductors

At locations shown in the plans developed by the Design-Build Team, install 4-wire THWN stranded copper feeder conductors to supply 240/120 VAC to the DMS field equipment cabinets. Size the conductors as specified in the plans developed by the Design-Build Team. Comply with the 2018 NCDOT *Standard Specifications for Roads and Structures* and 2018 Roadway Standard Drawings and all applicable electrical codes.

3-Wire Copper Feeder Conductors

At locations shown in the plans developed by the Design-Build Team, install 3-wire THWN stranded copper feeder conductors to supply 120 VAC to the CCTV field equipment cabinets. Size the conductors as specified in the plans developed by the Design-Build Team. Comply with the 2018 NCDOT *Standard Specifications for Roads and Structures* and 2018 Roadway Standard Drawings and all applicable electrical codes.

Grounding System

Install ground rods as indicated in the plans developed by the Design-Build Team. Connect the #4 AWG grounding conductor to ground rods using an exothermic welding process. Test the system to ensure a ground resistance of 20-ohms or less is achieved. Drive additional ground rods as necessary or as directed by the Engineer to achieve the proper ground resistance.

ETHERNET EDGE SWITCH

The Design-Build Team shall furnish and install a managed Ethernet edge switch as specified below that is fully compatible, interoperable, and completely interchangeable and functional within the existing City or Division traffic signal system communications network.

DESCRIPTION

Ethernet Edge Switch

Furnish and install a hardened, field Ethernet edge switch (hereafter "edge switch") for traffic signal controllers as specified below. Ensure that the edge switch provides wire-speed, fast Ethernet connectivity at transmission rates of 100 megabits per second from each remote ITS device location to the routing switches.

Contact the City or Division to arrange for the programming of the new Field Ethernet Switches with the necessary network configuration data, including but not limited to, the Project IP Address, Default Gateway, Subnet Mask and VLAN ID information. Provide a minimum five (5) days working notice to allow the City or Division to program the new devices.

B. Network Management

Ensure that the edge switch is fully compatible with the City's or Division's existing Network Management Software.

MATERIALS

General

Ensure that the edge switch is fully compatible and interoperable with the trunk Ethernet network interface and that the edge switch supports half and full duplex Ethernet communications.

Furnish an edge switch that provide 99.999% error-free operation, and that complies with the Electronic Industries Alliance (EIA) Ethernet data communication requirements using single-mode fiber-optic transmission medium and copper transmission medium. Ensure that the edge switch has a minimum mean time between failures (MTBF) of 10 years, or 87,600 hours, as calculated using the Bellcore/Telcordia SR-332 standard for reliability prediction.

Compatibility Acceptance

The Engineer has the authority to require the Design-Build Team to submit a sample Field Ethernet Switch and Field Ethernet Transceiver along with all supporting documentation, software and testing procedures to allow a compatibility acceptance test be performed prior to approving the proposed Field Ethernet Switch and Field Ethernet Transceiver for deployment. **The Compatibility Acceptance testing will ensure that the proposed device is 100% compatible and interoperable with the existing City Signal System network, monitoring software and Traffic Operations Center network hardware.** Allow fifteen (15) working days for the Compatibility Acceptance Testing to be performed.

Standards

Ensure that the edge switch complies with all applicable IEEE networking standards for Ethernet communications, including but not limited to:

- IEEE 802.1D standard for media access control (MAC) bridges used with the Spanning Tree Protocol (STP);

- IEEE 802.1Q standard for port-based virtual local area networks (VLANs);
- IEEE 802.1P standard for Quality of Service (QoS);
- IEEE 802.1w standard for MAC bridges used with the Rapid Spanning Tree Protocol (RSTP);
- IEEE 802.1s standard for MAC bridges used with the Multiple Spanning Tree Protocol;
- IEEE 802.1x standard for port based network access control, including RADIUS;
- IEEE 802.3 standard for local area network (LAN) and metropolitan area network (MAN) access and physical layer specifications;
- IEEE 802.3u supplement standard regarding 100 Base TX/100 Base FX;
- IEEE 802.3x standard regarding flow control with full duplex operation; and
- IFC 2236 regarding IGMP v2 compliance.
- IEEE 802.1AB Link Layer Discovery Protocol (LLDP)
- IEEE 802.3ad Ethernet Link Aggregation
- IEEE 802.3i for 10BASE-T (10 Mbit/s over Fiber-Optic)
- IEEE 802.3ab for 1000BASE-T (1Gbit/s over Ethernet)
- IEEE 802.3z for 1000BASE-X (1 Gbit/s Ethernet over Fiber-Optic)

Functional

Ensure that the edge switch supports all Layer 2 management features and certain Layer 3 features related to multicast data transmission and routing. These features shall include, but not be limited to:

- An STP healing / convergence rate that meets or exceeds specifications published in the IEEE 802.1D standard.
- An RSTP healing / convergence rate that meets or exceeds specifications published in the IEEE 802.1w standard.
- An Ethernet edge switch that is a port-based VLAN and supports VLAN tagging that meets or exceeds specifications as published in the IEEE 802.1Q standard, and has a minimum 4-kilobit VLAN address table (254 simultaneous).
- A forwarding / filtering rate that is a minimum of 14,880 packets per second for 10 megabits per second and 148,800 packets per second for 100 megabits per second.
- A minimum 4-kilobit MAC address table.
- Support of Traffic Class Expediting and Dynamic Multicast Filtering.
- Support of, at a minimum, snooping of Version 2 & 3 of the Internet Group Management Protocol (IGMP).

- Support of remote and local setup and management via telnet or secure Web-based GUI and command line interfaces.
- Support of the Simple Network Management Protocol version 3 (SNMPv3). Verify that the Ethernet edge switch can be accessed using the resident EIA-232 management port, a telecommunication network, or the Trivial File Transfer Protocol (TFTP).
- Port security through controlling access by the users. Ensure that the Ethernet edge switch has the capability to generate an alarm and shut down ports when an unauthorized user accesses the network.
- Support of remote monitoring (RMON-1 & RMON-2) of the Ethernet agent.
- Support of the TFTP and SNTP. Ensure that the Ethernet edge switch supports port mirroring for troubleshooting purposes when combined with a network analyzer.

Physical Features

Ports: Provide 10/100/1000 Mbps auto-negotiating ports (RJ-45) copper Fast Ethernet ports for all edge switches. Provide auto-negotiation circuitry that shall automatically negotiate the highest possible data rate and duplex operation possible with attached devices supporting the IEEE 802.3 Clause 28 auto-negotiation standard.

Optical Ports: Ensure that all fiber-optic link ports operate at 1310 or 1550 nanometers in single mode. Provide Type LC connectors for the optical ports, as specified in the plans developed by the Design-Build Team or by the Engineer. Do not use mechanical transfer registered jack (MTRJ) type connectors.

Provide an edge switch having a minimum of two optical 100/1000 Base X ports capable of transmitting data at 100/1000 megabits per second. Ensure that each optical port consists of a pair of fibers; one fiber will transmit (TX) data and one fiber will receive (RX) data. Ensure that the optical ports have an optical power budget of at least 15 dB.

Copper Ports: Provide an edge switch that includes a minimum of four copper ports. Provide Type RJ-45 copper ports and that auto-negotiate speed (i.e., 10/100/1000 Base) and duplex (i.e., full or half). Ensure that all 10/100/1000 Base TX ports meet the specifications detailed in this section of this Special Provision and are compliant with the IEEE 802.3 standard pinouts. Ensure that all Category 5E unshielded twisted pair / shielded twisted pair network cables are compliant with the EIA/TIA-568-B standard.

Port Security: Ensure that the edge switch supports / complies with the following (remotely) minimum requirements:

- Ability to configure static MAC addresses access
- Ability to disable automatic address learning per ports; know hereafter as Secure Port. Secure Ports only forward

- Trap and alarm upon any unauthorized MAC address and shutdown for programmable duration. Port shutdown requires administrator to manually reset the port before communications are allowed.

Management Capabilities

Ensure that the edge switch supports all Layer 2 management features and certain Layer 3 features related to multicast data transmission and routing. These features shall include, but not be limited to:

- An STP healing / convergence rate that meets or exceeds specifications published in the IEEE 802.1 D standards;
- An RSTP healing / convergence rate that meets or exceeds specifications published in the IEEE 802.1w standard;
- An Ethernet edge switch that is a port-based VLAN and supports VLAN tagging that meets or exceeds specifications as published in the IEEE 802.1Q standard, and has a minimum 4-kilobit VLAN address table (254 simultaneous);
- A forwarding / filtering rate that is a minimum of 14,880 packets per second for 10 megabits per second, 148,800 packets per second for 100 megabits per second and 1,488,000 packets per second for 1000 megabits per second;
- A minimum 4-kilobit MAC address table;
- Support of Traffic Class Expediting and Dynamic Multicast Filtering.
- Support of, at a minimum, snooping of Version 2 & 3 of the Internet Group Management Protocol (IGMP);
- Support of remote and local setup and management via telnet or secure Web-based GUI and command line interfaces; and
- Support of the Simple Network Management Protocol (SNMP). Verify that the Ethernet edge switch can be accessed using the resident EIA-232 management port, a telecommunication network, or the Trivial File Transfer Protocol (TFTP).

Network Capabilities: Provide an edge switch that supports / complies with the following minimum requirements:

- Provide full implementation of IGMPv2 snooping (RFC 2236);
- Provide full implementation of SNMPv1, SNMPv2c, and/or SNMPv3;
- Provide support for the following RMON–I groups, at a minimum:
  - Part 1: Statistics
  - Part 2: History
  - Part 3: Alarm
  - Part 9: Event

- Provide support for the following RMON–2 groups, at a minimum:
  - Part 13: Address Map
  - Part 17: Layer Matrix
  - Part 16: Layer Host
  - Part 18: User History
- Capable of mirroring any port to any other port within the switch;
- Meet the IEEE 802.1Q (VLAN) standard per port for up to four VLANs;
- Meet the IEEE 802.3ad (Port Trunking) standard for a minimum of two groups of four ports;
- Password manageable;
- Telnet / CLI;
- HTTP (Embedded Web Server) with Secure Sockets Layer (SSL); and
- Full implementation of RFC 783 (TFTP) to allow remote firmware upgrades.

*Network Security***:** Provide an edge switch that supports / complies with the following (remotely) minimum network security requirements:

- Multi-level user passwords;
- RADIUS centralized password management (IEEE 802.1X);
- SNMPv3 encrypted authentication and access security;
- Port security through controlling access by the users: ensure that the Ethernet edge switch has the capability to generate an alarm and shut down ports when an unauthorized user accesses the network;
- Support of remote monitoring (RMON-1&2) of the Ethernet agent; and
- Support of the TFTP and SNTP. Ensure that the Ethernet edge switch supports port mirroring for troubleshooting purposes when combined with a network analyzer.

Electrical Specifications

Ensure that the edge switch operates and power is supplied with 115 volts of alternating current (VAC). Ensure that the edge switch has a minimum operating input of 110 VAC and a maximum operating input of 130 VAC. Ensure that if the device requires operating voltages other than 120 VAC, supply the required voltage converter. Ensure that the maximum power consumption does not exceed 50 watts. Ensure that the edge switch has diagnostic light emitting diodes (LEDs), including link, TX, RX, speed (for Category 5E ports only), and power LEDs.

Environmental Specifications

Ensure that the edge switch performs all of the required functions during and after being subjected to an ambient operating temperature range of -30 degrees to 165 degrees Fahrenheit as

defined in the environmental requirements section of the NEMA TS 2 standard, with a noncondensing humidity of 0 to 95%.

Provide certification that the device has successfully completed environmental testing as defined in the environmental requirements section of the NEMA TS 2 standard. Provide certification that the device meets the vibration and shock resistance requirements of Sections 2.1.9 and 2.1.10, respectively, of the NEMA TS 2 standard. Ensure that the edge switch is protected from rain, dust, corrosive elements, and typical conditions found in a roadside environment.

The edge switch shall meet or exceed the following environmental standards:

- IEEE 1613 (electric utility substations)
- IEC 61850-3 (electric utility substations)
- IEEE 61800-3 (variable speed drive systems)
- IEC 61000-6-2 (generic industrial)
- EMF - FCC Part 15 CISPR (EN5502) Class A

Ethernet Patch Cable

Furnish a factory pre-terminated / pre-connectorized Ethernet patch cable with each edge switch. Furnish Ethernet patch cables meeting the following physical requirements:

- Five (5)-foot length
- Category 5e or better
- Factory-installed RJ-45 connectors on both ends
- Molded anti-snag hoods over connectors
- Gold plated connectors

Furnish Fast Ethernet patch cords meeting the following minimum performance requirements:

- TIA/EIA-568-B-5, Additional Transmission Performance Specifications for 4-pair 100 Ω Enhanced Category 5 Cabling
- Frequency Range: 1-100 MHz
- Near-End Crosstalk (NEXT): 30.1 dB
- Power-sum NEXT: 27.1 dB
- Attenuation to Crosstalk Ratio (ACR): 6.1 dB
- Power-sum ACR: 3.1 dB
- Return Loss: 10dB
- Propagation Delay: 548 nsec

CONSTRUCTION METHODS

General

Ensure that the edge switch is UL listed.

Verify that network / field / data patch cords meet all ANSI/EIA/TIA requirements for Category 5E and Category 6 four-pair unshielded twisted pair cabling with stranded conductors and RJ45 connectors.

Contact the Signal Shop a minimum of 5 days prior to installation for the most current edge switch IP Address, VLAN, subnet mask, default gateway and configuration files.

Edge Switch

Mount the edge switch inside each field cabinet by securely fastening the edge switch to the upper end of the right rear vertical rail of the equipment rack using manufacturer-recommended or Engineer-approved attachment methods, attachment hardware and fasteners.

Ensure that the edge switch is mounted securely in the cabinet and is fully accessible by field technicians without blocking access to other equipment. Verify that fiber-optic jumpers consist of a length of cable that has connectors on both ends, primarily used for interconnecting termination or patching facilities and / or equipment.

HUB CABINET

DESCRIPTION

The Design-Build Team shall furnish and install air-conditioned hub cabinets, hub cabinet base extenders, hub cabinet foundations and all necessary hardware as described herein. Size the cabinet appropriately to fit all the equipment and to allow for 25% free space available after all equipment is installed. Size the cabinet to ensure ease of access to equipment and provide proper ventilation in order to maintain an internal operating environment that does not exceed the environmental operating ranges for devices placed within the cabinet.

MATERIALS

Hub Cabinet

1. **Standards**

   Ensure that the hub cabinets comply with the following standards:

   - ANSI;
   - ASTM;
   - IMSA ;
   - ISO 9001;
   - NEC;
   - NEMA TS-2; and
   - UL listed.

2. Functional

Furnish Caltrans Type 340 base-mounted hub cabinets meeting the following minimum requirements:

- Side-by-side, double doors on both front and rear of cabinet
- Fiber-optic interconnect centers (paid separately)
- Grounding bus bar
- 19-inch rack system for mounting of all devices in the cabinet
- Pull-out shelf for laptop and maintenance use
- Maintenance access connections
- LED lighting
- Ventilation fans
- 120VAC power supply
- 120VAC ground fault circuit interrupter (GFCI)-protected duplex outlets for tools
- 120VAC surge-protected duplex outlets for equipment
- Sunshields constructed of light gauge aluminum that sit approximately one inch above the surface of the cabinet on all sides, including doors
- Lightning and surge protection on incoming and outgoing electrical lines (power and data)
- Managed Ethernet switch (provided by Department of Information Technology (DIT))
- Door status sensors compatible with provided Managed Ethernet switches
- Power strip along vertical rail
- HVAC system to maintain optimal temperature and humidity for the Ethernet hub switches and other powered electronics in the cabinet
- UPS with sufficient capacity to hold hub's electrical load (minus the HVAC) for four hours. Cabinet AC system will not be connected to the UPS

3. Physical Features

Provide cabinets that are completely weatherproof to prevent the entry of water. Provide cabinet and door exterior seams that are continuously welded, and all exterior welds are smooth. Provide cabinets with four full-size doors with full-length stainless-steel piano hinges, with stainless steel pins spot-welded at the top. Provide hinges that utilize stainless steel hinge pins. Provide hinges that are mounted so that they cannot be removed from the door or cabinet without first opening the door. Provide door and hinges braced to withstand a 100-pound per vertical foot of door height load applied vertically to the outer edge of the door when standing open. Ensure that there is no permanent deformation or impairment of any part of the door or cabinet body when the load is removed. Provide cabinet door fitted with a #2 Corbin lock. Provide two keys for each cabinet. Provide cabinet doors that are also pad lockable. Provide door openings that are double flanged on all four sides.

Provide cabinets constructed of unpainted sheet aluminum alloy H5052-H32 with a minimum thickness of 0.125 inch.

Provide the hub cabinet with sunshields outside to deflect solar heat away from the cabinet. The sunshields must be offset a minimum of one inch from the exterior cabinet walls. Ensure that the sunshields are fabricated from 5052-H32 aluminum sheet that is 0.125-inch-thick, and that sunshield corners are rounded and smoothed for safety. Mount the sunshields on standoffs on the top and on each side of the cabinet including the doors.

Provide doorstops at 90 and 180-degree positions. Ensure that both the door and the doorstop mechanism are of sufficient strength to withstand a simulated wind load of five pounds per square foot of door area applied to both the inside and outside surfaces without failure, permanent deformation, or compromising of door position and normal operation. Do not provide auxiliary police doors.

Ensure that cabinet doors include a gasket to provide a dust and weather-resistant seal when closed. Ensure that the gasket material is closed-cell neoprene and maintains its resiliency after exposure to the outdoor environment. Ensure that the gasket shows no sign of rolling or sagging and provide a uniform dust and weather-resistant seal around the entire door facing.

Provide door alarms for all four doors that are compatible with the hub switches to be provided and installed by DIT. Door alarms should send a network alert to the switch when a hub cabinet door is opened or if the door alarm fails or is tampered with. Coordinate with the Engineer and DIT for hub switch model information.

Provide cabinets that include predrilled holes of standard diameter and bolt pattern with four (4) anchor bolts with each cabinet unit as part of the unit price bid. Provide a panel with each cabinet that matches the rest of the cabinet; and is held in place by four bolts provided with the panel. Drill or punch the panel to accommodate the bolts; the drill holes shall match the bolt pattern of the base cabinet of the cabinet. Provide a panel designed to be fitted in the interior of the cabinet and fabricated of the same material and thickness as the cabinet bottom.

Provide rails to create a cage to mount hardware, wiring panels and miscellaneous mounting brackets. Provide rails constructed of .1345-inch steel or .105-inch stainless steel. Provide rails with a keyhole design with slots 2 inches on center with a top opening of 5/8 inch in diameter to allow the insertion of a .625-inch by 1-inch carriage bolt. Ensure that the rails are 1.5 to 2 inches wide by .5 inches deep. Drill and tap the rails for 10-32 screws or rack screws with EIA universal spacing.

Provide rack assemblies that have a removable, standard 19-inch EIA compliant rack. The rack shall have a clearance between the rails of 17.5 inches.

Equip each cabinet with an aluminum storage compartment mounted in the rack assembly with the following dimensions (±0.5 inch): 16 inches wide, 14 inches long,

and 1.75 inches deep. Provide compartment with ball-bearing telescoping drawer guides to allow full extension from the rack assembly. Ensure that when extended, the storage compartment opens to provide storage space for cabinet documentation and other miscellaneous items. Ensure that the storage compartment is of adequate construction to support a weight of 20 pounds when extended without sagging. Provide a top to the storage compartment that is hinged aluminum. Provide two (2) removable metal shelves with each cabinet.

Furnish a cabinet base extender with each hub cabinet that complies with the requirements of the "Cabinet Base Adapter and Base Extender" section of this Project Special Provision.

Install an external generator connection port on the side of the cabinet opposite the air conditioning unit. Port should be designed and sized for the appropriate electrical requirements of the cabinet.

4. <u>Lighting</u>

Provide the field cabinet with four LED lamps (one above each door) and clear shatterproof shield assemblies which are mounted on the inside front and rear top of the cabinet. Ensure that these lamps are unobstructed and able to cast light on the equipment. Equip the field cabinet with door-actuated switches so that the lamps automatically turn on when any cabinet door is opened and go off when all the doors are closed.

5. <u>Electrical</u>

Provide a service panel assembly to function as the entry point for AC power to the cabinet and the location for power filtering, transient suppression, and equipment grounding. Provide AC isolation within the cabinet. Configure cabinet to accept 120 VAC from the utility company.

Provide circuit breakers that meet the NEC requirements, are UL listed and have an interrupt capacity of 5,000 amperes and insulation resistance of 100 MΩ at 500 VDC. Provide the hub cabinet with a main circuit breaker sized according to the NEC. Use appropriately sized branch circuit breakers to protect the electronics in the hub cabinet. Provide a dedicated branch circuit for each of the following items:

- HVAC
- Lighting
- Receptacles
- Ventilation fan
- One circuit per rack
- Others as needed.

Provide UL listed surge protection devices according to the UL 1449, 2nd edition standard that comply with the NEMA requirements as detailed in the NEMA LS 1 (1992) standard.

Provide branch circuits, surge protection devices, and grounding for the connected load served by the cabinet, including ventilation fans, internal lights, electrical receptacles, etc., as shown on the Plans developed by the Design-Build Team.

Furnish a power distribution assembly that fits in the EIA 19-inch rack and provides for protection and distribution of 120VAC power.

Ensure that ground bus bars are fabricated from a copper alloy material compatible with copper wire. Use ground bus bars that have at least two positions where a #6 AWG stranded copper wire can be attached.

Mount the ground bus bar on the side of the cabinet wall adjacent to the service panel assembly for the connection of AC neutral wires and chassis ground wires. If more than one ground bus bar is used in a cabinet, use a minimum of a #10 AWG copper wire to interconnect them.

Provide a detailed plan for power distribution within the cabinet. Label all breakers and conductors with size and loads. Have the plans signed and sealed by a NC registered PE and submit the plans developed by the Design-Build Team for review and approval.

6. <u>Ventilation</u>

Ensure the cabinet assembly can maintain the temperature and humidity within the environmental requirements of the hub switches and other powered electronics in the cabinet.

Include two cooling fans with 100 CFM, minimum capacity. Provide thermostats to be incorporated into the ventilation system. Mount fans in the top of the cabinet.

Provide the cabinets with vent openings in the lower portion of the door to allow convection cooling of electronic components. Cover them fully on the inside with a commercially available disposable three-layer graded type filter. All air entering the cabinet must pass through the air filter.

7. <u>Air Conditioner</u>

Furnish each hub cabinet with a rack mounted air-cooled air conditioner that operates on 120VAC. The air conditioner shall be fit within a 19-inch EIA communications rack and shall not be external mounted on the cabinet. The air conditioner shall be mounted in the bottom of the cabinet to avoid damage to any communications equipment.

The air conditioners shall have a built-in condensate evaporator and condensate drain fitting and hose that is plumbed to the outside of the cabinet. The air conditioner shall be rated for a minimum of 3500 BTU. There shall be low temperature control to prevent overcooling.

Provide EMI / RFI transient spike protection. Equip the cabinet and air conditioner with remote monitoring of high temperature and low airflow conditions. Intake air

shall enter through cabinet door vent and be exhausted through top cabinet vents. Air conditioners shall be CFC free or low ODP (R-22) refrigerant and shall use closed loop cooling. Insulate all cold components (coolant lines, compressor, evaporator, etc.) with high-performance insulation.

Blower motors shall be UL listed. Ensure the blower motors are equipped with automatic reset thermal overload protection. Provide double sealed and double shielded ball bearings.

The air conditioners shall have permanent corrugated aluminum or stainless steel air filters. The filters shall be removable and washable.

All grilles shall be stainless steel.

Hub Cabinet Base Extender

Fabricate hub cabinet base extenders from the same materials and with the same finish as the hub cabinet housing. Fabricate base extender in the same manner as hub cabinets, meeting all of the same applicable specifications called for in these project special provisions. Provide cabinet base extenders with a height of at least 8 inches.

Hub Cabinet Foundation

Furnish either poured concrete hub cabinet foundations or preformed hub cabinet foundations. Obtain approval of foundation type from the engineer.

Comply with Section 1000-4 of the 2018 *Standard Specifications for Road and Structures*.

Provide hub cabinet foundations with a minimum pad area that extend 24 inches from the front and back of the hub cabinet and 3 inches from the sides of the cabinet.

On the same side as the cabinet generator hookup, cast a three inch inside width galvanized steel U-bolt into the cabinet foundation. A minimum of four inches of the U-bolt shall be cast into the concrete and a minimum of three inches of the U-bolt shall be exposed for securing a generator to the foundation.

Furnish hub cabinet foundations with chamfered top edges. Provide minimum class B concrete.

Provide preformed hub cabinet foundations with 7” (L) x 18” (W) minimum opening for the entrance of conduits. For precast hub cabinet foundations, include steel reinforcement to ensure structural integrity during shipment and placing of item. Include four ¾ inch coil thread inserts for lifting. Comply with Article 1077-16 of the 2018 *Standard Specifications for Road and Structures*.

Hub Cabinet UPS

Furnish and install one rack mounted UPS in each new cabinet.

Furnish UPS with external temperature monitoring that will shut off when running on battery power and the maximum operating temperature for the hub switch is reached.

Install UPS with RJ-45 ethernet network monitoring ports that can be disabled via the UPS software / firmware.

UPS shall meet the following minimum specifications:

Output	
Output Power Capacity	480 Watts / 750 VA
Max Configurable Power	480 Watts / 750 VA
Nominal Output Voltage	120V
Output Voltage Distortion	Less than 5% at full load
Output Frequency (sync to mains)	57 - 63 Hz for 60 Hz nominal
Crest Factor	up to 5:1
Waveform Type	Sine wave
Output Connections	(4) NEMA 5-15R
Input	
Nominal Input Voltage	120V
Input Frequency	50/60 Hz +/- 3 Hz (auto sensing)
Input Connections	NEMA 5-15P
Cord Length	6 feet
Input voltage range for main operations	82 - 144V
Input voltage adjustable range for mains operation	75 -154 V
Battery Type	
Maintenance-free sealed Lead-Acid battery with suspended electrolyte, leak-proof.	
Typical recharge time	2 hours
Communications & Management	
Interface Port(s)	RJ, 45, DB-9 RS-232, USB
Control panel battery	LED status display with load and bar-graphs
Surge Protection and Filtering	
Surge energy rating	480 Joules

Environmental	
Operating Environment	-32 - 104 °F
Operating Relative Humidity	0 - 95%
Storage Temperature	5 - 113 °F
Storage Relative Humidity	0 - 95%
Conformance	
Regulatory Approvals	FCC Part 15 Class A, UL 1778

CONSTRUCTION METHODS

Hub Cabinet

Ensure all cabinet wiring is tagged and identified using insulated pre-printed sleeves and follows the project's cable identification scheme. Ensure that the wire markers identify usage in plain words with sufficient details without abbreviations or codes.

Use stranded copper for all conductors, including those in jacketed cables and solid copper for all grounding. Neatly arrange all wiring, firmly lace or bundle it, and mechanically secure the wiring without the use of adhesive fasteners. Route and secure all wiring and cabling to avoid sharp edges and to avoid conflicts with other equipment or cabling. Terminate all wiring on a terminal block, strip, bus bar, device clamp, lug, or connector. Do not splice any wiring. Label all wiring, cables, terminal strips, and distribution blocks with permanent and waterproof tags. Provide strain relief for all cabling with connectors, all cabling entering knockouts or ports at the equipment, and where appropriate.

Fasten all components of the cabinet assembly to be mounted on cabinet side panels with hex-head or Phillips-head machine screws. Install the screws into tapped and threaded holes in the panels. The components include, but are not limited to, terminal blocks; bus bars, panel and socket mounted TVSS, circuit breakers, accessory and equipment outlets, and DC power supply chassis.

Fasten all other cabinet components with hex-head or Phillips-head machine screws installed with nuts (with locking washer or insert) or into tapped and threaded holes. Fasten stud-mounted components to a mounting bracket providing complete access to the studs and mounting nuts. Ensure that all fastener heads and nuts (when used) are fully accessible within a complete cabinet assembly, and any component is removable without requiring removal of other components, panels or mounting rails. Do not use self-tapping or self-threading fasteners.

Mount the air conditioner in the bottom of the cabinet and do not obstruct any cable entry into the cabinet. Install condensate drains to drain condensation water out of the cabinet. Ensure the cabinet has provisions to route conduit to the existing cabinet as shown in the drawings.

Furnish and install a 48" 120 VAC power strip vertically along one of the rear rails of the communications rack. Provide a power strip that has at least eight outlets along its length.

Provide a cabinet that is ISO 9001 certified at the time of bid letting.

Locate cabinets as close to the edge of the controlled access as possible and protect hub cabinets with guardrail unless instructed otherwise by the engineer.

Install base mounted cabinets as shown on the plans developed by the Design-Build Team and as approved by the Engineer. Refer to the "Hub Cabinet Foundation" section of these Project Special Provision for installation requirements for the hub cabinet foundations. Install only the required number of conduits as shown on the plans developed by the Design-Build Team plus one additional spare stub out conduit. Position the ends of conduits approximately two inches above the finished surface of the concrete base.

Mount the hub cabinets on cabinet base extenders in accordance with the "Hub Cabinet Base Extender" section of these Project Special Provisions.

Mount surge protection devices in the cabinet for the field devices that will be connected to that cabinet.

Terminate power service wire, video, and data cabling on the appropriate terminal strips, surge protection devices or jacks in the cabinet with insulated terminal lugs or connectors. Use a calibrated ratchet-type crimping tool to install the insulated terminal lugs onto the field wires.

Label spare circuits of the data cables and connect them to the cabinet ground bus bar.

Neatly bundle and identify all field wiring cables in the cabinet with permanent waterproof tags.

Ground all hub cabinets in accordance with NEC requirements and the Hub Cabinet Grounding Detail included in this Project Special Provisions. Keep the ground wire from the cabinet ground bus bar to the ground rod assembly or array as short as possible. Ensure the ground wire is not in contact with any other part of the cabinet.

Hub Cabinet Base Extender

Install hub cabinet base extender at all hub cabinet locations.

Use permanent, flexible, waterproof sealing material to:

(a) Seal between the hub cabinet base and hub cabinet base extender.

(b) Seal 2-piece hub cabinet base extender seams.

(c) Seal space between hub cabinet base extender and the hub cabinet foundation.

Hub Cabinet Foundation

Comply with Section 825 of the 2018 *Standard Specifications for Road and Structures*.

When using poured concrete foundations and preformed concrete foundations, use procedures, equipment and hardware as follows:

(a) Locate new hub cabinets in locations as shown on the plans developed by the Design-Build Team and approved by the Engineer.

(b) Do not install foundations over uncompacted fill or muck.

(c) Do not install foundations in low areas or locations prone to standing water.

(d) Hand tamp soil before placing concrete to ensure ground is level.

(e) Use a minimum of four ½ inch diameter expanding type anchor bolts to secure cabinet to foundation.

(f) Install minimum four inches above and four inches below finished grade.

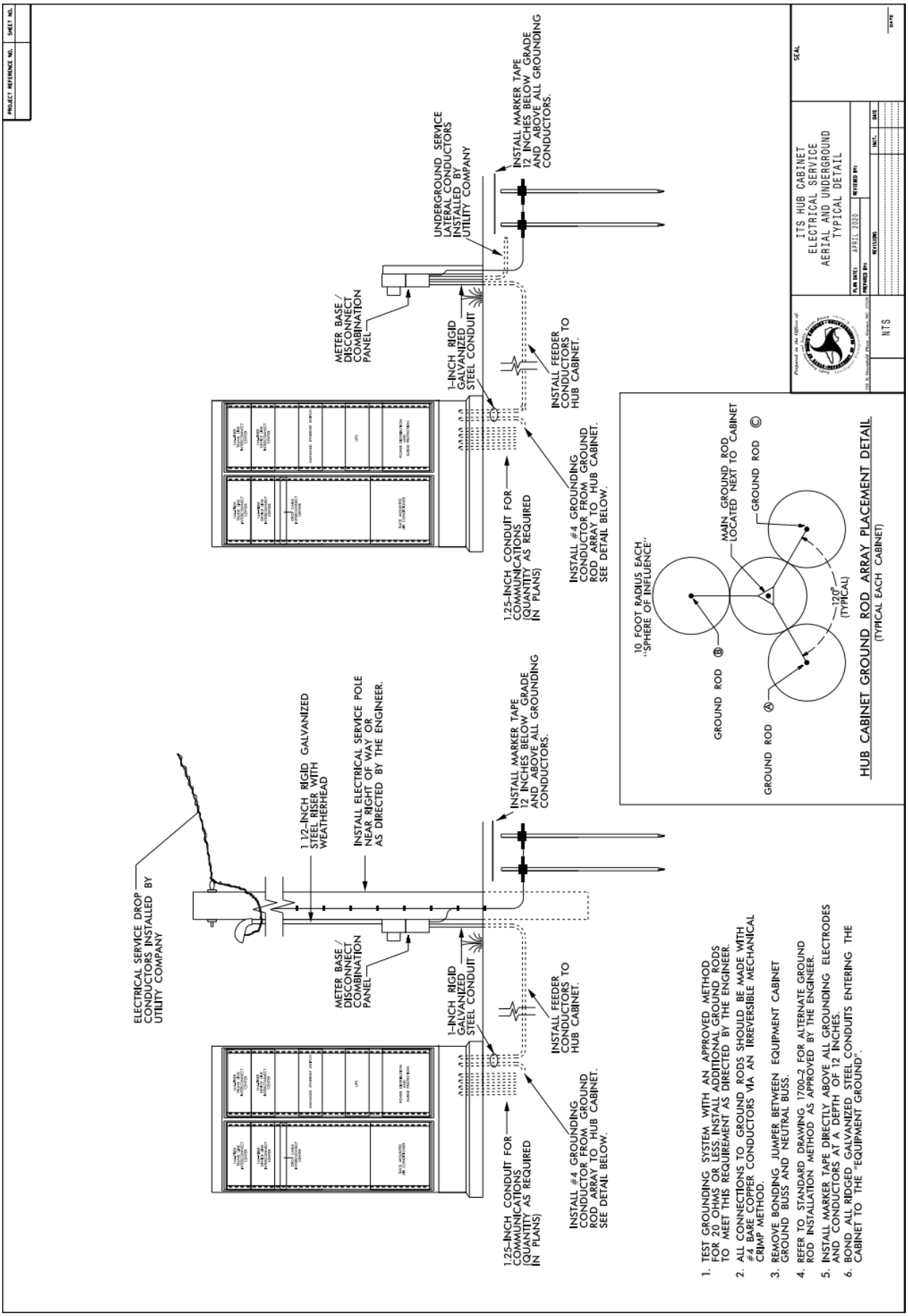
(g) Locate external stubbed out conduit at cabinet foundation so conduit is located on the side of the hub cabinet with the UPS, do not locate conduit under the air conditioning system. Install a minimum of 6 conduit stub-outs.

(h) Give hub cabinet foundation a broom finish and chamfered edges.

(i) Seal space between cabinet base and foundation with a permanent, flexible, waterproof sealing material.

Hub Cabinet UPS

Install rack mounted UPS in each hub cabinet in accordance with the plans developed by the Design-Build Team and detail drawings.


PROJECT REFERENCE NO.
SHEET NO.
ELECTRICAL SERVICE DROP CONDUCTORS INSTALLED BY UTILITY COMPANY
1 1/2-INCH RIGID GALVANIZED STEEL RISER WITH WEATHERHEAD
INSTALL ELECTRICAL SERVICE POLE NEAR RIGHT OF WAY OR AS DIRECTED BY THE ENGINEER.
METER BASE / DISCONNECT COMBINATION PANEL
1-INCH RIGID GALVANIZED STEEL CONDUIT
INSTALL MARKER TAPE 12 INCHES BELOW GRADE AND ABOVE ALL GROUNDING CONDUCTORS.
INSTALL FEEDER CONDUCTORS TO HUB CABINET.
1.25-INCH CONDUIT FOR COMMUNICATIONS (QUANTITY AS REQUIRED IN PLANS)
INSTALL #4 GROUNDING CONDUCTOR FROM GROUND ROD ARRAY TO HUB CABINET. SEE DETAIL BELOW.
UPS
POWER DISTRIBUTION AND SURGE PROTECTION
RACK MOUNTED AIR CONDITIONER
UNDERGROUND SERVICE LATERAL CONDUCTORS INSTALLED BY UTILITY COMPANY
INSTALL MARKER TAPE 12 INCHES BELOW GRADE AND ABOVE ALL GROUNDING CONDUCTORS.
METER BASE / DISCONNECT COMBINATION PANEL
1-INCH RIGID GALVANIZED STEEL CONDUIT
INSTALL FEEDER CONDUCTORS TO HUB CABINET.
1.25-INCH CONDUIT FOR COMMUNICATIONS (QUANTITY AS REQUIRED IN PLANS)
INSTALL #4 GROUNDING CONDUCTOR FROM GROUND ROD ARRAY TO HUB CABINET. SEE DETAIL BELOW.
10 FOOT RADIUS EACH "SPHERE OF INFLUENCE"
MAIN GROUND ROD LOCATED NEXT TO CABINET
GROUND ROD Ⓒ
GROUND ROD Ⓑ
GROUND ROD Ⓐ
120° (TYPICAL)
HUB CABINET GROUND ROD ARRAY PLACEMENT DETAIL
(TYPICAL EACH CABINET)
1. TEST GROUNDING SYSTEM WITH AN APPROVED METHOD FOR 20 OHMS OR LESS. INSTALL ADDITIONAL GROUND RODS TO MEET THIS REQUIREMENT AS DIRECTED BY THE ENGINEER.
2. ALL CONNECTIONS TO GROUND RODS SHOULD BE MADE WITH #4 BARE COPPER CONDUCTORS VIA AN IRREVERSIBLE MECHANICAL CRIMP METHOD.
3. REMOVE BONDING JUMPER BETWEEN EQUIPMENT CABINET GROUND BUSS AND NEUTRAL BUSS.
4. REFER TO STANDARD DRAWING 1700-2 FOR ALTERNATE GROUND ROD INSTALLATION METHOD AS APPROVED BY THE ENGINEER.
5. INSTALL MARKER TAPE DIRECTLY ABOVE ALL GROUNDING ELECTRODES AND CONDUCTORS AT A DEPTH OF 12 INCHES.
6. BOND ALL RIDGED GALVANIZED STEEL CONDUITS ENTERING THE CABINET TO THE "EQUIPMENT GROUND".
ITS HUB CABINET
ELECTRICAL SERVICE
AERIAL AND UNDERGROUND
TYPICAL DETAIL
PLAN DATE: APRIL 2020
PREPARED BY:
REVISIONS
REVIEWED BY:
INIT.
DATE
SEAL
DATE
NTS

PROJECT REFERENCE NO.	SHEET NO.
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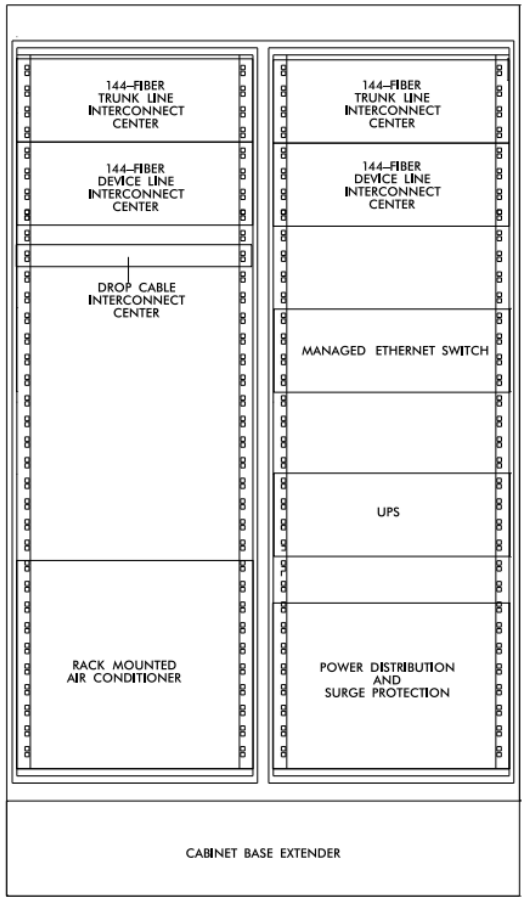


NOTES:

1. CABINET IS TYPE 340.
2. ALL DIMENSIONS ARE APPROXIMATE.
3. THE HUB CABINET SHALL BE A MINIMUM 62"H X 44"W (+/-) X 30"D.
4. CONDUIT ENTRANCES ARE IN BOTTOM OF CABINET UNDER UPS.
5. MINIMUM OF THREE (3) TOTAL OUTLETS: TWO (2) SURGE PROTECTED AND ONE (1) GFCI PROTECTED.
6. SURGE PROTECTION PANEL SHALL BE MOUNTED BEHIND THE POWER DISTRIBUTION PANEL.
7. FRONT DOOR SHALL HAVE A VENT WITH FILTER ALIGNING WITH AIR CONDITIONER INTAKE.
8. INSTALL A/C DRAIN LINE.

Prepared for the Offices of:
Intelligent Transportation Systems
750 Greenfield Parkway, Garner, NC 27529

NCDOT ITS
HUB CABINET
DETAIL

PLAN DATE: MARCH 2020 REVIEWED BY:
PREPARED BY: A. J. SKUCE

REVISIONS	INIT.	DATE

SEAL

DATE

**** NOTE**** Deleted *Variable Message Sign (VMS)* Project Special Provision

OBSERVATION PERIOD

30-DAY OBSERVATION PERIOD

The 30-Day Observation Period shall be considered part of work to be completed by the project completion date.

Upon successful completion of all project work the 30-day Observation Period may commence. Examples of project work includes but is not limited to:

- Installation of all project devices and communications infrastructure.
- Field Acceptance Testing of all devices.
- Central System Testing of all devices and network communications.
- Correction of all deficiencies and punch list items. (including minor construction items)

This observation consists of a 30-day period of normal, day-to-day operations of the field equipment in operation with new or existing central equipment without any failures. The purpose of this period is to ensure that all components of the system function in accordance with the plans developed by the Design-Build Team and these Project Special Provisions.

Respond to system or component failures (or reported failures) that occur during the 30-day Observation Period within twenty-four (24) hours. Correct any failures within forty-eight (48) hours (includes time of notification). Any failure that affects a major system component as defined below for more than forty-eight (48) hours will suspend the timing of the 30-day Observation Period beginning at the time when the Design-Build Team is was notified that the failure occurred. After the cause of such failures has been corrected, timing of the 30-day Observation Period will resume. System or component failures that necessitate a redesign of any component or a failure in any of the major system components exceeding a total of three (3) occurrences will terminate the 30-day Observation Period for that system. The 30-day Observation Period shall be restarted from day zero when the redesigned components have been installed and / or the failures corrected. The major system components are:

- CCTV Cameras and Central Operations
- Dynamic Message Sign (DMS) and Central equipment / Operations
- Portable Changeable Message Sign (PCMS)
- Communications infrastructure (examples: Fiber, Radios, Ethernet Switches, Core Switches, etc.)
- Any other ITS Devices not named above (examples: DSRC radios, Radar and Out-of-Street Detection, signals, etc.)
- **** NOTE **** Deleted bullets related to VMS requirements

FINAL ACCEPTANCE

Final system acceptance is defined as the time when all work and materials described in the plans developed by the Design-Build Team and these Project Special Provisions have been furnished and completely installed by the Design-Build Team; all parts of the work have been approved and accepted by the Engineer; and successful completion of the 30-day observation period.

The completed System shall be ready for final acceptance upon the satisfactory completion of all acceptance tests as detailed in their respective Section of the Project Special Provisions; the rectification of all punch-list discrepancies; and the submittal of all project documentation including As-Built Plans.

GEOTEXTILE FOR PAVEMENT STABILIZATION

(5-7-14) (Rev. 3-9-18) DB 08-05

Description

Supply and install geotextile for pavement stabilization in accordance with the Geotechnical Engineering Scope of Work found elsewhere in this RFP. Define "subbase" as the portion of the roadbed below the Type 1 Subgrade Stabilization, where required, or pavement structure (asphalt base course / ABC).

Materials

Refer to Division 10 of the 2018 *Standard Specifications for Roads and Structures*.

Item	Section
Geotextiles	1056

Provide Type 5 geotextile for geotextile for pavement stabilization that meets the following tensile strength requirements in the machine direction (MD) and cross-machine direction (CD):

GEOTEXTILE FOR PAVEMENT STABILIZATION REQUIREMENTS		
Tensile Strength	**Requirement (MARV[A])**	**Test Method**
Tensile Strength @ 5% Strain (MD & CD[A])	1,900 lb/ft	ASTM D4595
Ultimate Tensile Strength (MD & CD[A])	4,800 lb/ft	ASTM D4595

A. MD, CD and MARV per Article 1056-3 of the 2018 *Standard Specifications for Roads and Structures*.

Construction Methods

Place geotextile for pavement stabilization on top of the subbase as shown in the plans developed by the Design-Build Team. Pull geotextiles taut so they are in tension and free of kinks, folds, wrinkles or creases. Install geotextile for pavement stabilization either perpendicular or parallel to the survey or lane line as shown in the plans developed by the Design-Build Team. All geotextile joints shall overlap a minimum of 18 inches. Completely cover subbase with

geotextile for pavement stabilization. If installed parallel to the survey line or lane line, the outer edge of a full roll of geotextile shall be installed on the outer edge of the area requiring pavement stabilization. Hold geotextiles in place with wire staples or anchor pins as needed.

Do not damage geotextile for pavement stabilization when placing aggregate. Do not operate heavy equipment directly on geotextiles. Prior to operating any heavy equipment on geotextile for pavement stabilization, place a minimum of four inches of aggregate onto the geotextile. Replace any damaged geotextiles to the satisfaction of the Engineer.

AUTOMATED MACHINE GUIDANCE

(1-2-11) 801 DB8 R01

General

This Special Provision contains requirements to be followed if the Design-Build Team elects to use Global Positioning System (GPS) machine control grading, and shall be used in conjunction with Section 801 of the 2018 *Standard Specifications for Roads and Structures*. The use of this technology is referenced as Automated Machine Guidance (AMG).

All equipment using AMG shall be able to generate end results that meet the 2018 *Standard Specifications for Roads and Structures* requirements. The Design-Build Team shall perform test sections for each type of work to be completed with AMG to demonstrate that the system has the capability to achieve acceptable results. If acceptable results cannot be achieved, the Design-Build Team shall conform to the requirements for conventional stakeout.

The Design-Build Team shall be responsible for all errors resulting from the use of AMG and shall correct deficiencies to the satisfaction of the Engineer at no cost to the Department.

Submittals

If the Design-Build Team elects to use AMG, a Digital Terrain Model (DTM) of the design surface and all intermediate surfaces shall be developed and submitted to the Engineer for review and acceptance.

At least 90 days prior to beginning grading operations, the Design-Build Team shall submit to the Engineer an AMG work plan to include, but not be limited to, proposed equipment, control software manufacturer and version, types of work to be completed using AMG, project site calibration report, repetitive calibration methods for construction equipment and rover units to be used for the duration of the project, and local GPS base station to be used for broadcasting differential correction data to rover units (this may include the NC Network RTK). All surveys must be tied to existing project control as established by NCDOT.

Inspection

The Engineer will perform quality assurance checks of all work associated with AMG. If it is determined that work is not being performed in a manner that will assure accurate results, the Engineer may require corrective action at no cost to the Department.

The Design-Build Team shall provide the Engineer with one GPS rover units for use during the duration of the contract. The rovers shall be loaded with the same model that is used with the AMG and have the same capability as rover units used by the Design-Build Team. The rovers will be kept in the possession of the Engineer and will be returned to the Design-Build Team upon completion of the contract. All maintenance and repairs required for the rovers shall be the responsibility of the Design-Build Team. The Design-Build Team shall provide at least eight hours of formal training to the Engineer on the use of the proposed AMG system.

Subgrade and Base Controls

If the Design-Build Team elects to use AMG for fine grading and placement of base or other roadway materials, the GPS shall be supplemented with a laser or robotic total station. Include details of the proposed system in the AMG work plan. In addition, the following requirements apply for the use of AMG for subgrade and base construction.

- Provide control points at intervals along the project not to exceed 1,000 feet. The horizontal position of these points shall be determined by static GPS sessions or by traverse connection from the original base line control points. The elevation of these control points shall be established using differential leveling from project benchmarks, forming closed loops where practical. A copy of all new control point information shall be provided to the Engineer prior to construction activities.

- Provide control points and conventional survey grade stakes at 500-foot intervals and at critical points such as, but not limited to, PCs, PTs, superelevation transition points, and other critical points as requested by the Engineer.

- Provide hubs at the top of the finished subgrade at all hinge points on the cross section at 500-foot intervals. These hubs shall be established using conventional survey methods for use by the Engineer to check the accuracy of construction.

HORIZONTAL DRAINS

(11-7-19) DB8 R17

Description

Construct horizontal drains for slopes, rock cuts and retaining walls in accordance with the contract and Geotechnical Engineering Unit Standard Detail No. 817.01. A horizontal drain typically consists of a slotted PVC pipe placed in a drilled hole inclined at an angle above horizontal, but in some holes, the pipe may be omitted. Horizontal drains shall be required to drain water from slopes and rock cuts, and from behind retaining walls at locations and elevations shown in the plans developed by the Design-Build Team and as directed by the Engineer.

Materials

Refer to Division 10 of the 2018 *Standard Specifications for Roads and Structures*.

Item	Section
PVC Pipe	1044-6

As shown in the plans developed by the Design-Build Team, use solid and slotted PVC Schedule 40 or Schedule 80 pipes for drain pipe. Provide slotted PVC pipe with 0.01-inch wide horizontal slots in the direction perpendicular to the pipe length and evenly spaced around and along the pipe so that the open area is at least one square inch per linear foot of pipe.

Construction Methods

The Engineer will determine the number, location, elevation, inclination and length of horizontal drains required. The approximate known drain locations, elevations, inclination and lengths shall be shown in the plans developed by the Design-Build Team. Drain pipe requirements including those drains without pipes will also be determined by the Engineer and known pipe information shall be shown in the plans developed by the Design-Build Team.

Use drill rigs of the sizes necessary to install horizontal drains and with sufficient capacity to drill through whatever materials are encountered. Drilling through boulders, cobbles and rock lenses may be required, but drilling in continuous intact weathered or hard rock, as determined by the Engineer, will not be required unless the drain pipe is omitted. Drill straight and clean holes with the dimensions and orientations shown in the plans developed by the Design-Build Team or as directed by the Engineer. Drill holes within six inches of planned locations and elevations and 2° of required inclination.

For horizontal drains with drain pipes, do not insert PVC pipes into drill holes until hole locations, elevations, dimensions, inclination and cleanliness are approved by the Engineer. Insert drain pipes through hollow stem augers or into open clean drill holes. Do not vibrate, drive or otherwise force pipes into holes. If a drain pipe cannot be completely and easily inserted into a drill hole, remove the pipe and clean or re-drill the hole.

Extend solid PVC sections of drain pipes out past slope face far enough to connect to a drainage system or discharge water as directed by the Engineer. Seal all around drain pipe at collar of drill holes with a method acceptable to the Engineer. For each horizontal drain, record horizontal drain number, location, elevation, installation date, description of drilling conditions and completed drain pipe, if applicable, and drill hole diameter, length and inclination, and provide this information to the Engineer.

FOUNDATIONS AND ANCHOR ROD ASSEMBLIES FOR METAL POLES

(1-17-12) (Rev. 11-22-17) 9, 14, 17 DB9 R05

Description

Foundations for metal poles include foundations for signals, cameras, overhead and dynamic message signs (DMS) and high mount and light standards supported by metal poles or upright

trusses. Foundations consist of footings with pedestals and drilled piers with or without grade beams or wings. Anchor rod assemblies consist of anchor rods (also called anchor bolts) with nuts and washers on the exposed ends of rods and nuts and a plate or washers on the other ends of rods embedded in the foundation.

Construct concrete foundations with the required resistances and dimensions and install anchor rod assemblies in accordance with the contract and accepted submittals. Construct drilled piers consisting of cast-in-place reinforced concrete cylindrical sections in excavated holes. Provide temporary casings or polymer slurry as needed to stabilize drilled pier excavations. Use a prequalified Drilled Pier Contractor to construct drilled piers for metal poles. Define "excavation" and "hole" as a drilled pier excavation and "pier" as a drilled pier.

This provision does not apply to foundations for signal pedestals; see Section 1743 of the 2018 *Standard Specifications for Roads and Structures* and 2018 Roadway Standard Drawing No. 1743.01.

Materials

Refer to the 2018 *Standard Specifications for Roads and Structures*.

Item	Section / Article
Conduit	1091-3
Grout, Type 2	1003
Polymer Slurry	411-2(B)(2)
Portland Cement Concrete	1000
Reinforcing Steel	1070
Rollers and Chairs	411-2(C)
Temporary Casings	411-2(A)

Provide Type 3 material certifications in accordance with Article 106-3 of the 2018 *Standard Specifications for Roads and Structures* for conduit, rollers, chairs and anchor rod assemblies. Store steel materials on blocking at least 12 inches above the ground and protect it at all times from damage; and when placing in the work make sure it is free from dirt, dust, loose mill scale, loose rust, paint, oil or other foreign materials. Load, transport, unload and store foundation and anchor rod assembly materials so materials are kept clean and free of damage. Bent, damaged and / or defective materials shall be rejected.

Use conduit type in accordance with the contract. Use Class A concrete for footings and pedestals, Class Drilled Pier concrete for drilled piers and Class AA concrete for grade beams and wings including portions of drilled piers above bottom of wings elevations. Corrugated temporary casings may be accepted at the discretion of the Engineer. A list of approved polymer slurry products is available from:

connect.ncdot.gov/resources/Geological/Pages/Products.aspx

Provide anchor rod assemblies in accordance with the contract consisting of the following:

(A) Straight anchor rods,

(B) Heavy hex top and leveling nuts and flat washers on exposed ends of rods, and

(C) Nuts and either flat plates or washers on the other ends of anchor rods embedded in foundations.

Do not use lock washers. Use steel anchor rods, nuts and washers that meet ASTM F1554 for Grade 55 rods and Grade A nuts. Use steel plates and washers embedded in concrete with a thickness of at least ¼-inch. Galvanize anchor rods and exposed nuts and washers in accordance with Article 1076-4 of the 2018 *Standard Specifications for Roads and Structures*. It is not necessary to galvanize nuts, plates and washers embedded in concrete.

Construction Methods

Install the required size and number of conduits in foundations in accordance with the plans developed by the Design-Build Team and accepted submittals. Construct top of piers, footings, pedestals, grade beams and wings flat, level and within one-inch of the elevations shown in the plans developed by the Design-Build Team or approved by the Engineer. Provide an Ordinary Surface finish in accordance with Subarticle 825-6(B) of the 2018 *Standard Specifications for Roads and Structures* for portions of foundations exposed above finished grade. Do not remove anchor bolt templates or pedestal or grade beam forms or erect metal poles or upright trusses onto foundations until concrete attains a compressive strength of at least 3,000 psi.

(A) Drilled Piers

Before starting drilled pier construction, hold a predrill meeting to discuss the installation, monitoring and inspection of the drilled piers. Schedule this meeting after the Drilled Pier Contractor has mobilized to the site. The Resident or Division Traffic Engineer, Design-Build Team and Drilled Pier Contractor Superintendent shall attend this predrill meeting.

Do not excavate holes, install piles or allow equipment wheel loads or vibrations within 20 feet of completed piers until 16 hours after Drilled Pier concrete reaches initial set.

Check for correct drilled pier alignment and location before beginning drilling. Check plumbness of holes frequently during drilling.

Construct drilled piers with the minimum required diameters shown in the plans developed by the Design-Build Team. Install piers with tip elevations no higher than shown in the plans developed by the Design-Build Team or approved by the Engineer.

Excavate holes with equipment of the sizes required to construct drilled piers. Depending on the subsurface conditions encountered, drilling through rock and boulders may be required. Do not use blasting for drilled pier excavations.

Contain and dispose of drilling spoils and waste concrete as directed and in accordance with Section 802 of the 2018 *Standard Specifications for Roads and Structures*. Drilling spoils consist of all materials and fluids removed from excavations.

If unstable, caving or sloughing materials are anticipated or encountered, stabilize holes with temporary casings and / or polymer slurry. Do not use telescoping temporary casings. If it becomes necessary to replace a temporary casing during drilling, backfill the excavation, insert a larger casing around the casing to be replaced or stabilize the excavation with polymer slurry before removing the temporary casing.

If temporary casings become stuck or the Design-Build Team proposes leaving casings in place, temporary casings shall be installed against undisturbed material. Unless otherwise approved, do not leave temporary casings in place for mast arm poles and cantilever signs. The Engineer will determine if casings may remain in place. If the Design-Build Team proposes leaving temporary casings in place, do not begin drilling until the Department approves a casing installation method.

Use polymer slurry and additives to stabilize holes in accordance with the slurry manufacturer's recommendations. Provide mixing water and equipment suitable for polymer slurry. Maintain the required slurry properties at all times except for sand content.

Define a "sample set" as slurry samples collected from mid-height and within two feet of the bottom of holes. Take sample sets from excavations to test polymer slurry immediately after filling holes with slurry, at least every four hours thereafter and immediately before placing concrete. Do not place Drilled Pier concrete until both slurry samples from an excavation meet the required polymer slurry properties. If any slurry test results do not meet the requirements, the Engineer may suspend drilling until both samples from a sample set meet the required polymer slurry properties.

Remove soft and loose material from bottom of holes using augers to the satisfaction of the Engineer. Assemble rebar cages and place cages and Drilled Pier concrete in accordance with Subarticle 411-4(E) of the 2018 *Standard Specifications for Roads and Structures*, except for the following:

(1) Inspections for tip resistance and bottom cleanliness are not required,

(2) Temporary casings may remain in place if approved, and

(3) Concrete placement may be paused near the top of pier elevations for anchor rod assembly installation and conduit placement or

(4) If applicable, concrete placement may be stopped at bottom of grade beam or wings elevations for grade beam or wing construction.

If wet placement of concrete is anticipated or encountered, do not place drilled pier concrete until the Department approves a concrete placement procedure. If applicable, temporary casings and fluids may be removed when concrete placement is paused or stopped in accordance with the exceptions above provided holes are stable. Remove contaminated concrete from exposed drilled pier concrete after removing casings and fluids. If holes are unstable, do not remove temporary casings until the Department approves a procedure for placing anchor rod assemblies and conduit or constructing grade beams or wings.

Use collars to extend drilled piers above finished grade. Remove collars after drilled pier concrete sets and round top edges of piers.

If drilled piers are questionable, pile integrity testing (PIT) and further investigation may be required in accordance with Article 411-5 of the 2018 *Standard Specifications for Roads and Structures*. A drilled pier shall be considered defective in accordance with Subarticle 411-5(D) of the 2018 *Standard Specifications for Roads and Structures* and drilled pier acceptance shall be based in part on the criteria in Article 411-6 of the 2018 *Standard Specifications for Roads and Structures* except for the top of pier tolerances in Subarticle 411-6(C) of the 2018 *Standard Specifications for Roads and Structures*.

If a drilled pier is under further investigation, do not grout core holes, backfill around the pier or perform any work on the drilled pier until the Engineer accepts the pier. If the drilled pier is accepted, dewater and grout core holes and backfill around the pier with approved material to finished grade. If the Engineer determines a pier is unacceptable, remediation shall be required in accordance with Article 411-6 of the 2018 *Standard Specifications for Roads and Structures*. No additional compensation or extension of completion date or time will be allowed for remediation of unacceptable drilled piers or post repair testing.

Permanently embed a plate in or mark top of piers with the pier diameter and depth, size and number of vertical reinforcing bars and the minimum compressive strength of the concrete mix at 28 days.

(B) Footings, Pedestals, Grade Beams and Wings

Excavate as necessary for footings, grade beams and wings in accordance with the plans developed by the Design-Build Team, accepted submittals and Section 410 of the 2018 *Standard Specifications for Roads and Structures*. If unstable, caving or sloughing materials are anticipated or encountered, shore foundation excavations as needed with an approved method. Notify the Engineer when foundation excavation is complete. Do not place concrete or reinforcing steel until excavation dimensions and foundation material are approved by the Engineer.

Construct cast-in-place reinforced concrete footings, pedestals, grade beams and wings with the dimensions shown in the plans developed by the Design-Build Team and in accordance with Section 825 of the 2018 *Standard Specifications for Roads and Structures*. Use forms to construct portions of pedestals and grade beams protruding above finished grade. Provide a chamfer with a ¾-inch horizontal width for pedestal and grade beam edges exposed above finished grade. Place concrete against undisturbed soil or backfill and fill in accordance with Article 410-8 of the 2018 *Standard Specifications for Roads and Structures*. Proper compaction around footings and wings is critical for foundations to resist uplift and torsion forces.

(C) Anchor Rod Assemblies

Size anchor rods for design and the required projection above top of foundations. Determine required anchor rod projections from nut, washer and base plate thicknesses, the protrusion of three to five anchor rod threads above top nuts after tightening and the distance of one nut thickness between top of foundations and bottom of leveling nuts.

Protect anchor rod threads from damage during storage and installation of anchor rod assemblies. Before placing anchor rods in foundations, turn nuts onto and off rods past leveling nut locations. Turn nuts with the effort of one workman using an ordinary wrench without a cheater bar. Report any thread damage to the Engineer that requires extra effort to turn nuts.

Arrange anchor rods symmetrically about center of base plate locations as shown in the plans developed by the Design-Build Team. Set anchor rod elevations based on required projections above top of foundations. Securely brace and hold rods in the correct position, orientation and alignment with a steel template. Do not weld to reinforcing steel, temporary casings or anchor rods.

Install top and leveling (bottom) nuts, washers and the base plate for each anchor rod assembly in accordance with the following procedure:

(1) Turn leveling nuts onto anchor rods to a distance of one nut thickness between the top of foundation and bottom of leveling nuts. Place washers over anchor rods on top of leveling nuts.

(2) Determine if nuts are level using a flat rigid template on top of washers. If necessary, lower leveling nuts to level the template in all directions or if applicable, lower nuts to tilt the template so the metal pole or upright truss will lean as shown in the plans developed by the Design-Build Team. If leveling nuts and washers are not in full contact with the template, replace washers with galvanized beveled washers.

(3) Verify the distance between the foundation and leveling nuts is no more than one nut thickness.

(4) Place base plate with metal pole or upright truss over anchor rods on top of washers. High mount luminaires may be attached before erecting metal poles but do not attach cables, mast arms or trusses to metal poles or upright trusses at this time.

(5) Place washers over anchor rods on top of base plate. Lubricate top nut bearing surfaces and exposed anchor rod threads above washers with beeswax, paraffin or other approved lubricant.

(6) Turn top nuts onto anchor rods. If nuts are not in full contact with washers or washers are not in full contact with the base plate, replace washers with galvanized beveled washers.

(7) Tighten top nuts to snug-tight with the full effort of one workman using a 12-inch wrench. Do not tighten any nut all at once. Turn top nuts in increments. Follow a star pattern cycling through each nut at least twice.

(8) Repeat (7) for leveling nuts.

(9) Replace washers above and below the base plate with galvanized beveled washers if the slope of any base plate face exceeds 1:20 (5%), any washer is not in firm contact with the base plate or any nut is not in firm contact with a washer. If any washers are replaced, repeat (7) and (8).

(10) With top and leveling nuts snug-tight, mark each top nut on a corner at the intersection of two flats and a corresponding reference mark on the base plate. Mark top nuts and base plate with ink or paint that is not water-soluble. Use the turn-of-nut method for pretensioning. Do not pretension any nut all at once. Turn top nuts in increments for a total turn that meets the following nut rotation requirements:

NUT ROTATION REQUIREMENTS (Turn-of-Nut Pretensioning Method)	
Anchor Rod Diameter, inch	**Requirement**
≤ 1 1/2	1/3 turn (2 flats)
> 1 1/2	1/6 turn (1 flat)

Follow a star pattern cycling through each top nut at least twice.

(11) Ensure nuts, washers and base plate are in firm contact with each other for each anchor rod. Cables, mast arms and trusses may now be attached to metal poles and upright trusses.

(12) Between four and 14 days after pretensioning top nuts, use a torque wrench calibrated within the last 12 months to check nuts in the presence of the Engineer. Completely erect mast arm poles and cantilever signs and attach any hardware

before checking top nuts for these structures. Check that top nuts meet the following torque requirements:

TORQUE REQUIREMENTS	
Anchor Rod Diameter, inch	**Requirement, ft-lb**
7/8	180
1	270
1 1/8	380
1 1/4	420
≥ 1 1/2	600

If necessary, retighten top nuts in the presence of the Engineer with a calibrated torque wrench to within ± 10 ft-lb of the required torque. Do not overtighten top nuts.

(13) Do not grout under base plate.

OVERHEAD AND DYNAMIC MESSAGE SIGN FOUNDATIONS

(9-11-17) DB9 R07

Description

Sign foundations include foundations for overhead and dynamic message signs (DMS) supported by metal poles or upright trusses. Sign foundations consist of footings with pedestals or drilled piers with or without grade beams or wings, conduit and anchor rod assemblies. Construct sign foundations in accordance with the contract and accepted submittals. Define "cantilever sign" as an overhead cantilever sign support in accordance with Figure 1-1 of the 2013 AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals,* 6th Edition, including the latest interim specifications and the latest interim revisions.

Materials

Use sign foundation materials that meet the *Foundations and Anchor Rod Assemblies for Metal Poles* Project Special Provision found elsewhere in this RFP.

Subsurface Conditions

Assume the following soil parameters and groundwater elevation for sign foundations unless these subsurface conditions are not applicable to sign locations:

A. Unit weight (γ) = 120 pcf,

B. Friction angle (ϕ) = 30°,

C. Cohesion (c) = 0 psf and

D. Groundwater seven feet below finished grade.

A subsurface investigation shall be required if the Engineer determines these assumed subsurface conditions do not apply to a sign location and the sign cannot be moved. Subsurface conditions requiring a subsurface investigation shall include, but are not limited to, weathered or hard rock, boulders, very soft or loose soil, muck or shallow groundwater. No additional compensation or extension of completion date or time will be allowed for subsurface investigations.

Subsurface Investigations

Use a prequalified geotechnical consultant to perform one standard penetration test (SPT) boring in accordance with ASTM D1586 at each sign location requiring a subsurface investigation. Rough grade sign locations to within two feet of finished grade before beginning drilling. Drill borings to two drilled pier diameters below anticipated pier tip elevations or refusal, whichever is higher.

Use the computer software gINT version V8i or later manufactured by Bentley Systems, Inc. with the current NCDOT gINT library and data template to produce SPT boring logs. Provide boring logs sealed by a geologist or engineer licensed in the state of North Carolina.

Sign Foundation Designs

Design sign foundations for the wind zone and clearances shown in the plans developed by the Design-Build Team and the slope of finished grade at each sign location. Use the assumed soil parameters and groundwater elevation above for sign foundation designs unless a subsurface investigation is performed or required by the Engineer. For sign locations requiring a subsurface investigation, design sign foundations for the subsurface conditions at each sign location. Design footings, pedestals, drilled piers, grade beams and wings in accordance with the 2013 AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, 6th Edition, including the latest interim specifications and the latest interim revisions. In some instances, conflicts with drainage structures may dictate sign foundation types.

Design footings in accordance with Section 4.4 of the AASHTO *Standard Specifications for Highway Bridges*. Do not use an allowable bearing pressure of more than 3,000 psf for footings.

Design drilled piers for side resistance only in accordance with Section 4.6 of the AASHTO *Standard Specifications for Highway Bridges* except reduce ultimate side resistance by 25% for uplift. Use the computer software LPILE Version 2016 or later manufactured by Ensoft, Inc. to analyze drilled piers. Provide drilled pier designs with a horizontal deflection of less than one inch at top of piers. For cantilever signs with single drilled pier foundations supporting metal poles, use wings to resist torsion forces. Provide drilled pier designs with a factor of safety of at least 2.0 for torsion.

For drilled pier sign foundations supporting upright trusses, use dual drilled piers connected with a grade beam having a moment of inertia approximately equal to that of either pier. The Broms' method is acceptable to analyze drilled piers with grade beams instead of LPILE. Use a safety factor of at least 3.5 for the Broms' design method in accordance with C13.6.1.1 of the 2013

AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, 6th Edition, including the latest interim specifications and the latest interim revisions.

Submit boring logs, if any, working drawings and design calculations for acceptance in accordance with Article 105-2 of the 2018 *Standard Specifications for Roads and Structures*. Submit working drawings showing plan views, required foundation dimensions and elevations and typical sections with reinforcement, conduit and anchor rod assembly details. Include all boring logs, design calculations and LPILE output for sign foundation design submittals. Have sign foundations designed, detailed and sealed by an engineer licensed in the state of North Carolina.

Construction Methods

Construct footings, pedestals, drilled piers, grade beams and wings and install anchor rod assemblies for sign foundations in accordance with the *Foundations and Anchor Rod Assemblies for Metal Poles* Project Special Provision found elsewhere in this RFP. Submit boring logs, if any, working drawings and design calculations for acceptance in accordance with Article 105-2 of the 2018 NCDOT *Standard Specifications for Roads and Structures*. Submit working drawings showing plan views, required foundation dimensions and elevations and typical sections with reinforcement, conduit and anchor rod assembly details. Include all boring logs, design calculations and LPILE output for sign foundation design submittals. Have sign foundations designed, detailed and sealed by an engineer licensed in the state of North Carolina.

ROADWAY LIGHTING FOUNDATIONS

(9-12-17) DB9 R09

Description

Roadway lighting foundations include foundations for high mount and light standards. High mount foundations for high mount standards and standard foundations for light standards consist of drilled piers or footings with pedestals, conduit and anchor rod assemblies. Construct roadway lighting foundations in accordance with the contract, 2018 Roadway Standard Drawings and accepted submittals. Define “high mount foundation” as a drilled pier including the conduit and anchor rod assembly that meets 2018 Roadway Standard Drawing No. 1402.01. Define “standard foundation” as a drilled pier or footing with pedestal including the conduit and anchor rod assembly that meets 2018 Roadway Standard Drawing No. 1405.01.

Materials

Use roadway lighting foundation materials that meet the *Foundations and Anchor Rod Assemblies for Metal Poles* Project Special Provision found elsewhere in this RFP. Provide metal shrouds for median mounted light standards in accordance with Subarticle 1400-4(I) of the 2018 *Standard Specifications for Roads and Structures*.

Roadway Lighting Foundations

(A) High Mount Foundations

Construct high mount foundations for the wind zone and high mount heights shown in the Final Lighting Plans provided by the Department, unless the following assumed site conditions are not applicable to high mount locations:

1) Soil with unit weight (γ) $\geq$ 120 pcf and friction angle (ϕ) $\geq$ 30°,

2) Groundwater at least seven feet below finished grade and

3) Slope of finished grade 6:1 (H:V) or flatter.

A subsurface investigation and high mount foundation design shall be required if the Engineer determines these assumed site conditions do not apply to a high mount location and the high mount cannot be moved. Subsurface conditions requiring a high mount foundation design, include but are not limited to, weathered or hard rock, boulders, very soft or loose soil, muck or shallow groundwater. No extension of completion date or time will be allowed for subsurface investigations or high mount foundation designs.

(B) Standard Foundations

Construct standard foundation types for the light standard types shown in the Final Lighting Plans provided by the Department and the site conditions at each light standard location. When weathered or hard rock, boulders or obstructions conflict with standard foundations, submit an alternate standard foundation design for acceptance in accordance with Article 105-2 of the 2018 *Standard Specifications for Roads and Structures*. No extension of completion date or time will be allowed for alternate standard foundations.

Subsurface Investigations

Use a prequalified geotechnical consultant to perform one standard penetration test (SPT) boring in accordance with ASTM D1586 at each high mount location requiring a subsurface investigation. Rough grade high mount locations to within two feet of finished grade before beginning drilling. Drill borings to two drilled pier diameters below anticipated pier tip elevations or refusal, whichever is higher.

Use the computer software gINT Version V8i or later manufactured by Bentley Systems, Inc. with the current NCDOT gINT library and data template to produce SPT boring logs. Provide boring logs sealed by a geologist or engineer licensed in the state of North Carolina.

High Mount Foundation Designs

Design high mount foundations for the wind zone and high mount heights shown in the Final Lighting Plans provided by the Department and the slope of finished grade and subsurface conditions at each high mount location. Design drilled piers, footings and pedestals in

accordance with the 2013 AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, 6th Edition, including the latest interim specifications and the latest interim revisions.

Design drilled piers for side resistance only in accordance with Section 4.6 of the AASHTO *Standard Specifications for Highway Bridges*. Use the computer software LPILE Version 2016 or later manufactured by Ensoft, Inc. to analyze drilled piers. Provide drilled pier designs with a horizontal deflection of less than 0.5-inch at top of piers.

Design footings in accordance with Section 4.4 of the AASHTO *Standard Specifications for Highway Bridges.* Do not use an allowable bearing pressure of more than 3,000 psf for footings.

Submit boring logs, working drawings and design calculations for acceptance in accordance with Article 105-2 of the 2018 *Standard Specifications for Roads and Structures*. Submit working drawings showing plan views, required foundation dimensions and elevations and typical sections with reinforcement, conduit and anchor rod assembly details. Include all boring logs, design calculations and LPILE output for high mount foundation design submittals. Have high mount foundations designed, detailed and sealed by an engineer licensed in the state of North Carolina.

Construction Methods

Grade around roadway lighting locations with cut and fill slopes as shown on 2018 Roadway Standard Drawing No. 1402.01 or No. 1405.01. Construct drilled piers, footings and pedestals and install anchor rod assemblies for roadway lighting foundations in accordance with the *Foundations and Anchor Rod Assemblies for Metal Poles* Project Special Provision found elsewhere in this RFP.

For median mounted light standards, place concrete for median barriers and underlying pedestals in the same pour. Construct concrete barriers in accordance with the contract and make concrete median barriers continuous through standard foundations. Coordinate construction of median mounted light standards with sign structures, concrete barriers, drainage structures, etc. to avoid conflicts.

LIGHTING

(10-13-20) DB14 R02-2

DESCRIPTION

The work covered by this Section consists of furnishing, installing, connecting, and placing into satisfactory operating condition roadway lighting at locations shown on the Final Lighting Plans provided by the Department. Perform all work in accordance with these Special Provisions, the Final Lighting Plans provided by the Department, the National Electrical Code, and North Carolina Department of Transportation "Standard Specifications for Roads and Structures" (*2018 Standard Specifications*).

Perform all work in conformance with Division 14 of the 2018 *Standard Specifications for Roads and Structures* except as modified or added to by these Special Provisions. Install all bore

pits outside the clear zone, as defined in the AASHTO Roadside Design Guide or as directed by the Engineer.

In addition to the requirements of Division 1400, other specific Sections of the 2018 *Standard Specifications for Roads and Structures* applicable to the work on this project are listed below.

Section 1401	High Mount Standard and Portable Drive Unit
Section 1404	Light Standards
Section 1407	Electric Service Pole and Lateral
Section 1408	Light Control System
Section 1409	Electrical Duct
Section 1410	Feeder Circuits
Section 1411	Electrical Junction Boxes

LIGHT STANDARD LIGHT EMITTING DIODE (LED) LUMINAIRES

DESCRIPTION

Furnish, install and place into satisfactory operation luminaire, either on a bracket arm or directly mounted to the standard, complete with all light sources, drivers, wiring inside standard from circuit conductors to luminaire, in-line breakaway fuseholders and fuses and ground wiring at the pole on light standards less than 55 feet in height.

Type	**HPS Replacement Equivalent**	**Color Temp**	**Min. % of initial output at 70k hours**	**Min. Maintained Delivered Lumens**
185W LED	250W	3500K ±500K	83%	15,500
285W LED	400W	3500K ±500K	83%	19,150

Third party certified photometric files in IES format are required to be submitted with the catalog cuts for the proposed LED roadway luminaire. Photometric files must show that proposed luminaire will meet or exceed the design shown in the Final Lighting Plans provided by the Department.

The manufacturer shall state the Light Loss Factor (LLF) used in the photometric calculations for the proposed luminaire. LLF shall be calculated as follows:

LLF = Lamp Lumen Depreciation (LLD) x Luminaire Dirt Depreciation (LDD)

- Lamp Lumen Depreciation (LLD) shall be the value calculated and reported by the manufacturer based on the LM-80 and TM-21 reports for the proposed fixture for 70,000 hours at 25° C.
- Luminaire Dirt Depreciation (LDD) = 0.90

MATERIALS

LUMINAIRE REQUIREMENTS

A. General Requirements

- LM-79 photometric test reports shall be provided for all LED luminaires. LM-79 luminaire photometric reports shall be produced by an independent test laboratory and include the following:

  - Name of test laboratory. The test laboratory must hold National Voluntary Laboratory Accreditation Program (NVLAP) accreditation for the IES LM-79 test procedure or must be qualified, verified, and recognized through the U.S. Department of Energy's CALiPER program.
  - Report number
  - Date
  - Complete luminaire catalog number. Catalog number tested must match the catalog number of the luminaire submitted, except for variations which do not affect performance.
  - Description of luminaire, LED light source(s), and LED driver(s)
  - Goniophotometry
  - Colorimetry

- LM-80 lumen maintenance test report shall be provided for each respective LED light source.
- Luminaire shall be constructed of a single piece die cast aluminum housing. Each luminaire shall be finished gray in color unless otherwise noted.
- The luminaire shall have a 7 pin ANSI C136.41 compliant photocontrol receptacle for future expansion capabilities. The Design-Build Team shall provide and install a shorting cap on all luminaires
- Provide a summary of reliability testing performed for LED driver.
- Luminaires maximum total power consumption shall not exceed the values shown in the table above. Nominal luminaire input wattage shall account for nominal applied voltage and any reduction in driver efficiency due to sub-optimal driver loading.
- Luminaire shall have a maximum Backlight, Uplight & Glare (BUG) rating of 3-0-3 and an IESNA distribution of Type II or Type III as required to meet the spacing, the average maintained footcandle level and the average to minimum uniformity ratio requirements shown on the Final Lighting Plans provided by the Department. The same BUG rating and distribution type shall be used throughout the project.
- Minimum Ingress Protection (IP) dust and moisture ratings for the luminaire electrical components (driver and surge protection) and luminaire optical components shall be IP65 and IP66, respectively, as specified in ANSI C136.25.
- Luminaire shall have external and internal labels per ANSI C136.15 and ANSI C136.22, respectively. Internal label shall identify the manufacturer, year and month of manufacture and the manufacturer's part number.

- Luminaire shall have an internal bubble level.
- Luminaires shall start and operate in -20° C to +40° C ambient.
- Luminaires shall be rated for continuous service at an ambient temperature of 40° C (104° F)
- Electrically test fully assembled luminaires before shipment from factory.
- Effective Projected Area (EPA) and weight of the luminaires shall not exceed 1.4 square feet and 46 lbs.
- Luminaires shall be designed for ease of electrical component replacement.
- Luminaires shall be rated for minimum 2G vibration, minimum, per ANSI C136.31.
- LED light sources and drivers shall be RoHS compliant.
- The luminaire manufacturer shall have no less than five (5) years of experience in manufacturing LED-based lighting products and the manufacturing facility must be ISO 9001 certified.
- Luminaire shall have a 1.25” to 2.0” adjustable tenon mount for connection to luminaire bracket arm assembly.
- Pole hardware, nuts, bolts, and washers, etc. shall be made from 18-8 stainless steel, or steel conforming to ASTM A307 galvanized in accordance with ASTM A153.
- Grommets shall be installed in cable entry holes. Cable entry holes shall be free from sharp edges which might cut conductors or an ungloved hand.
- All conductors inside the luminaire shall be neatly secured with tie-wraps as needed to prevent pinch points and assist in trouble shooting.

B. Driver

- Shall be 0V-10V dimmable.
- Rated case temperature shall be suitable for operation in the luminaire operating in the ambient temperature range of -20° C to +40° C.
- Shall be rated for 480VAC at 50/60 Hz, and shall operate normally for input voltage fluctuations of ± 10%.
- Shall have a minimum Power Factor (PF) of 0.90 at full input power and across specified voltage range.
- Shall provide UL Class II output.

C. Surge Suppression

- Integral surge protection shall meet ANSI/IEEE C62.45 procedures based on ANSI/IEEE C62.41.2 definitions for standard and optional waveforms for location category C-High 10kV/10kA test, IEC 61000-4-2 (Electrostatic Discharge) 8kV Air/4kV Contact test and IEC 61000-4-4 (Fast Transients).

D. Electromagnetic interference

- Luminaires shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and across specified voltage range.

- Luminaires shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.

E. Electrical safety testing

- Luminaires shall be listed for wet locations.
- Luminaires shall be UL listed and labeled.

F. Finish

- Luminaires shall be painted with a corrosion resistant polyester powdered paint with a minimum 2.0 mil thickness.
- Luminaires shall exceed a rating of six per ASTM D1654 after 1000 hours of salt spray fog testing per ASTM B117.
- The coating shall exhibit no greater than 30% reduction of gloss per ASTM D523, after 500 hours of QUV testing at ASTM G154 Cycle 6.
- Exterior surfaces shall be smooth and free of burrs.

G. Thermal management

- Mechanical design of protruding external surfaces (heat sink fins) on roadway luminaries shall facilitate hose-down cleaning and discourage debris accumulation.
- Liquids or moving parts will not be allowed for thermal management.

H. Color Quality

- Minimum Color Rendering Index (CRI) of 70 with a Correlated Color Temperature (CCT) of 3000K to 4000K

I. Optics

- Transmissive optical components shall be applied in accordance with OEM design guidelines to ensure suitability for the thermal / mechanical / chemical environment.

J. The following shall be in accordance with corresponding sections of ANSI C136.37

- All internal components shall be assembled and pre-wired using modular electrical connections.
- Terminal blocks shall be used for incoming AC lines. Terminal blocks shall be easily accessible to installers or repair personnel. Wire nuts are prohibited inside the luminaire housing.

K. Latching and hinging

- Refractor and housing door holders and hinges shall be designed to maintain positive control of door to the luminaire body so as not to allow the accidental disengagement of either door.
- Drivers shall be mounted to a housing door designed to be opened from the bottom of the luminaire. Housing door shall allow easy removal for troubleshooting / repair on the ground.

L. Manufacturer or local sales representative shall provide installation and troubleshooting support via telephone and / or e-mail.

WARRANTY

Provide a minimum ten-year warranty covering maintained integrity and functionality of the luminaire housing, wiring, and connections, LED light source(s) and LED driver. Negligible light output from more than 10 percent of the LED packages constitutes luminaire failure.

Warranty period shall begin after project acceptance by the Department. Supplier shall furnish documentation of warranty procedures to the Design-Build Team stating that warranty is for NCDOT.

CONSTRUCTION METHODS

Level and secure each luminaire in all directions. Adjust any luminaires, as directed by the Engineer, to provide optimal illumination distribution.

All LED packages on all luminaires must be operating normally at contract completion. Any luminaire displaying improper operating characteristics prior to contract completion will be replaced by the Design-Build Team at no additional cost to the Department.

HIGH MAST LIGHT EMITTING DIODE (LED) LUMINAIRES

DESCRIPTION

The Design-Build Team shall furnish, install and place into satisfactory operation, LED luminaires on high mount standards as detailed in these Special Provisions.

The Design-Build Team shall supply Holophane or Cooper LED high mount luminaires as specified below or approved equal.

Mounting Height	Nos. of Fixtures	Holophane Part Number	Cooper Part Number
120’	8	HMLED3-PK3-40K-HVOLT-G-AW-P7	GAN-AF-10-LED-8-5WQ-AP-MA-4N7
100’	6	HMLED3-PK3-40K-HVOLT-G-AW-P7	GAN-AF-10-LED-8-5WQ-AP-MA-4N7
80’	8	HMLED3-PK1-40K-HVOLT-G-AW-P7	GAN-AF-06-LED-8-5WQ-AP-MA-4N7
60’	4	HMLED3-PK1-40K-HVOLT-G-AW-P7	GAN-AF-06-LED-8-5WQ-AP-MA-4N7

Any alternate luminaire submitted for approval must meet the minimum requirements in the table and sections below.

Mounting Height	Max. LED Fixture Wattage	Number & HPS Replacement Equivalent	Color Temp	Min. % of initial output at 70k hours	Min. Maintained Delivered Lumens (per fixture)
120’	560W	8 x 750W	3500K ±500K	87%	54,000
100’	560W	6 x 750W	3500K ±500K	87%	54,000
80’	335W	8 x 400W	3500K ±500K	87%	27,000
60’	335W	4 x 400W	3500K ±500K	87%	27,000

The Design-Build Team shall supply the Department with current catalog cuts and 3rd party certified photometric data files in Illuminating Engineering Society (IES) format for any alternate high mount luminaire submitted for approval. The Department will thoroughly evaluate alternate luminaires to determine if proposed alternate high mount luminaire meets or exceeds design criteria.

The manufacturer shall state the Light Loss Factor (LLF) used in the photometric calculations for the proposed luminaire. LLF shall be calculated as follows:

LLF = Lamp Lumen Depreciation (LLD) x Luminaire Dirt Depreciation (LDD)

- Lamp Lumen Depreciation (LLD) shall be the value calculated and reported by the manufacturer based on the LM-80 and TM-21 reports for the proposed fixture for 70,000 hours at 25° C.
- Luminaire Dirt Depreciation (LDD) = 0.90

High mount luminaire retrofit LED kits are not an acceptable alternative.

MATERIALS

LUMINAIRE REQUIREMENTS

A. General Requirements

- LM-79 photometric test reports shall be provided for all LED luminaires. LM-79 luminaire photometric reports shall be produced by an independent test laboratory and include the following:

  - Name of test laboratory. The test laboratory must hold National Voluntary Laboratory Accreditation Program (NVLAP) accreditation for the IES LM-79 test procedure or must be qualified, verified, and recognized through the U.S. Department of Energy's CALiPER program.
  - Report number
  - Date
  - Complete luminaire catalog number. Catalog number tested must match the catalog number of the luminaire submitted, except for variations which do not affect performance.
  - Description of luminaire, LED light source(s), and LED driver(s)
  - Goniophotometry
  - Colorimetry

- LM-80 lumen maintenance test report shall be provided for each respective LED light source.
- Luminaire shall be constructed of aluminum. Each luminaire shall be finished gray in color unless otherwise noted.
- The luminaire shall have a 7 pin ANSI C136.41 compliant photocontrol receptacle for future expansion capabilities. The Design-Build Team shall provide and install a shorting cap for all luminaires.
- Provide a summary of reliability testing performed for LED driver.
- Luminaires maximum total power consumption shall not exceed the values shown in the table above. Nominal luminaire input wattage shall account for nominal applied voltage and any reduction in driver efficiency due to sub-optimal driver loading.
- Luminaire shall have a maximum Backlight, Uplight & Glare (BUG) rating of 5-0-5 and an IESNA distribution of Type V as required to meet the spacing, the average maintained footcandle level and the average to minimum uniformity ratio requirements shown on the Final Lighting Plans provided by the Department. The same BUG rating and distribution type shall be used throughout the project.
- Luminaire LED modules shall meet dust and moisture rating of IP-66, minimum.
- Luminaire shall have an external label per ANSI C136.15.
- Luminaires shall have an internal label per ANSI C136.22.
- Luminaires shall start and operate in -20° C to +40° C ambient.
- Electrically test fully assembled luminaires before shipment from factory.
- Effective Projected Area (EPA) and weight of the luminaires shall not exceed 1.3 square feet and 65 lbs.

- Luminaires shall be designed for ease of electrical component replacement.
- Luminaires shall be rated for minimum 2G vibration, minimum, per ANSI C136.31-2010
- LED light sources and drivers shall be RoHS compliant.
- The luminaire manufacturer shall have no less than five (5) years of experience in manufacturing LED-based lighting products and the manufacturing facility must be ISO 9001 certified.
- Pole hardware, nuts, bolts, and washers, etc. shall be made from 18-8 stainless steel, or steel conforming to ASTM A307 galvanized in accordance with ASTM A153.

B. Driver

- Shall be 0V-10V dimmable.
- Rated case temperature shall be suitable for operation in the luminaire operating in the ambient temperature range of -20° C to +40° C.
- Shall be rated for 480VAC at 50/60 Hz, and shall operate normally for input voltage fluctuations of ± 10%.
- Shall have a minimum Power Factor (PF) of 0.90 at full input power and across specified voltage range.

C. Surge Suppression

- Integral surge protection shall meet ANSI/IEEE C62.45 procedures based on ANSI/IEEE C62.41.2 definitions for standard and optional waveforms for location category C-High 10kV/10kA test, IEC 61000-4-2 (Electrostatic Discharge) 8kV Air/4kV Contact test and IEC 61000-4-4 (Fast Transients).

D. Electromagnetic interference

- Luminaires shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and across specified voltage range.
- Luminaires shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.

E. Electrical safety testing

- Luminaires shall be listed for wet locations.
- Luminaires shall be UL listed and labeled.

F. Finish

- Luminaires shall be painted with a corrosion resistant polyester powdered paint with a minimum 2.0 mil thickness.
- Luminaires shall exceed a rating of six per ASTM D1654 after 1000 hours of salt spray fog testing per ASTM B117.

- The coating shall exhibit no greater than 30% reduction of gloss per ASTM D523, after 500 hours of QUV testing at ASTM G154 Cycle 6.

G. Thermal management

- Mechanical design of protruding external surfaces (heat sink fins) shall facilitate hose-down cleaning and discourage debris accumulation.

H. Color Quality

- Minimum Color Rendering Index (CRI) of 70 with a Correlated Color Temperature (CCT) of 3000K to 4000K

I. Optics

- Transmissive optical components shall be applied in accordance with OEM design guidelines to ensure suitability for the thermal / mechanical / chemical environment.

J. The following shall be in accordance with corresponding sections of ANSI C136.37

- All internal components shall be assembled and pre-wired using modular electrical connections.
- Terminal blocks shall be used for incoming AC lines
- Latching and hinging

K. Manufacturer or local sales representative shall provide installation and troubleshooting support via telephone and / or e-mail.

WARRANTY

Provide a minimum ten-year warranty covering maintained integrity and functionality of the luminaire housing, wiring, and connections, LED light source(s) and LED driver. Negligible light output from more than 10 percent of the LED packages constitutes luminaire failure.

Warranty period shall begin after project acceptance by the Department.

CONSTRUCTION METHODS

Level and secure each luminaire in all directions. Securely terminate the wiring for each high mount luminaire and include an equipment grounding conductor to bond the housing to the supply cord grounding conductor.

Adjust any luminaires, as directed by the Engineer, to provide optimal illumination distribution.

All LED packages on all luminaires must be operating normally at contract completion. Any luminaire displaying improper operating characteristics prior to contract completion shall be replaced by the Design-Build Team at no additional cost to the Department.

LIGHTING CONTROL SYSTEM

DESCRIPTION

The work covered under this section consists of furnishing and installing an entire control system, including enclosure, control panel, breakers, terminal blocks, wiring, conduits, lightning arrester, a concrete foundation, metal pole and galvanized slotted channel is also included.

The control system shall be standard electrical components in a stainless steel enclosure mounted on a metal pole with a concrete foundation as shown in the contract.

MATERIALS

Refer to Division 10 of the 2018 NCDOT *Standard Specifications for Roads and Structures*.

Item	**Section**
Conduit	1091-3
Portland Cement Concrete, Class A	1000-4
Wire and Cable	1091-2, 1400-2

Provide concrete foundations and wire in accordance with the 2018 NCDOT *Standard Specifications for Roads and Structures*.

Use a piece of 4” rigid galvanized steel conduit (RGC), embedded in concrete as shown in the Final Lighting Plans provided by the Department, for mounting the control system.

Provide a NEMA type 3R stainless steel enclosure with external stainless mounting flanges, drip shield, back panel and continuous hinge door with a print pocket. Provide a door closing mechanism interlocked with a flange mounted operator handle to prevent the opening of the door with the service circuit breaker in the ON position, except by use of safety override devices.

Provide an enclosure approximately 36" (h) x 30" (w) x 10" (d) unless noted otherwise in the Final Lighting Plans provided by the Department. Provide only openings necessary for the entrance of conduits as shown in the Final Lighting Plans provided by the Department. Do not use knockouts. Ensure the enclosure conforms with NEC Article 312 and mount the devices so the NEC clearances will be provided, except use 1.5" where not specified or noted in the tables for minimum wire bending space.

Use minimum 1-5/8” x 1-5/8” galvanized slotted steel framing channel with straps and bolts for the mounting brackets and hardware for attaching the enclosure. Use galvanized finish on the brackets and hardware and coat all field cuts or scratches with organic zinc repair paint.

Provide a neutral bar, bonded to the panel, with sufficient box lug type terminals to accept the required number of wires.

Mount components to the back panel with manufacturer supplied mounting brackets or permanently attached screw studs.

Use a service circuit breaker providing an minimum interrupting rating of 22,000 A. Provide thermal magnetic, molded case, permanent trip breakers. Provide multi-tap, solderless, load side box lugs or distribution terminal blocks of the appropriate size. Use insulating material approved for NEMA 3R applications. Provide a breaker with a voltage and amperage rating as indicated in the Final Lighting Plans provided by the Department.

Use feeder circuit breakers which are rated 14,000 A minimum interrupting capacity and have an open type molded case with a non-adjustable thermal magnetic trip setting as noted in the Final Lighting Plans provided by the Department.

Where Communication Gateways are required, provide a single pole, open type gateway circuit breaker rated at 240 VAC phase to ground with a minimum interrupting current capacity of 5,000 A and a high magnetic trip setting of 15 A.

Use a Type 1 surge protection device (SPD) meeting UL 1449 and UL 96A, designed to contain and arrest an arc of 20,000 A. Install the SPD on the load side of the service breaker.

Use terminals and lugs rated for the connection of the appropriate size copper conductors. All conductors shall be made of copper and neatly wrapped in bundles or run in plastic raceways.

Perform all galvanizing in accordance with Section 1076 of the 2018 NCDOT *Standard Specifications for Roads and Structures*.

Provide a drawing to scale showing the location, brand and catalog number of each component of the control system for approval. The completed light control system shall be marked "Suitable for Use as Service Equipment", in a prominent location in the enclosure, in accordance with NEC Article 409.110. If the control system is not made in a certified UL 508A Panel Shop, a third party, recognized by the Department of Insurance as having the authority, shall label the control systems.

CONSTRUCTION METHODS

Construct the new control system foundation at the new location as shown in Roadway Standard Drawing No. 1408 with the top of the foundation three inches above finished grade.

Fasten the enclosure to the pole by means of a galvanized bracket assembly as shown in the Final Lighting Plans provided by the Department. Make all cuts square and remove all rough edges. Have mounting holes match existing mounting holes of the enclosure.

Arrange all conduits entering the enclosure in a neat symmetrical manner and extend directly downward into the foundation. Install six RGC feeder circuit conduits as shown in the Roadway Standard Drawings.

Install a Control System Junction Box as shown in the Final Lighting Plans provided by the Department. Stub all feeder circuit conduits and spare conduits from Control System in the Control System Junction Box. See Section 1412 of the 2018 NCDOT *Standard Specifications for Roads and Structures* for junction box construction methods. See Final Lighting Plans provided by the Department for conduit sizes. Place pull cord in any unused conduits and cap unused conduit in junction box.

To prevent the creation of electrically parallel paths, install a bonded conduit choke on the underground termination point of the system grounding conductor conduit in accordance with NEC Article 250.64(E). Do not terminate the system grounding conduit under the concrete foundation pad.

Install a grounding electrode system consisting of a minimum of two ground rods spaced not less than six feet apart at all new lighting control system panels. Connect ground rods with an appropriately sized bonding jumper.

Apply two coats of organic zinc repair paint to all field cut metal and conduit threads as specified in Article 1076-7 of the 2018 NCDOT *Standard Specifications for Roads and Structures*.

Install a 4” to 2” galvanized reducing bushing to the top of the 4” RGC the control system enclosure is mounted to. Install a 10’ section of 2” RGC on the reducing bushing and install a cap on the top of the 2” RGC.

COMMUNICATION GATEWAY

DESCRIPTION

The Design-Build Team shall provide and install a communication gateway at the lighting control panels noted on the Final Lighting Plans provided by the Department. The communication gateway shall be used to provide communication from the control nodes on the luminaires to a centralized monitoring software package. The communication gateway shall be mounted on a piece of rigid galvanized conduit installed above the lighting control panel.

MATERIAL

The communication gateway shall be a GE LightGrid gateway rated for the voltage shown in the Final Lighting Plans provided by the Department.

Use conduit and conductors as specified in Article 1400-2 of the 2018 NCDOT *Standard Specifications for Roads and Structures*.

Provide stainless steel straps, galvanized conduit hangers, galvanized bolts, washers and nuts, and liquid-tight flexible metallic conduit (LFMC).

CONSTRUCTION METHODS

Mount the communication gateway to the 2” RGC pole, installed as part of the control system special provision, using the bands included with the gateway. Remove an existing cable gland in the bottom of the gateway enclosure and replace with a ½” RGC fitting. Install ½” RGC and appurtenances required to route conduit to bottom of lighting control panel enclosure. Transition RGC to LFMC to make the turn into the bottom of the enclosure. Secure LFMC to bottom of enclosure using a weatherproof fitting. Install a bonding bushing on the LFMC fitting inside the enclosure and attach to bonding jumper inside the enclosure.

Strap standoffs with rigid conduit hangers to the 2” RGC and secure ½” conduit to the conduit hanger. Install #12 THWN conductors inside the ½” RGC for power from the gateway circuit breaker in the control system enclosure to the gateway. Use a UV resistant cable tie to secure the magnetic GPS antenna to the frame.

See section below for commissioning requirements.

CONTROL NODE

DESCRIPTION

The Design-Build Team shall provide and install a communication node with each new LED luminaire on the project. The communication node shall be used to interface with the Department’s Statewide lighting control system. The communication node shall be provided with 10 years of service from the manufacturer.

MATERIALS

The communication node shall be a GE LightGrid version 2.0 (or higher) node rated for the same service voltage as the luminaire. No other materials are required for this section.

CONSTRUCTION METHODS

Install communication node on the seven-pin photocell receptacle of the luminaire. The communication node utilizes a twist-lock connection to ensure positive connection to the luminaire.

See section below for commissioning requirements.

SMART CONTROL SYSTEM INITILIZATION AND COMMISSIONING

DESCRIPTION

The Communication Gateway(s) and Control Nodes as described in the prior sections shall require commissioning to enable communication with the existing Statewide lighting control system.

After project award, the Design-Build Team shall coordinate with Brady / Trane Services (Brady) at 919-232-5764 or warranty.request@bradyservices.com to have Brady commission the smart controls system, incorporate new gateways and smart nodes into the LightGrid infrastructure and troubleshoot communication issues. Brady shall bill the Design-Build Team directly for these services.

MATERIALS

No materials are required for this section.

CONSTRUCTION METHODS

As part of this contract, the Design-Build Team shall provide new GE LightGrid gateways and control nodes. See Sections 5.00 and 6.00, respectfully, of these Project Special Provisions for gateway and control node requirements.

As a function of the LightGrid system, the Design-Build Team is unable to turn the lights on for testing during the day. The luminaires installed as part of this project are powered 24/7; however, the control node installed on each luminaire has an integral photocontrol, preventing the luminaire from operating during daylight hours.

The Design-Build Team shall notify Brady at least two weeks prior to beginning the construction work. Brady will remotely commission the new LightGrid system, override the internal control node photocontrol and turn all of the control nodes on for 24/7 operation for the duration of the lighting construction. This will allow the Design-Build Team to turn the lighting circuits on and off during the day via the breakers in the lighting control panel.

The Design-Build Team shall notify Brady again when lighting work is complete. At that point Brady will remotely confirm that there is communication between the control nodes and the gateway, and will place the system to normal dusk to dawn operation.

In the event that a communication failure of some, or all, smart nodes or the gateway is encountered, the Design-Build Team shall coordinate with Brady to troubleshoot and resolve the failure.

HIGH VISIBILITY DEVICES

(10/25/2019) (Rev. 12/30/2020)

Description

In accordance with this RFP, the Design-Build Team shall furnish and install high visibility devices for projects on interstates and freeways. High visibility devices include drums, skinny drums, stationary work zone signs and portable work zone signs. All of these devices shall be new. Used devices shall not be acceptable.

The purpose of high visibility devices is to enhance the conspicuity of the devices in order to improve both safety and mobility through the interstate and freeway work zones. In addition,

using new devices help to ensure they remain in compliance with required retroreflective properties for the full life of the project and to improve the overall appearance of significant work zones throughout the State.

Materials

A) General

Use materials in accordance with the manufacturer's recommendations that will retain both durability and retroreflectivity as described elsewhere in this project special provision for a period of at least 36 months.

The following are required high visibility devices to be used for Work Zone Performance applications.

- Drums
- Skinny Drums (daytime use only)
- Stationary Work Zone Signs
- Rigid Portable Work Zone Signs

All drums shall be new and meet the existing requirements of Section 1089-5 of the 2018 NCDOT *Standard Specifications for Roads and Structures* and shall have Grade B flexible fluorescent orange sheeting that meets the retroreflective requirements of Section 1092-2 of the 2018 NCDOT *Standard Specifications for Roads and Structures*.

All stationary work zone signs shall be new and meet the existing requirements of Section 1089-1 of the 2018 NCDOT *Standard Specifications for Roads and Structures*. Legend overlays shall be prohibited and shall not be accepted on the interstate / freeway or associated intersecting roadways. Vertical sign post reflector strips shall be added to all stationary sign supports. Use Grade B fluorescent orange for work zone sign supports and Grade B fluorescent yellow for exit sign supports. Install strips a minimum of six inches in length on sign supports with one sign mounted at a minimum of 4.5 feet in length for sign supports with two or more signs mounted vertically.

All portable work zone signs shall be new and have composite substrates as described in Section 1089-1 of the 2018 NCDOT *Standard Specifications for Roads and Structures*. Roll-up signs shall not meet the requirements of the project special provision. The remainder of the existing requirements of Section 1089-1 of the 2018 NCDOT *Standard Specifications for Roads and Structures* remain. Used sign stands will be acceptable.

B) Material Qualifications / Certifications

Only use materials as listed above that are on the NCDOT Approved Products List. In addition, provide a Type 3 Material Certification for all materials in accordance with Section 106-3 and Section 1087-4 of the 2018 NCDOT *Standard Specifications for Roads and Structures*.

(C) Performance

Poor performance of any device or sign at any site, whether or not related to a specific contract may be grounds for removing the material from the NCDOT Approved Products List and / or removing from any project under contract.

Construction Methods

All requirements of Section 1110-3 and Section 1130-3 of the 2018 NCDOT *Standard Specifications for Roads and Structures* shall apply except roll-up signs shall not be permitted for use.

The use of skinny drums shall be prohibited for all nighttime lane closures on interstates and freeways.

Maintenance

Replace any sign or drum that prematurely fails due to any damage or defect that causes it to perform unsatisfactorily with an "in kind" device of similar quality and age according to the guidelines set forth in the American Traffic Safety Service Association's (ATSSA) Quality Guidelines for Work Zone Traffic Control Devices. An "in kind" replacement sign or drum is not required to be new, however, it shall be less than one year old and have 100% of its original sheeting area and at least 85% of the retroreflective qualities of a new device, so that it is undetectable adjacent to the original devices and signs placed on the project.

**** NOTE **** Deleted *Work Zone Traffic Pattern Masking* Project Special Provision

BLACK EPOXY PAVEMENT MARKING MATERIAL
(1-26-17)

Description

This work shall consist of applying black epoxy pavement marking material on concrete.

Epoxy Pavement Marking Material

(A) Formulation

Use epoxy pavement marking material consisting of 100% solid two-part system formulated and designed to provide a simple volumetric mixing ratio of the two components.

(B) Epoxide Value: ASTM D1652

WPE of the epoxy resin shall be 250 ± 50 for both white and yellow component A on a pigment free basis.

(C) Amine Value ASTM D2074

The total amine value of the curing agent (component B) shall be 450 ± 50

(D) Requirements

(1)	Color	
	Black:	Shall meet ASTM standard
(2)	Hardness:	ASTM D2240
	Minimum Shore D hardness:	80
(3)	Abrasion Resistance:	ASTM C-501
	Minimum wear index of catalyzed sample:	80
(4)	Adhesion to Concrete**:**	ASTM D4541
	At 100% concrete failure:	greater than 325 psi
(5)	Tensile Strength:	ASTM D638
	Minimum average tensile strength:	6000 psi
(6)	Compressive Strength:	ASTM D695
	Minimum compressive strength:	12000 psi
(7)	Drying Time:	ASTM D711
	Maximum drying time at 75±2°F:	10 minutes
(8)	Gel Time:	ASTM D2471
	Maximum gel time:	3 minutes

(E) Material Certification**:** Type 3 Material Certification and Type 4 Material Certification

Construction Methods

Epoxy Pavement Marking Material shall conform to the requirements of Section 1205 of the 2018 *Standard Specifications for Roads and Structures*.

(A) Application Equipment

Use epoxy application equipment, which is equipped with or capable of the following:

Precisely metering the two components in the ratio of proportion recommended by the manufacturer.

Producing the required amount of heat at the mixing head and gun tip.

Maintaining temperatures within the tolerances recommended.

Gauges for each proportioning pump so that any pressure difference can be easily monitored.

A minimum 24" long static mixer unit for proper mixing of the two components of the epoxy marking material.

Each component of the epoxy pavement marking shall be in a homogeneous state prior to mixing,

Have the capability to totally mix component A with component B immediately prior to the marking application.

Have the capability to spray pavement marking material and have the equipment mounted on a truck of sufficient size and stability with an adequate power source to produce uniform lines of the specified dimension.

A metering device to register the accumulated installed footage for each gun.

(B) Weather Limitations

Apply epoxy pavement marking only when the ambient air temperature and the pavement surface temperature is a minimum of 35° F and rising.

(C) Application

Produce epoxy pavement marking lines that have a minimum dry thickness of 15 mils when placed on concrete pavements and 20 mils when placed on asphalt pavements.

Use **Type I** epoxy material (fast dry) for epoxy pavement markings except when otherwise specified in the contract documents.

Type II epoxy material may be used with lane closures as approved by the Engineer to allow for curing time.

Do not place epoxy markings on fresh asphalt pavements until 15 days have elapsed after the last asphalt layer is placed.

Using the epoxy application equipment, apply the pavement marking materials simultaneously. Hot-spray the epoxy resin, mixed in accordance with the manufacturer's recommendations, onto the pavement surface within an application temperature range recommended by the manufacturer. Inject retroreflective glass beads into the molten (liquid) Epoxy Marking.

Individual Components: Before mixing, heat the individual components to within the temperature range of 100° F to 170° F. Do not exceed the upper limit of the manufacturer's recommended heating temperature at any time under any circumstances.

Mixed Material: After mixing, ensure that the application temperatures for the combined materials at the gun tip are within the temperature range recommended by the manufacturer for the particular product used.

Produce marking, which upon cooling, has the ability to resist deformation caused by traffic throughout its entire length.

(D) Observation Period

Epoxy pavement markings shall be subject to a 30-day observation period.

Maintain responsibility for the pavement markings for a 30-day observation period beginning upon the satisfactory completion of all work required in the plans developed by the Design-Build Team. Guarantee the markings under the payment and performance bond in accordance with Article 105-17 of the 2018 *Standard Specifications for Roads and Structures*.

Have traffic operating on the facility during the entire 30-day observation period unless otherwise directed.

Provide pavement marking material, which during the 30-day observation period, shows no signs of failure due to blistering, excessive cracking, chipping, bleeding, staining, discoloration, oil content of the pavement materials, smearing or spreading under heat, deterioration due to contact with grease deposits, oil, diesel fuel, or gasoline drippings, spilling, poor adhesion to the pavement materials, vehicular damage, debonding and normal wear.

Replace, at no additional expense to the Department, any pavement markings that do not perform satisfactorily under traffic during the 30-day observation period.

WORK ZONE PRESENCE LIGHTING

(10/14/19) (Rev. 12/20/20)

DESCRIPTION

The Design-Build Team shall furnish and install Work Zone Presence Lighting during nightly work activities on high speed (55 mph or greater) facilities.

MATERIALS

Anti-glare lighting systems shall be required. Work Zone Presence Lighting shall be in addition to the Design-Build Team's Portable Construction Lighting. Work Zone Presence Lighting shall be installed in accordance with the detail below and the manufacturer's recommendations.

All Work Zone Presence Lighting shall be supplied with a power source to provide the light output as described in the chart below.

Each light unit shall be capable of providing a minimum of 14,000 lumens illuminating a minimum area of approximately 3,000 square feet. The light shall be capable of being elevated to a height of 14 feet above the pavement.

Each light unit support base or mounting stand shall have the capability of being leveled so that the light mast is plumb.

Provide Work Zone Presence Lighting listed on the NCDOT APL.

CONSTRUCTION METHODS

Work Zone Presence Lighting may prestaged (up to one hour prior to single lane closures and up to two hours prior to double and triple lane closures) along with other traffic control devices or installed within one hour after the necessary traffic control devices have been installed for the lane closure(s). At the end of the work night, the Work Zone Presence Lighting shall be removed within one hour before or one hour after the lane closure(s) is removed.

Whenever possible, each light unit shall be placed on the outside paved shoulder, a minimum of four feet from the travel lane, and spaced according to the chart for the amount of light output for each unit.

Work Zone Presence Lighting will be permitted to supplement the Portable Construction Lighting inside the lane closure. At no time shall Work Zone Presence Lighting be used in lieu of required Portable Construction Lighting.

If there is sufficient existing overhead lighting, in the Department's sole discretion, Work Zone Presence lighting may be eliminated.

Lighting Unit Installation Requirements

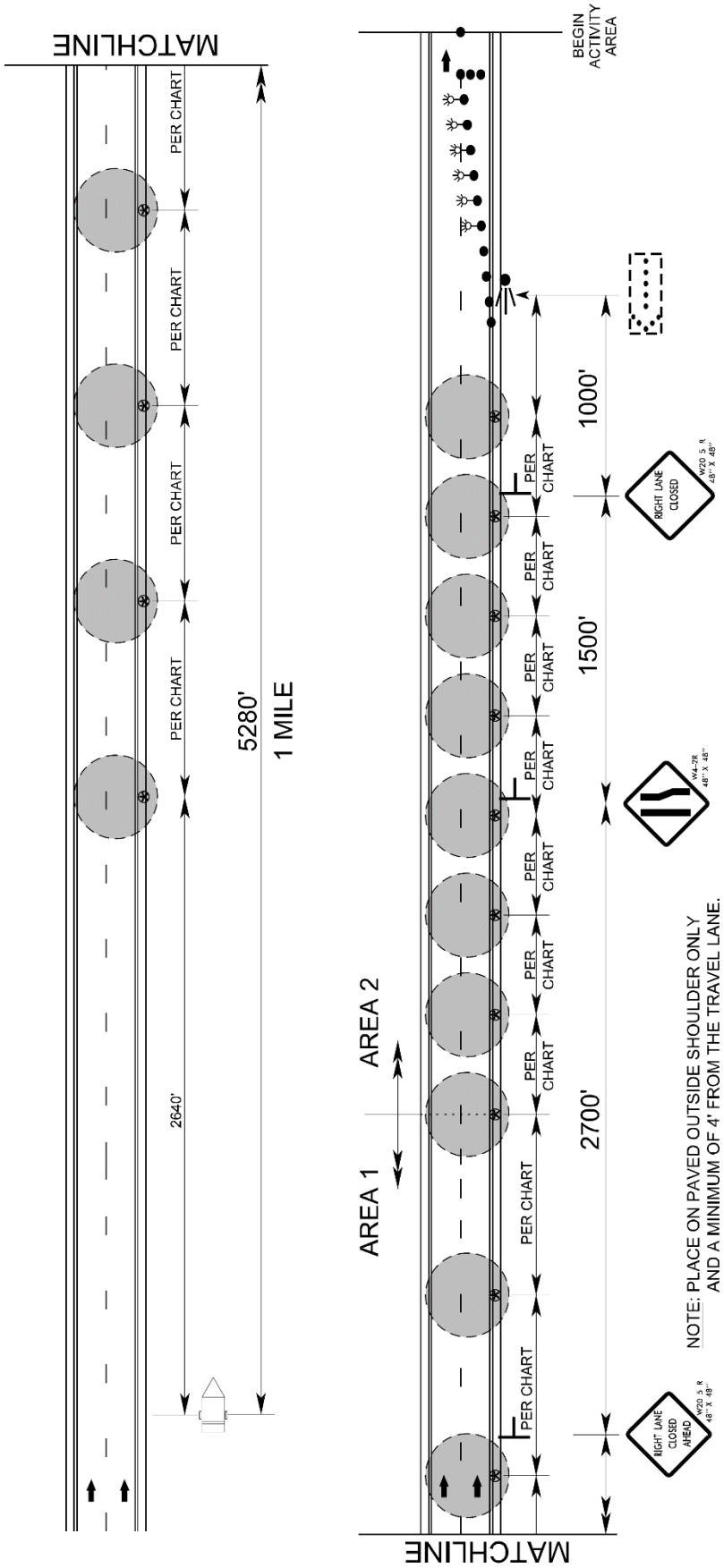
The lighting units shall be installed in advance of the lane closure as shown on the detail below and spaced according to the chart below:

		AREA 1 *		AREA 2 **	
Light Output (Lumens)	**Illuminated Fixture Area (Sq. Ft.)**	**Nos. of Lights**	**Spacing *****	**Nos. of Lights**	**Spacing *****
14,000 - 35,000	4	6	640’ (16 skips)	8	480’ (12 skips)
35,001 - 59,999	5	5	800’ (20 skips)	6	640’ (16 skips)
60,000+	6+	4	1,000’ (25 skips)	5	800’ (20 skips)

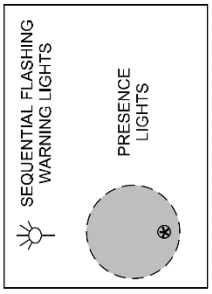
* Area 1: Begins 2,640’ downstream from CMS; Extends to just past 1st Lane Closure Sign

** Area 2: Begins just past the 1st Lane Closure Sign; Extends to just past the last Lane Closure Sign

*** Skips refer to traditional ten-foot pavement marking lines with 30’ gaps.



NOTE: PLACE ON PAVED OUTSIDE SHOULDER ONLY AND A MINIMUM OF 4' FROM THE TRAVEL LANE.



SPACING CHART

Light Output	Fixture Area	AREA 1		AREA 2	
(Lumens)	(Minimum)	# of Lights	Spacing*	# of Lights	Spacing*
14K to 35K	4	6	640' (16 skips)	8	480' (12 skips)
35.1K to 60K	5	5	800' (20 skips)	6	640' (16 skips)
60K +	6+	4	1000' (25 skips)	5	800' (20 skips)

*SKIPS REFER TO TRADITIONAL 10' PAVEMENT MARKING LINES WITH 30' GAPS.

AREA 1: BEGINS 2,640' DOWNSTREAM FROM CMS; EXTENDS TO JUST PAST 1ST LANE CLOSURE SIGN

AREA 2: BEGINS JUST PAST THE 1ST LANE CLOSURE SIGN; EXTENDS TO JUST PAST THE LAST LANE CLOSURE SIGN

SEQUENTIAL FLASHING WARNING LIGHTS

(10/08/2016) (Rev 12/30/2020)

Description

In accordance with this RFP, the Design-Build Team shall furnish and install Sequential Flashing Warning Lights on drums used for merging tapers during nightly work activities on all roadways with posted speed limits of 55 mph or higher.

The purpose of these lights is to assist the motorist in determining which direction to merge when approaching a lane closure. It is also designed to reduce the number of late merges resulting in devices being struck and having to be reset to maintain positive guidance at the merge point. The successive flashing of the lights shall occur from the upstream end of the merging taper to the downstream end of the merging taper in order to identify the desired vehicle path.

Materials

The Sequential Flashing Warning Lights shall meet all of the requirements for warning lights within the latest edition of the Manual of Uniform Traffic Control Devices (MUTCD).

Each light unit shall be capable of operating fully and continuously for a minimum of 200 hours when equipped with a standard battery set.

Each light in the sequence shall be flashed at a rate of not less than 55 times per minute and not more than 75 times per minute. The flash rate and flash duration shall be consistent throughout the sequence.

Supply a Type 3 Certification (Independent Test Lab results) documenting all actual test results for the specified parameters contained in the Institute of Transportation Engineer's (ITE's) *Purchase Specification for Flashing and Steady Burn Warning Lights*. The laboratory shall also identify all manufacturer codes and part numbers for the incandescent lamp or LED clusters, lenses, battery, and circuitry, and the total width of the light with the battery in place. The complete assembly shall be certified as crashworthy when firmly affixed to the channelizing device.

All Sequential Flashing Warning Lights shall be on the NCDOT Work Zone Traffic Control Approved Products List.

Construction Methods

Sequential Flashing Warning Lights are to be used for night time lane closures on all roadways with posted speed limits of 55 mph or higher.

These lights shall flash sequentially beginning with the first light and continuing until the final light.

The Sequential Flashing Warning Lights shall automatically flash in sequence when placed on the drums that form the merging taper.

The number of lights used in the drum taper shall equal the number of drums used in the taper.

Sequential Flashing Warning Lights shall only be mounted on drums.

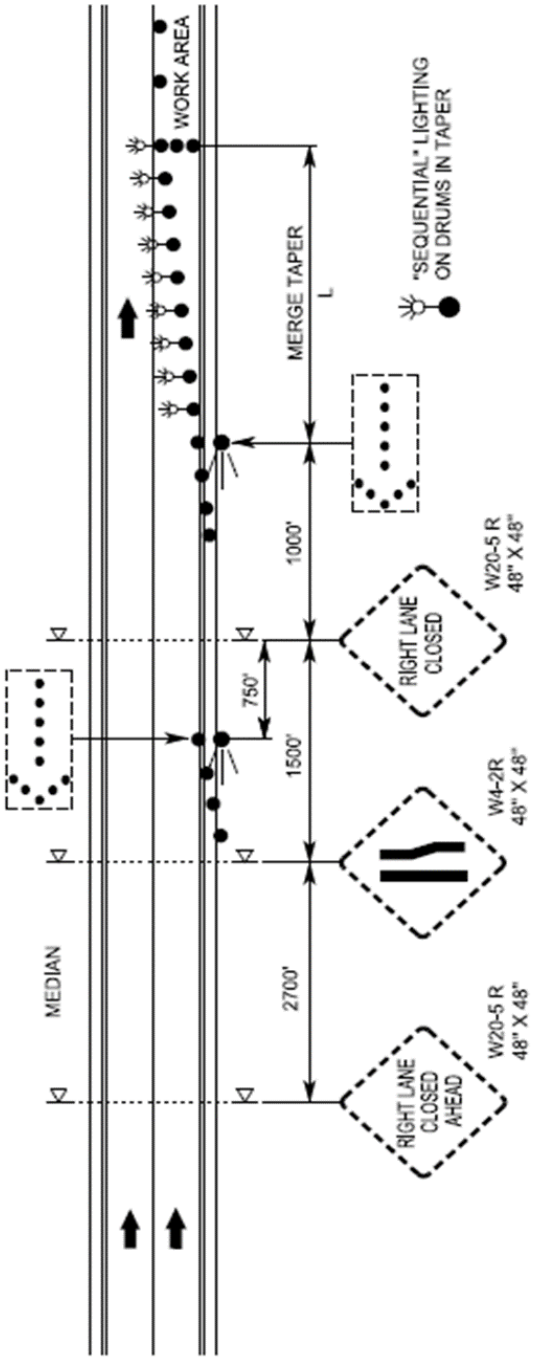
The Sequential Flashing Warning Lights shall be weather independent and visual obstructions shall not interfere with the operation of the lights.

The Sequential Flashing Warning Lights shall automatically sequence when placed in line in an open area with a distance between lights of ten to 100 feet. A ten-foot stagger in the line of lights shall have no adverse effect on the operation of the lights.

If one light fails, the flashing sequence shall continue. If more than one light fails, all of the lights are to be automatically turned to the “off” mode. Non-sequential flashing is prohibited.

When lane closures are not in effect, the Sequential Flashing Warning Lights shall be deactivated.

SEQUENTIAL FLASHING WARNING LIGHTS



WORK ZONE DIGITAL SPEED LIMIT SIGNS

(9/30/2019)

Description

In accordance with this RFP, The Design-Build Team shall furnish and install Work Zone Digital Speed Limit Signs on interstates and freeways with speed limits of 55 mph or greater. These signs are regulatory speed limit signs with LED displays for the speed limit numbers. The purpose of Work Zone Digital Speed Limit signs is to easily change work zone speed limits between activities that necessitate the need for a lower speed limit and the ones that do not.

Materials

Work Zone Digital Speed Limit Signs shall be a minimum 36” wide x 48” high. The speed limit sign (R2-1) shall be black on white with high intensity white prismatic sheeting.

The Work Zone Digital Speed Limit sign shall be mounted such that the bottom of the sign is seven feet above the roadway.

The LED panel shall be a minimum of 28” wide x 18” high. The display on the LED panel shall be amber or white.

The LED numbers shall have a minimum 5 wide by 7 high pixel array with a minimum height of 18”.

The LED panel shall have auto brightness / dimming capability.

The black on orange “WORK ZONE” sign shall be mounted above the speed limit sign. It shall be 36” wide x 24” high with high intensity prismatic orange sheeting.

The black on white “$250 FINE” sign shall be mounted below the speed limit sign. It shall be 36” wide x 24” high with high intensity prismatic white sheeting.

All digital speed limit systems shall have operational software and wireless communications that allow remote operation and data monitoring. It shall be configured to allow access by the Engineer or his designee to change each sign independently or change the speed limit on all signs at once from a PC, tablet or cellular phone application.

Radar equipment to detect approaching speeds on the digital speed limit systems is optional. However, if the systems have radar, they shall be equipped to store the detected speed data, this information should be available in a spreadsheet format that can be accessed remotely from a secure cloud location.

The Work Zone Digital Speed Limit systems shall have flashing beacons. The beacons shall be a minimum of eight-inch diameter LED circular yellow. They shall be mounted above, below or beside the sign assemblies and shall be centered. The beacons shall alternately flash at rates not less than 50 or more than 60 times per minute.

In addition, the flashing beacons shall be mounted in such a manner that the $250 Speeding Fine sign is not obscured when in operation.

All digital speed limit systems shall have operational software and wireless communications that allow remote operation and data monitoring. It shall be configured to allow access by the Engineer or his designee to change each sign independently or change the speed limit on all signs at once from a PC, tablet or cellular phone application.

Work Zone Digital Speed Limit Signs may be trailer mounted or stationary mounted. The unit shall be solar powered and have the ability to operate continuously. It shall be supplemented with a battery backup system which includes a 110/120 VAC powered on-board charging system.

When fully charged, the batteries shall be capable of powering the display for 20 continuous days with no solar power. The unit shall be capable of being powered by a standard 110/120 VAC power source.

Store the battery bank and charging system in a lockable, weather and vandal resistant box.

All Work Zone Digital Speed Limit equipment shall be on the NCDOT Work Zone Traffic Control Approved Products List.

Digital Speed Limit Displays

The speed limit shall be continuously displayed on the signs. All other stationary speed limit signs shall be covered when Digital Speed Limit systems are in operation.

Reduced Speed Limit Displays

The Digital Speed Limit systems shall have beacons activated when the work zone speed limit is reduced. Otherwise, the beacons shall remain off.

<u>IF THE DIGITAL SPEED LIMIT SYSTEM IS EQUIPPED WITH RADAR:</u> The Digital Speed Limit systems shall display the reduced work zone speed limit without flashing the LED speed limit number unless approaching speeds are detected to be 6 mph or higher than the displayed speed limit. If speeds are detected 6 mph or higher than the displayed speed limit, the LED shall flash the speed limit until the speeds are within 6 mph of the displayed speed limit.

Existing Speed Limit Displays

When the existing speed limit is displayed on the Digital Speed Signs, the beacons shall remain off.

<u>IF THE DIGITAL SPEED LIMIT SYSTEM IS EQUIPPED WITH RADAR:</u> The speed limit number shall not flash unless the approaching speeds are detected to be 6 mph or higher than the displayed speed limit.

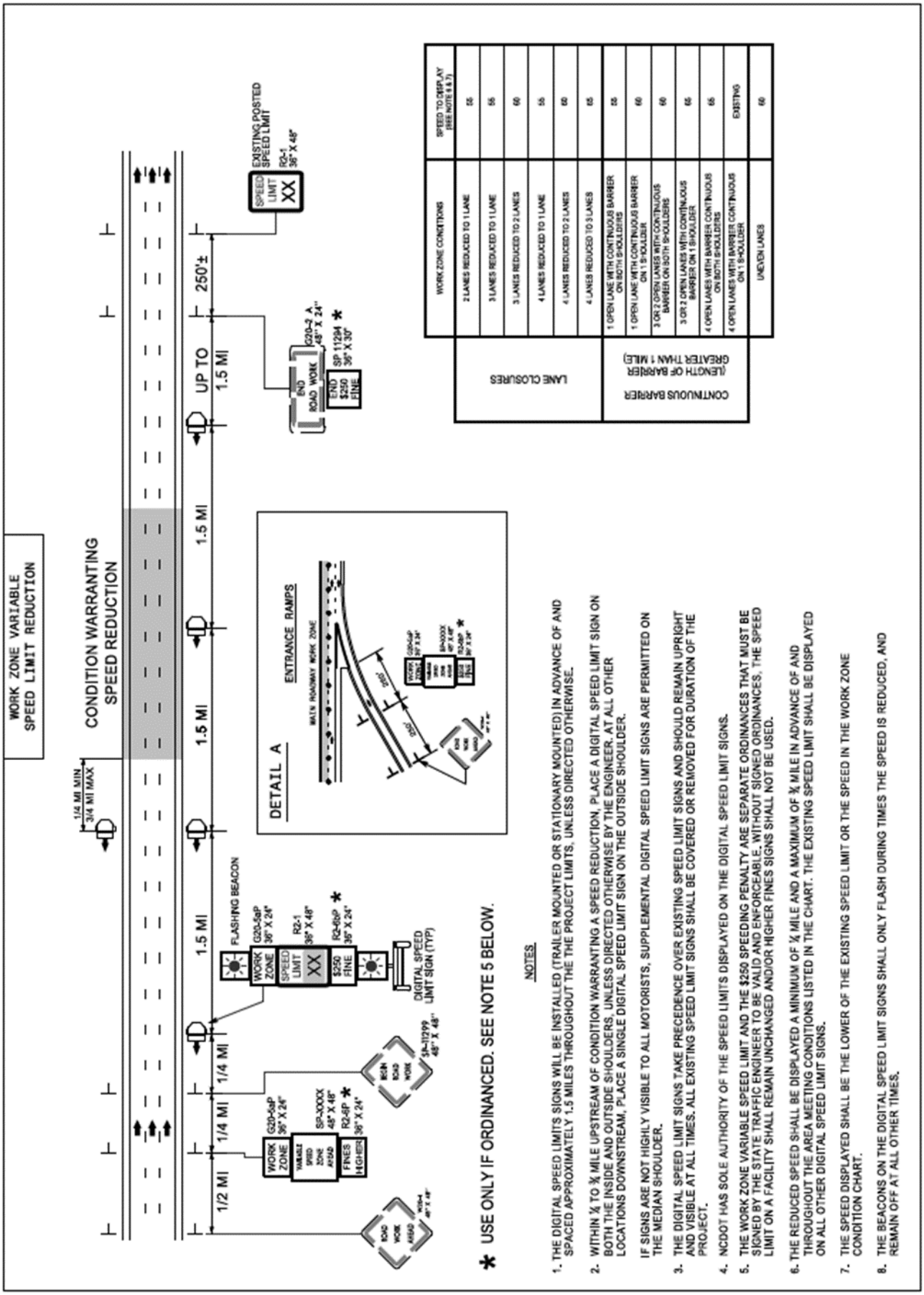
Construction Methods

The speed limits shall be the sole authority of the NCDOT. In order to have a lawfully enforceable speed limit, an ordinance by the State Traffic Engineer shall be required for all speed limits.

The Regional Traffic Engineering Office and the Division Construction Engineer, in coordination with the Work Zone Traffic Control Section, will provide all work zone speed limit recommendations based on activities and conditions.

The Design-Build Team shall be responsible for coordinating with the Engineer when the work zone speed limits are to be changed and shall obtain approval by the Engineer or his designee before the speed limit is changed.

Whenever possible, each trailer mounted unit shall be placed on the paved shoulder. All trailer mounted units shall have the capability of being leveled.



	WORK ZONE CONDITIONS	SPEED TO DISPLAY (SEE NOTE 4 & 7)
LANE CLOSURES	2 LANES REDUCED TO 1 LANE	55
	3 LANES REDUCED TO 1 LANE	55
	3 LANES REDUCED TO 2 LANES	60
	4 LANES REDUCED TO 1 LANE	55
	4 LANES REDUCED TO 2 LANES	60
	4 LANES REDUCED TO 3 LANES	65
CONTINUOUS BARRIER (LENGTH OF BARRIER GREATER THAN 1 MILE)	1 OPEN LANE WITH CONTINUOUS BARRIER ON BOTH SHOULDERS	55
	1 OPEN LANE WITH CONTINUOUS BARRIER ON 1 SHOULDER	60
	3 OR 2 OPEN LANES WITH CONTINUOUS BARRIER ON BOTH SHOULDERS	60
	3 OR 2 OPEN LANES WITH CONTINUOUS BARRIER ON 1 SHOULDER	65
	4 OPEN LANES WITH BARRIER CONTINUOUS ON BOTH SHOULDERS	65
	4 OPEN LANES WITH BARRIER CONTINUOUS ON 1 SHOULDER	EXISTING
	UNEVEN LANES	60

SIGN NUMBER: WZTC
TYPE: STATIONARY
QUANTITY: SEE PLANS

SIGN WIDTH: 4'-0"
HEIGHT: 4'-0"
TOTAL AREA: 16.0 Sq.Ft.

BORDER TYPE: INSET
RECESS: 0.47"
WIDTH: 0.63"
RADII: 1.5"

NO. Z BARS: 2
LENGTH: 40.0

BACKG COLOR: Fluorescent Orange
COPY COLOR: Black

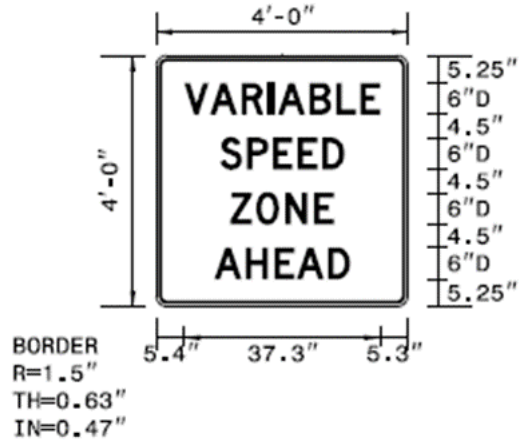
SYMBOL	X	Y	WID	HT

MAT'L: 0.080" (2.0 mm) ALUMINUM

DESIGN BY: J.Navarrete
PROJECT ID:
CHECKED BY:
LOCATION:
May 13, 2019
DIV: DIV

USE NOTES: 1,2

1. Legend and border shall be direct applied black non-reflective sheeting.
2. Background shall be NC GRADE B fluorescent orange retroreflective sheeting.



Spacing Factor is 1 unless specified otherwise

LETTER POSITIONS

Letter spacings are to start of next letter

																											Series/Size Text Length
	V	A	R	I	A	B	L	E																			D 2000
5.4	4.9	6	5.1	1.9	6	5.1	4.6	3.7	5.3																		37.3
	S	P	E	E	D																						D 2000
12.2	5.1	5	4.7	4.7	4.1	12.1																					23.6
	Z	O	N	E																							D 2000
14.2	5	5.6	5.5	3.7	14																						19.8
	A	H	E	A	D																						D 2000
11.2	6	5.5	4.2	6	4.1	11																					25.6

FILENAME: Special Signs 7

NORTH CAROLINA D.O.T. SIGN DETAIL

WORK ZONE PERFORMANCE PAVEMENT MARKINGS

(10/08/2016) (Rev. 01/05/21)

Description

The Design-Build Team shall furnish and install Work Zone Performance pavement markings that delineate the travel way for work zone traffic patterns on high speed (55 mph or greater) facilities and or facilities that have traffic volumes greater than 50,000 ADT. The purpose of Work Zone Performance pavement marking is to provide a more durable work zone pavement marking that shall last the full duration of a traffic pattern without requiring replacement or reapplication for a period of up to 12 months. The Work Zone Performance pavement markings shall also provide a higher retroreflectivity performance level, throughout the required 12-month duration, than standard traffic paints to improve nighttime work zone visibility.

Materials

a) General

Use materials in accordance with the manufacturer's recommendations that shall retain both durability and a minimum retroreflectivity, as described elsewhere in this RFP, for a period of at least 12 months.

On concrete pavement, the Design-Build Team shall provide black contrast "Performance" pavement markings that contrast the white skip lines along through lanes and ramp lanes. The black contrast "Performance" pavement markings shall immediately follow the white skip line at the same width and half the length, or border the long edges of the white skip line at a width of 1.5". Black contrast "Performance" pavement marking shall be matt and non-retroreflective.

The Work Zone Performance pavement markings shall be manufactured to bond successfully to both concrete and asphalt pavements. The pavement marking materials shall be applied in a single application. The following are approved materials to be used for Work Zone Performance pavement markings:

- Polyurea (for use on concrete pavement only)
- Thermoplastic (Extruded and Sprayed)
- Epoxy
- Polymer (Single System)
- Cold Applied Plastic (Type 4)

When using Cold Applied Plastic Type 4 pavement markings, place temporary raised markers half on and half off edge lines and centerlines to help secure the tape to the roadway. Markers shall be spaced the appropriate distance apart as described by the 2018 Roadway Standard Drawing No. 1250.01, Sheet 1 of 3.

b) Material Qualifications / Certifications

The Design-Build Team shall only use Work Zone Performance pavement marking materials, as listed above, that are on the NCDOT Approved Products List at the time of installation. In accordance with Article 106-3, and Section 1087-4 of the 2018 NCDOT *Standard Specifications for Roads and Structures,* the Design-Build Team shall provide a Type 3 Material Certification for all materials, and a Type 3 and Type 4 certification for all reflective media.

c) Performance

Poor performance of Work Zone Performance pavement marking materials at any site, whether or not related to a specific contract, may be grounds for removing the material from the NCDOT Approved Products List.

Construction Methods

The Design-Build Team shall not use hand applied methods or any other non-truck mounted application equipment / device to install Work Zone Performance pavement markings for applications longer than 1000 feet.

All Work Zone Performance pavement markings shall be installed in a single application. Multiple passes shall not be allowed.

a) Testing Procedures.

All Work Zone Performance pavement markings shall be tested by the Department through an independent Mobile Retroreflective Contractor. The Work Zone Performance pavement markings will be scanned to ensure the retroreflectivity requirements in **Section c** below are met.

b) Application Equipment

Application equipment shall be in accordance with Section 1205 of the 2018 NCDOT *Standard Specifications for Roads and Structures.*

c) Material Application

The Work Zone Performance pavement marking material shall be applied at the following minimum thicknesses:

- Polyurea = 20 mils wet
- Epoxy = 20 mils wet
- Thermoplastic (Extruded or Sprayed) = 50 mils wet
- Polymer = 20 mils wet
- Cold Applied Plastic (IV) = Manufacturer's recommendation

The Work Zone Performance pavement marking line widths for interstates and freeways shall be as follows:

- Edge lines, Solid Lane Lines, Skip and Mini-Skip Lines = 6”
- Gorelines = 12”

The Work Zone Performance pavement marking line widths for all other facilities shall be four inches.

“No track” dry times for the liquid systems shall be ten minutes or shorter. Traffic shall not be placed on any material until it is sufficiently dry / cured to eliminate wheel tracking.

The minimum level of retroreflectivity for all Work Zone Performance pavement marking system selected shall be as follows:

Reflectometer Requirements for Work Zone “Performance” Pavement Markings

Color	Initial	6 Months	12 Months
White	375 mcd/lux/m2	275 mcd/lux/m2	150 mcd/lux/m2
Yellow	250 mcd/lux/m2	150 mcd/lux/m2	100 mcd/lux/m2

For the initial installation and the durations noted in the chart above, the Work Zone Performance pavement markings shall adhere to the corresponding retroreflectivity levels.

The Design-Build Team shall notify the Engineer, in writing, a minimum of 7 - 10 days prior to the installation of Work Zone Performance pavement markings. The Department will measure initial retroreflectivity levels with a mobile retroreflectomer within 30 days after placement to ensure compliance with the reflectifity levels in the chart above.

Work Zone Performance pavement markings shall maintain the retroreflectivity levels for the durations noted above. If the markings appear to be non-performing, in the Engineer’s sole discretion, the Engineer may request additional retroreflectivity readings to be performed by the Department. If and when this becomes necessary, the same notification procedure as described above shall be used to have Work Zone Performance pavement markings measured by a Mobile Retroreflective Contractor.

If measured and found to be noncompliant, the Design-Build Team shall replace the Work Zone Performance pavement markings at no cost to the Department.

All Work Zone Performance pavement markings shall be durable enough to withstand a single snow event without showing excessive fatigue in either bonding or retroreflectivity. The Design-Build Team shall replace the Work Zone Performance pavement markings if a single snowplow event results in more than 25% of the pavement marking edgelines or skips being physically removed and / or the Work Zone Performance pavement markings do not meet the following minimum retroreflectivity values:

Reflectometer Requirements for Work Zone Performance Pavement Markings after a Single Snowplowed Event

Color	MINIMUM
White	150 mcd/lux/m2
Yellow	100 mcd/lux/m2

Unless the temporary traffic pattern is to be modified within 30 days, the Design-Build Team shall replace all non-compliant Work Zone Performance pavement markings within 30 days of determining they are non-compliant.

If the work zone experiences more than one snow event requiring snowplowing, the retroreflectivity values in the chart above will no longer apply. The Engineer will determine if the pavement markings are performing adequately and / or if replacement is necessary due to excessive damage caused solely by snowplow activities. If the Work Zone Performance pavement markings are found to be deficient, solely in the Engineer's discretion, they shall be replaced. In such case, the Work Zone Performance pavement markings will be paid for as extra work in accordance with Subarticle 104-8-(A) of the NCDOT *Standard Specifications for Roads and Structures* at the unit price of $0.40 per linear foot. Unless the temporary traffic pattern is to be modified within 30 days, the Design-Build Team shall replace all Work Zone Performance pavement markings damaged due to multiple snowplow events within 30 days.

If the Work Zone Performance pavement markings need to remain in place longer than 12 months, the markings shall be scanned by a Mobile Retroreflective Contractor. If the Work Zone Performance pavement markings meet or exceed the 12-month retroreflectivity requirements noted above, the markings can remain in place. If the Work Zone Performance pavement markings do not meet or exceed the 12-month retroreflectivity requirements noted above, the Design-Build Team shall replace the Work Zone Performance pavement markings within 15 days of the 12-month duration date at no cost to the Department. If and when this becomes necessary, the same notification procedure as described above shall be used to have Work Zone Performance pavement markings measured by a Mobile Retroreflective Contractor.

d) Surface Preparation

Prior to installation, all pavement surfaces to receive Work Zone Performance pavement markings shall be swept clean and prepared in accordance with the Manufacturer's recommendation.

e) Temperature and Weather Limitations

Work Zone Performance pavement markings shall only be applied when the ambient air temperature and the pavement temperature are 50° F or higher for thermoplastic and are 40° F or higher for all other materials. The Design-Build Team shall not install Work Zone Performance pavement markings unless the pavement surface is completely dry. The Design-

Build Team shall not install Work Zone Performance pavement markings within four hours of a heavy rain event, (rainfall intensities equal to or greater than 1 inch / per hour).

In the event a traffic shift must occur when the air and / or pavement temperatures are below the aforementioned minimums and / or a rain event occurs four hours prior to or during a planned traffic shift, the Design-Build Team may install temporary pavement marking paint, at the Engineer's sole discretion. Temporary pavement marking paint shall be applied in one application and shall produce a four-inch wide line at 15 mils (wet). Beads that provide the following minimum retroreflectivity shall be applied to the temporary pavement marking paint:

White:	225 mcd / lux / m2
Yellow:	200 mcd / lux / m2

The temporary pavement marking paint with beads shall maintain the minimum retroreflectivity noted above until placement of the Work Zone Performance pavement markings.

The Design-Build Team shall replace / reapply temporary pavement marking paint with beads that does not adhere to the retroreflectivity requirements noted above at no cost to the Department. The Design-Build Team shall apply the Work Zone Performance pavement markings within 90 days of installing the temporary pavement marking paint with beads.

Excluding damage due solely to snowplow events, the Design-Build Team shall replace all Work Zone Performance pavement material that debonds and / or does not adhere to the retroreflectivity levels for the corresponding durations noted above at no cost to the Department.

TYPICAL MEDIAN ACCESS AREAS

(12/18/18)

Description

Perform the work covered by this section including, but not limited to, constructing, maintaining, and removing Typical Median Access Areas for construction vehicle ingress to and egress from the median to / from active travel lanes on controlled access facilities.

Typical Median Access Areas are not required when construction vehicle ingress and egress is conducted using lane closures as shown on 2018 Roadway Standard Drawing No. 1101.05, Sheet 2 of 2.

Materials

Refer to Divisions 6, 10, 11, 12, and 17 in the 2018 *Standard Specifications for Roads and Structures.*

Provide temporary traffic control devices listed on the NCDOT Approved Products List (APL).

Provide Work Zone Performance Pavement Markings (Reference the *Work Zone Performance Pavement Markings* Project Special Provision found elsewhere in this RFP)

Provide High Visibility Devices (Reference the *High Visibility Devices* Project Special Provision found elsewhere in this RFP)

Flashing Beacon and Detection System

(A) General

Provide flashing beacon and detection system components listed on the NCDOT ITS and Signals Qualified Products List (QPL).

Provide a trailer mounted flashing beacon and warning sign assembly that meets or exceeds the physical and operational requirements of the MUTCD, or other mounting method approved by the Department. The following specifications supplement those basic requirements.

- Provide a totally mobile complete unit capable of being located as traffic conditions demand.
- The warning sign height shall comply with 2018 Roadway Standard Drawing No. 1110.01, Sheet 1 of 3, when raised in the upright position.
- The flashing beacon housing assembly shall be of weather resistant construction.

(B) Power System

Provide a unit that is solar powered and supplemented with a battery backup system that includes a 110/120 VAC powered on-board charging system.

The unit shall also be capable of being powered by standard 110/120 VAC power source.

The batteries, when fully charged, shall be capable of powering the display for 20 continuous days with no solar power.

Store the battery bank and charging system in a lockable, weather, and vandal resistant box.

(C) Controller

Provide automatic brightness / dimming of the display and a manual override dimming switch.

The controller shall provide a battery-charge status indicator.

Mobile radio or any other radio transmissions shall not affect the controller.

Store the controller in a lockable, weather and vandal resistant box.

(D) Trailer

Finish all exterior metal surfaces with Federal orange enamel per Federal Standard 595a, color chip ID# 13538 or 12473 respectively. The trailer shall be able to support a 100 mph wind load with the display fully extended.

The trailer shall be equipped with leveling jacks capable of stabilizing the unit in a horizontal position when located on slopes 6:1 or flatter.

The trailer shall be properly equipped in compliance with North Carolina Law governing motor vehicles.

Provide a minimum four-inch wide strip of fluorescent orange retroreflective sheeting to the frame of the trailer. Apply the sheeting to all sides of the trailer. The retroreflective sheeting shall be Grade B that conforms to Article 1092-2 in the 2018 *Standard Specifications for Roads and Structures.* Drums may be supplemented around the unit in place of the sheeting.

(E) Reliability

Provide a sign unit, flashing beacons, and detection system with all components rated to operate at temperatures ranging from -30° F to 165° F.

Construction Methods

See Typical Median Access Detail below.

Temporary Acceleration Lane

Construct a temporary acceleration lane with a minimum length of 1720 feet and a minimum clear width of 12 feet from the face of the positive protection to the active travel lanes. At least 920 feet of parallel merge / diverge area shall be required adjacent to the active travel lanes, in addition to a 300-foot merging taper and a 500-foot channelized acceleration area that includes a 100-foot detection area. The channelized acceleration and detection areas shall have positive protection separating them from the active travel lanes and shall not overlap the 920 feet of parallel merge / diverge area.

For the proposed traffic volumes and durations in areas of temporary median access for construction traffic, the Design-Build Team shall 1) evaluate and upgrade the existing pavement structure, as needed, and 2) design all temporary pavement, in accordance with the Pavement Management Scope of Work found elsewhere in this RFP.

Using Work Zone Performance Pavement Markings, install 12-inch yellow diagonal lines (2:1 slope) at 100-foot intervals throughout the upstream half of the parallel merge / diverge area, and at 55-foot intervals throughout the downstream half of the parallel merge / diverge area.

Remove any conflicting markings in accordance with Section 1205 of the 2018 *Standard Specifications for Roads and Structures*.

Flashing Beacons and Detection System

Provide High Visibility advance warning signage as shown in the details below. Provide a flashing beacon system with two (2) flashing lights per sign to alert motorists in the active travel lanes of work vehicles entering from the median.

Provide a non-intrusive detection system capable of detecting vehicles in the work area at least 400 feet in advance of the parallel merge / diverge area. The detection system shall be programmed such that passing public traffic in active travel lanes and vehicles in the work area not intending to use the parallel merge / diverge area are not detected.

Once detection occurs, the beacons on the advance warning sign(s) shall begin flashing immediately at a rate of not less than 50 or more than 60 times per minute. The beacons on the advance warning sign(s) shall flash continuously in an alternating pattern at all times that work vehicles are detected. The beacons shall continue flashing for thirty (30) seconds after detection ceases before turning off, and personnel on site shall have the ability to adjust this time based on field conditions. The flashing beacon system shall remain dark when idle.

Expedite repairs due to failure, malfunction or damage to the flashing beacons and / or detection system. Furnish another flashing beacon system or detection system approved by the Department during the repair time. Repair or replace flashing beacon system and / or detection systems immediately; otherwise, suspend all construction activities requiring the use of the Median Access Area until the flashing beacon system and / or detection system is restored to operation.

Perform all maintenance operations recommended by the manufacturer of the flashing beacon system and detection system.

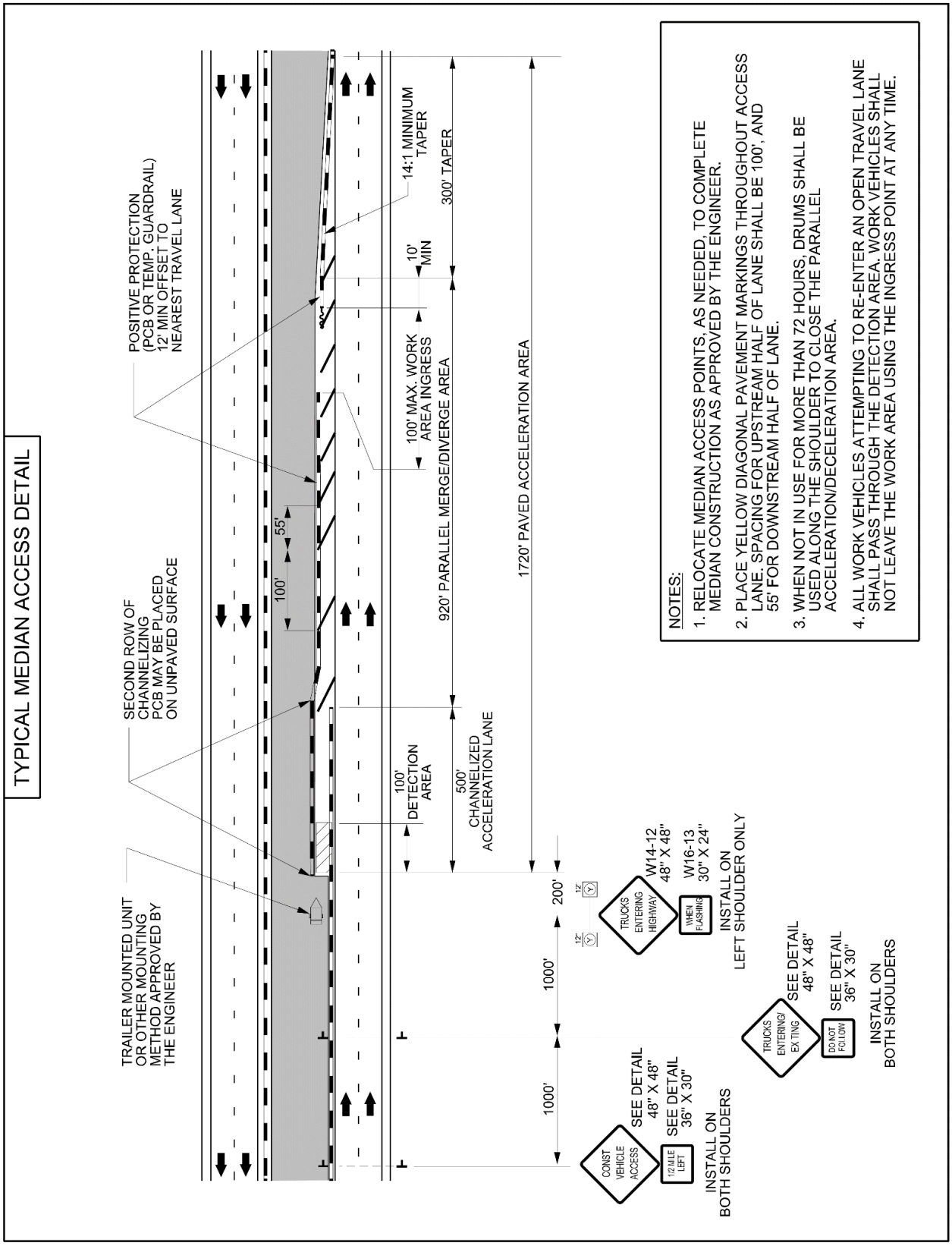
Location, Placement and Use

Typical Median Access Areas shall not be located within one-half (1/2) mile of any interchange acceleration or deceleration lanes, unless approved by the Department. All proposed locations for Typical Median Access Areas shall be reviewed and approved by the Department prior to installation.

Work vehicles using a particular Median Access Area shall not utilize any interchange ramp (on-ramp or off-ramp) within one (1) mile of the Median Access area.

Typical Median Access Areas installed in accordance with this section will not require the use of temporary lane closures for ingress / egress of work vehicles.

The Design-Build Team shall comply with multiple and single vehicle hauling restrictions as shown in the TMP when performing hauling of equipment or materials to or from the project while using Typical Median Access Areas.


TYPICAL MEDIAN ACCESS DETAIL
TRAILER MOUNTED UNIT OR OTHER MOUNTING METHOD APPROVED BY THE ENGINEER
SECOND ROW OF CHANNELIZING PCB MAY BE PLACED ON UNPAVED SURFACE
POSITIVE PROTECTION (PCB OR TEMP. GUARDRAIL) 12' MIN OFFSET TO NEAREST TRAVEL LANE
100'
55'
100' DETECTION AREA
500' CHANNELIZED ACCELERATION LANE
920' PARALLEL MERGE/DIVERGE AREA
100' MAX. WORK AREA INGRESS
10' MIN
14:1 MINIMUM TAPER
300' TAPER
1720' PAVED ACCELERATION AREA
1000'
1000'
200'
CONST VEHICLE ACCESS
SEE DETAIL 48" X 48"
1/2 MILE LEFT
SEE DETAIL 36" X 30"
INSTALL ON BOTH SHOULDERS
12"
TRUCKS ENTERING HIGHWAY
W14-12 48" X 48"
WHEN FLASHING
W16-13 30" X 24"
INSTALL ON LEFT SHOULDER ONLY
TRUCKS ENTERING/ EXITING
SEE DETAIL 48" X 48"
DO NOT FOLLOW
SEE DETAIL 36" X 30"
INSTALL ON BOTH SHOULDERS
NOTES:
1. RELOCATE MEDIAN ACCESS POINTS, AS NEEDED, TO COMPLETE MEDIAN CONSTRUCTION AS APPROVED BY THE ENGINEER.
2. PLACE YELLOW DIAGONAL PAVEMENT MARKINGS THROUGHOUT ACCESS LANE. SPACING FOR UPSTREAM HALF OF LANE SHALL BE 100', AND 55' FOR DOWNSTREAM HALF OF LANE.
3. WHEN NOT IN USE FOR MORE THAN 72 HOURS, DRUMS SHALL BE USED ALONG THE SHOULDER TO CLOSE THE PARALLEL ACCELERATION/DECELERATION AREA.
4. ALL WORK VEHICLES ATTEMPTING TO RE-ENTER AN OPEN TRAVEL LANE SHALL PASS THROUGH THE DETECTION AREA. WORK VEHICLES SHALL NOT LEAVE THE WORK AREA USING THE INGRESS POINT AT ANY TIME.

SIGN NUMBER: WZTC
TYPE: STATIONARY
QUANTITY: SEE PLANS

SIGN WIDTH: 5'-6"
HEIGHT: 5'-6"
TOTAL AREA: 30.3 Sq.Ft.

BORDER TYPE: INSET
RECESS: 0"
WIDTH: 0"
RADII: 0"

NO. Z BARS: 2
LENGTH: 58.0

BACKG COLOR: Fluorescent Orange
COPY COLOR: Black

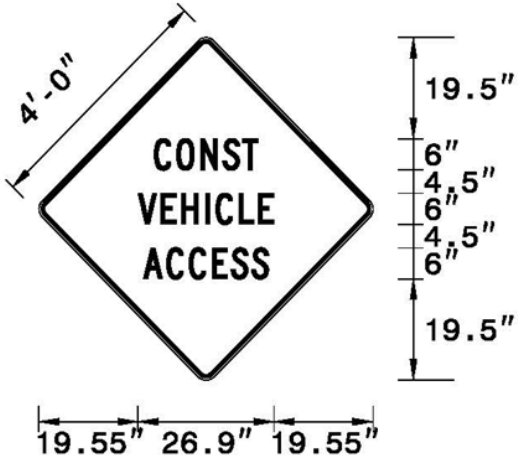
SYMBOL	X	Y	WID	HT

MAT'L: 0.080" (2.0 mm) ALUMINUM

DESIGN BY: J.Navarrete
PROJECT ID: I5922
CHECKED BY:
LOCATION:
Mar 14, 2018
DIV:WZTC

USE NOTES: 1,2

1. Legend and border shall be direct applied black non-reflective sheeting.
2. Background shall be NC GRADE B fluorescent orange retroreflective sheeting.



Spacing Factor is 1 unless specified otherwise

LETTER POSITIONS

Letter spacings are to start of next letter

																											Series/Size Text Length
		C	O	N	S	T																					C 2000
	22.7	4.4	4.7	4.4	3.9	3.1	22.7																				20.5
		V	E	H	I	C	L	E																			C 2000
	19.6	4.6	4.1	4.7	2	4.6	3.9	3.1	19.6																		26.9
		A	C	C	E	S	S																				C 2000
	20.6	4.6	4.4	4.6	3.8	4.1	3.4	20.6																			24.8

FILENAME: I5922 Sign Designs

NORTH CAROLINA D.O.T. SIGN DETAIL

SIGN NUMBER: WZTC
TYPE: STATIONARY
QUANTITY: SEE PLANS

SIGN WIDTH: 3'-0"
HEIGHT: 2'-6"
TOTAL AREA: 7.5 Sq.Ft.

BORDER TYPE: INSET
RECESS: 0.47"
WIDTH: 0.63"
RADII: 1.5"

NO. Z BARS:
LENGTH:

BACKG COLOR: Fluorescent Orange
COPY COLOR: Black

SYMBOL	X	Y	WID	HT

MAT'L: 0.080" (2.0 mm) ALUMINUM

DESIGN BY: J.Navarrete
PROJECT ID: I5922

CHECKED BY:
LOCATION:

Mar 14, 2018
DIV:WZTC

USE NOTES: 1,2

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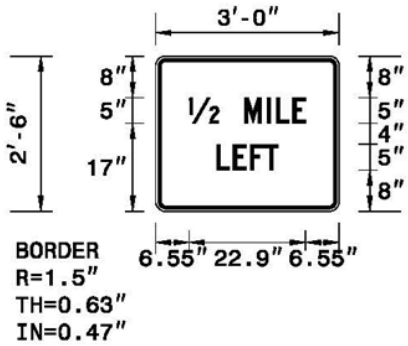
2. Background shall be NC GRADE B fluorescent orange retroreflective sheeting.



Spacing Factor is 1 unless specified otherwise

LETTER POSITIONS

Letter spacings are to start of next letter																												Series/Size Text Length
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		L	E	F	T																							C 2000
	12	3.3	3.4	2.8	2.8	12																						12.1

FILENAME: I5922 Sign Designs

NORTH CAROLINA D.O.T. SIGN DETAIL

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RADII: 0"

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LENGTH: 58.0

BACKG COLOR: Fluorescent Orange
COPY COLOR: Black

SYMBOL	X	Y	WID	HT

MAT'L: 0.080" (2.0 mm) ALUMINUM

DESIGN BY: J.Navarrete
PROJECT ID: I5922

CHECKED BY:
LOCATION:

Mar 14, 2018
DIV: DIV

USE NOTES: 1,2

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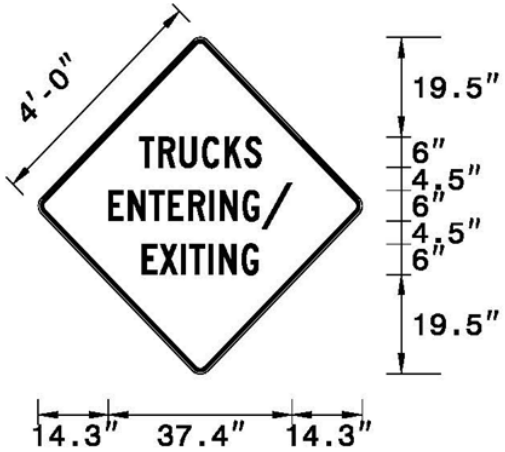

Spacing Factor is 1 unless specified otherwise

LETTER POSITIONS

Letter spacings are to start of next letter

																											Series/Size Text Length
		T	R	U	C	K	S																				C 2000
	20.6	3.9	4.4	4.6	4.6	4.1	3.4	20.6																			24.8
		E	N	T	E	R	I	N	G	/																	C 2000
	14.3	4.1	4.2	3.9	4.1	4.4	2.2	4.6	3.9	6.1	14.3																37.4
		E	X	I	T	I	N	G																			C 2000
	21.2	3.6	4.4	1.7	3.9	2.2	4.6	3.4	21.2																		23.6

FILENAME: I5922 Sign Designs

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BACKG COLOR: Fluorescent Orange
COPY COLOR: Black

SYMBOL	X	Y	WID	HT

MAT'L: 0.080" (2.0 mm) ALUMINUM

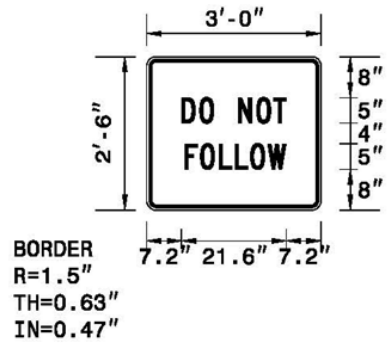
DESIGN BY: J.Navarrete
PROJECT ID: I5922

CHECKED BY:
LOCATION:

Mar 14, 2018
DIV:WZTC

USE NOTES: 1,2

1. Legend and border shall be direct applied black non-reflective sheeting.
2. Background shall be NC GRADE B fluorescent orange retroreflective sheeting.



Spacing Factor is 1 unless specified otherwise

LETTER POSITIONS

Letter spacings are to start of next letter

																											Series/Size Text Length
	D	O		N	O	T																					C 2000
7.2	3.7	3	5	3.8	3.6	2.6	7.2																				21.6
	F	O	L	L	O	W																					C 2000
7.9	3.1	3.9	3.3	3.2	3.6	3.8	7.2																				20.9

FILENAME: I5922 Sign Designs

NORTH CAROLINA D.O.T. SIGN DETAIL

CONNECTED LANE CLOSURE DEVICES
(10/29/18)

Description

The Design-Build Team shall furnish, install, operate, maintain, relocate, and remove connected lane closure devices for use on interstate and freeway lane closures. The connected lane closure devices shall transmit the location of the lane closure to navigational companies such as WAZE, Google Maps, Inrix, Here, TrafficCast, TomTom, Apple Maps, Panasonic, the Statewide Traffic Operations Center, (STOC), and any other navigational companies that requests it. A connected lane closure device shall be installed on the flashing arrow board identifying the beginning of a lane closure, and another connected lane closure device shall be installed on a crashworthy traffic control device (such as a drum) at the end of the same lane closure.

Materials

The connected lane closure devices shall be designed and built to transmit the location of the lane closure to the navigational companies as well as the STOC. The format of the information received by each of these shall be approved by each entity, and at minimum, consist of an XML file. The connected lane closure devices shall be capable of obtaining wireless communication by either cellular or satellite technology.

The initial connected device shall be designed and attached to the flashing arrow board in such a manner that it is only activated when either the left or right arrows are displayed, not when the flashing arrow board is operated in caution mode. When the lane closure is removed, and the flashing arrow board turned off or changed to caution mode, the connected device shall automatically turn off simultaneously.

The second connected device in a lane closure shall be installed on a crashworthy traffic control device. It shall have an easily accessible power switch and a small status indicator light mounted such that it is visible when passing by in a vehicle at operating speed. When switched to the ON position, the light shall indicate that device has established communication and is transmitting. The light may be either steady burn or flashing and shall not exceed one inch in diameter.

The devices shall have battery life sufficient to maintain operation for the duration of the lane closure, or have the ability to be recharged without deactivating the device.

Construction Methods

Connected lane closure devices shall be used on all lane closures on freeways and interstates throughout the project.

Two connected lane closure devices shall be installed per grouping of lane closures (single, double, or triple); one attached and wired into the flashing arrow board at the beginning of the first taper, and the other at the last traffic control device at the end of the lane closure(s). Supplemental flashing arrow boards in advance of the first lane closure taper or flashing arrow boards in subsequent lane closures (for double and triple lane closures) shall not have connected

devices. Subsequent lane closures occurring downstream of where all lanes have been reopened and lane closures in the opposite direction of travel will require additional connected devices.

The second connected lane closure device shall be manually turned ON and OFF by crews installing and removing the lane closure, unless the device can be controlled by the initial connected device. The unit shall be turned on immediately upon installation of the lane closure and turned off immediately upon removal of the lane closure.
polymerpoly

Once installed, the Design-Build Team shall verify that the connected lane closure devices are transmitting information prior to leaving the device unattended and re-verify transmission every 72 hours for as long as the device is in use.

Technical Requirements

The connected devices shall run continuously during any active lane closures for the construction duration.

The GPS within the connected devices shall have a horizontal accuracy of 50 feet, 95% of the time.

The connected device information, including the location, transmission status, and battery status shall be transmitted within five (5) minutes of initiation and updated every fifteen (15) minutes. In addition to transmitting information to the Department, the Design-Build Team shall keep the retained device information for one (1) year after Final Acceptance of the project. Information shall include timestamps, device name, and GPS location. This information shall be made available to the Department upon request.

The battery voltage shall be collected at least once an hour. The information shall be stored and available for troubleshooting. The system shall transmit an alert if the battery voltage of a device is under a specified threshold.

The connected devices shall emit an audible an alert if a device is not transmitting its position for a period of one hour.

The outputs from the connected device on the arrow board and the downstream connected device at the end of the lane closure shall be easily identifiable as a single pair, either by sequential device IDs, identical project names, or other method as approved by the Engineer. Additional pairs on the project shall have unique identifiable information such that it is not confused with another project pair.

DYNAMIC TRAVELER INFORMATION SYSTEM

(05/05/2021)

Description

The Design-Build Team will not be required to provide an automated, stand-alone real-time Dynamic Traveler Information System solely for the construction activities required for

(1) Intermediate Contract Time No. 1, (2) utility relocations, and / or (3) geotechnical investigations. For all other construction activities, the Design-Build Team shall provide, install, relocate, operate, maintain, and remove an automated, stand-alone, real-time Dynamic Traveler Information System that adheres to the requirements noted herein for the entire construction duration.

A Dynamic Traveler Information System is a group of devices that work together using software to automatically detect traffic conditions and display messages using preprogrammed response algorithms. The purpose of this system is to provide advance notification to motorists of traffic delays and queues in advance of long-term work zones in order to reduce the likelihood of high-speed crashes.

The Dynamic Traveler Information System shall detect the presence of slow / stopped traffic queues that develop in the work zone and display travel times or slowed / stopped traffic messages on integrated portable changeable message signs (PCMS).

Materials and System Operational Requirements

A. General

These specifications cover the general operational requirements for the Dynamic Traveler Information System. The Design-Build Team shall provide the following equipment for the Dynamic Traveler Information System:

- Six traffic sensors capable of detecting traffic in both directions of I-40
- Eight PCMS used exclusively for the Dynamic Traveler Information System
- Communication equipment for all above devices, including but not limited to all components and communication methods necessary to allow each device to send and receive data to and from the website and Traffic Management Software

The approximate location of the aforementioned Dynamic Traveler Information System devices shall be as follows:

- Excluding I-85 southbound, one traffic sensor one mile in advance of the work zone on each end of the project
- One traffic sensor centered between each interchange in the work zone, including the I-40 / US 15-501 interchange
- Excluding I-85 southbound, one PCMS two miles in advance of the work zone approaching each end of the project
- Excluding the area between NC 86 (Martin Luther King, Jr. Blvd.) and US 15-501, one PCMS centered between each interchange in the eastbound direction
- Excluding the area between SR 1009 (Old NC 86) and I-40 / I-85, one PCMS centered between each interchange in the westbound direction

Prior to installing the Dynamic Traveler Information System devices, the Design-Build Team shall obtain the Engineer’s written approval of the device locations.

To prevent access by unauthorized parties, the Design-Build Team shall provide physical and electronic / software protections for all system components and processes pertaining thereto.

The Design-Build Team shall provide the following:

- A customized website that is integrated with the Dynamic Traveler Information System for NCDOT
- Traffic Management Software capable of analyzing data and accurately supplying the indicated information

B. Documentation

The Design-Build Team shall provide a set of complete specifications and literature on the Dynamic Traveler Information System. All the requirements of this project special provision shall be included in the submittal. Provide documents for each device containing all information necessary to determine product specification compliance. At least ten business days prior to the delivery of the Dynamic Traveler Information System, provide a detailed security plan and protocol that will be used to protect data and communications to the Department for review and acceptance. This security plan shall include physical locking mechanisms with locks that are unique to the Dynamic Traveler Information System (a key shall be provided to the Engineer), password handling techniques, and limited static IPs for remote access to equipment.

C. Power Source

As defined in the Malfunctions, Maintenance and Inspection Section of this project special provision, the Design-Build Team shall provide power for continuous operation of all devices,.

D. Installation

The traffic sensors shall be located and aimed to ensure accurate data. Prior to installation of the traffic sensors, the Design-Build Team shall coordinate the installation locations and details with the Department and obtain Department written approval.

E. Traffic Sensors

The Design-Build Team shall provide traffic sensors that withstand, without deterioration, inclement weather and visibility conditions including but not limited to sunlight, light precipitation, temperature, light, fog, darkness, excessive dust and road debris.

The Design-Build Team shall provide traffic sensors that:

- Collect and report individual vehicle data.
- Collect and report data on a per lane basis.
- Collect speed, volume, and lane occupancy data, for the required direction(s) of traffic.
- Communicate data to the Traffic Management Software at least once per minute.

The Design-Build Team shall install and maintain traffic sensors that continuously detect all public traffic on I-40 eastbound, I-40 westbound and I-85 northbound. Configure traffic sensors to allow active and inactive collection zones, so that construction traffic is differentiated from public traffic. At a minimum, detect speed, volume, and occupancy levels in each lane, each minute. Summarize data in five-minute bins for data storage and transfer to the Traffic Management Software. Do not block or shield critical locations from the traffic sensor. Test each traffic sensor, and re-test as needed, to confirm the accuracy of the data reported.

The Design-Build Team shall collect and report data to the Traffic Management Software which meets the following requirements at any given time during testing and operation:

- Per direction volume accuracy: greater than 90%
- Per lane volume accuracy: greater than 90%
- Per direction average speed accuracy: greater than 90%

F. Portable Changeable Message Signs (PCMS)

The Design-Build Team shall provide and maintain Portable Changeable Message Signs (PCMS) capable of displaying the travel time and / or slow / stopped traffic advisories to motorists. Provide PCMS that meet or exceed the material and functional requirements as required in Section 1120 of the 2018 *North Carolina Standard Specifications for Roads and Structures.* The PCMS shall be capable of communicating wirelessly with, and being controlled by, the Traffic Management Software. The Design-Build Team shall provide PCMS which display messages and log the date, time and text of the messages when being controlled by the Traffic Management Software. PCMS messages shall be in compliance with the MUTCD and shall be approved by the Engineer prior to implementaion.

No more than one pixel illumination failure on the board shall be allowed at any given time during testing and operation. Continuously monitor PCMS status. The Design-Build Team shall include in the monitoring procedure an evaluation of power levels, communication connections, and the number of unlit pixels. A minimum of weekly, the Traffic Control Supervisor shall inspect the system onsite to document that the correct message is displayed with the correct date and time.

G. Traffic Management Software (Software)

The software has two main functions: Queue Warning and Travel Time notification. The Design-Build Team shall use software that meets or exceeds the following requirements for each function:

Queue Warning

The intent of the Queue Warning function is to detect traffic congestion and queue formation, and notify approaching drivers of the conditions. Queue Warning is the most critical function of the system, and shall continuously monitor traffic and report the required operational characteristics to the software each minute. Use a combination of real-time speed and percent lane occupancy information reported by traffic sensors, compared with configurable

thresholds, to initiate a slow or stopped traffic message. Message examples include "SLOW TRAFFIC AHEAD / REDUCE SPEED AHEAD," and "STOPPED TRAFFIC AHEAD / PREPARE TO STOP," Configure Queue Warning messages to override all other messages on a PCMS. Send communication to project personnel when traffic conditions violate predetermined thresholds. Data collected by the Dynamic Traveler Information System will be owned by NCDOT and shall be in a file format compatible with the STOC's operating platform. The Design-Build Team shall submit predetermined thresholds with the Transportation Management Plans developed by the Design-Build Team for review and acceptance by the Department.

The Queue Warning monitoring procedure shall include onsite observation by the Traffic Control Supervisor to document posted messages and times during an actual event. The Design-Build Team shall compare those messages with the information available from the software. The Design-Build Team shall complete software monitoring as needed and when requested by the Department.

Travel Time Notification

The intent of the travel time function is to detect when no queues are present and notify approaching drivers of the travel times through the work zone. Travel time notification is the secondary function and serves as the default function when Queue Warning is inactive

The Travel Time Notification monitoring procedure shall include onsite observation by the Traffic Control Supervisor to document posted messages when a Queue Warning event is not occurring.

Reporting and Operational Requirements

The Design-Build Team shall communicate with and / or control all of the Dynamic Traveler Information System devices. Poll the traffic sensors and PCMS a minimum of once per minute, and update the PCMS with new messaging no more frequently than once every three minutes, and not less than once every six minutes. Collect from each device, as applicable, and store in configurable bins the following data: device name and location, 50th percentile and 85th percentile speeds, volume, lane occupancy, message sign history, as well as battery status and communication status. Make historical data available to NCDOT staff at all times and for a minimum of two years after the Department's final project acceptance. Provide an electronic copy of all data, including date and duration of system malfunctions, to NCDOT staff after all project construction activity is completed and the Dynamic Traveler Information System has been removed.

H. Website

The purpose of the website is to be a real time traffic operations dashboard showing current traffic conditions, real time speeds, and posted messages to the nearest minute. Using Google Maps or equivalent, display a full color map of the project area that shows roadways impacted by project activities and for which data is being collected. Display current average speed at each traffic sensor for which data is available. Display a representation of each device in its

approximate location, relative to the roadway and other nearby features, and indicate the operational status of each device. Display the messages posted on the PCMS. Refresh information at least once per minute. In the event devices are moved to a new location in the field, automatically reflect these changes to the system layout on the website.

I. Traffic Control Devices

As shown in the plans developed by the Design-Build Team, the Design-Build Team shall provide traffic control devices needed to set up, operate, maintain and remove the Dynamic Traveler Information System.

J. Malfunctions, Maintenance and Inspection

Excluding the construction activities identified elsewhere in this project special provision that do not require an operational Dynamic Traveler Information System, the Design-Build Team shall operate the Dynamic Traveler Information System, including all components listed above, continuously (24 hours per day, 7 days per week) for the duration of all construction activities.

Excluding the construction activities identified elsewhere in this project special provision that do not require an operational Dynamic Traveler Information System, the Design-Build Team shall continuously operate the Dynamic Traveler Information System with no major malfunctions throughout the duration of all construction activities. Malfunctions include, but are not limited to, the inability of the equipment to provide accurate, real-time traffic data, inability of the equipment to determine lane closure status from connected lane closure devices; inability to withstand a construction roadside environment or normal weather conditions; and / or interference from construction equipment. Monitor and inspect equipment and data on a regular basis to avoid malfunctions. Upon discovery or notification of a malfunction, make all necessary corrections to the components of the system such that system malfunctions are corrected within a 72-hour period through repair or replacement of the equipment. (Reference the Transportation Management Scope of Work found elsewhere in this RFP) Components include traffic sensors, PCMS, communications equipment and all hardware and software required to place the real time information on the devices in accordance with this project special provision.

The Design-Build Team shall be responsible for detecting all data malfunctions. The Design-Build Team shall monitor, inspect, and maintain traffic sensors so that malfunctions in data collection can be detected as soon as possible. Causes of malfunction may include high winds, shifting earth beneath or around the device, or interference by construction equipment. At a minimum, monitoring shall include evaluation and documentation of power levels, communication connections, and accuracy of data provided to the Traffic Management Software. Monitoring data accuracy shall include but not be limited to, recalibration and aiming of the device or retesting accuracy in accordance with the Dynamic Traveler Information System Deployment Section found elsewhere in this project special provision. Monitor as needed and when requested by the Department.

K. Complete and Operational System

Direct and indirect costs associated with operating the Dynamic Traveler Information System including but not be limited to, FCC licensing, cellular communication, wireless data networks, satellite and internet subscription charges, solar power system support, battery charging and maintenance shall be included in the lump sum price bid for the entire project.

Construction Methods

A. System Manager

The Design-Build Team shall provide one person, available 24 hours per day, as the System Manager for the Dynamic Traveler Information System. Provide this person's 24-hour contact information to the Department. Provide a System Manager who is locally available to supervise, monitor, and maintain the system components, maintain the system website, relocate devices as necessary, and respond to malfunctions and emergencies. Prior to the Dynamic Traveler Information System becoming operational, the Design-Build Team shall provide the name and contact information of the System Manager to the Department.

B. Dynamic Traveler Information System Deployment

The Design-Build Team shall deliver all of the required devices to the place and time designated by the Design-Build Team and approved by the Department, in writing. The Design-Build Team shall confirm that all devices are in good condition and in working order. Each PCMS shall be in like-new condition when delivered to the project site. Coordinate with the Department to determine final traffic sensor locations, then deploy and install traffic sensors. Complete stand-alone tests, system operational tests, final deployment, and system initiation prior to impacting traffic.

Stand-alone Testing

The Design-Build Team shall conduct stand-alone tests of each device. Test traffic sensors from their installed locations. PCMS may be tested in other locations. If visible by public traffic, the Design-Build Team shall turn all PCMS away from traffic during testing.

The Design-Build Team shall complete a stand-alone test for each PCMS prior to installation, and to verify that the unit operates as specified. At a minimum, the stand-alone test procedures shall include the following functions:

- Turning the sign on and off
- Displaying and removing a test message
- Counting pixels not illuminated (no more than 1 malfunctioning pixel shall be allowed)
- Checking message logs for accuracy
- Measuring sign legibility and visibility

If a PSMS fails to pass the stand-alone test, repair or replace the PCMS, and repeat the test until successful.

System Operational Testing

A minimum of 14 days prior to beginning testing, the Design-Build Team shall provide a System Operational Testing Plan to the Department for review and acceptance. The Testing Plan shall detail a five-day operational test procedure of the System Operational Requirements and include operation of the software using real time information from traffic sensors already tested and installed and already tested PCMSs located in an off-project location. Begin testing 14 days prior to implementation to verify the system operates in a fully functional manner and as required in this project special provision. After the system is tested and approved for use on the project, collect baseline traffic data for a minimum of ten days prior to any modification to traffic operations.

The Design-Build Team shall provide complete operations support from the software supplier during the operational test. Testing shall include, but not be limited to, 1) providing verification that the reported drive times, speeds, and volumes through the work zone accurately reflect field conditions and 2) using the Traffic Control Supervisor to monitor and document the posted messages. Post test messages two times per day during the test period to verify functionality and communications and verify that proper messages are being posted to the PCMS. If any equipment malfunctions occur for a combined period of two hours or more during the operational test on any day, restart the five-day test and no credit will be given for that day of the operational test period.

The Design-Build Team shall be responsible for replacing all defective equipment at no additional cost to the Department.

Indicate the date and time of any activity necessary to maintain operation of the Dynamic Traveler Information System during the operational test period. Include in each entry, at a minimum, the following information:

- A description of the malfunction
- Identity of the malfunctioning equipment
- Cause of equipment malfunction (if known)
- A description of the type of work performed
- Time and date of repair completion

Once the operational test report is received and accepted by the Department, the Dynamic Traveler Information System will be considered operational, and the system will be accepted for use.

SOUND BARRIER WALL

(3-6-15) (Rev. 9-11-17)

(A) DESCRIPTION

This work consists of furnishing precast panels, structural steel, concrete columns, and all other materials; handling, transporting, fabricating, galvanizing, and storing materials;

furnishing erection drawings, pile excavation, backfilling, erecting and installing the sound barrier wall members and all other materials as required by the plans developed by the Design-Build Team, the 2018 *Standard Specifications for Roads and Structures* and this Project Special Provision.

Unless otherwise approved by the Engineer, the Design-Build Team has a choice of ten or 15-foot pile spacing. Pile spacing greater than 15 feet will not be permitted. Provide consistent pile spacing the entire length of the wall. Use odd pile spacing, if necessary, only at the ends of the wall and at turning points, as approved by the Engineer.

A maximum one-foot drop or rise in top of wall elevation between wall sections will be permitted. Elevation changes greater than one foot, if necessary, will be allowed only at the end of the wall. Top of wall elevation changes that result in a jagged appearance shall not be allowed. Unless otherwise approved by NCDOT, the wall shall adhere to the Design Noise Report developed by the Design-Build Team.

(B) ALTERNATE PILE SPACING

As an alternate, the Design-Build Team may submit plans for pile spacing greater than ten feet and less than 15 feet for review and approval. A submittal reducing the post spacing shall include the material and design specifications. The submittal shall also include an elevation view depicting the revised post spacing and proposed top of wall elevations. The proposed top of wall elevations shall be equal to or greater than the dimensions shown in the Design Noise Report developed by the Design-Build Team. The excavated hole diameter, excavation depth and reinforcing steel shall be equal to the amount required for 15-foot pile spacing. A variance in the reinforcing steel will be allowed for the length of horizontal and number of vertical reinforcement bars in the precast panel for the alternate pile spacing.

Submit two sets of detailed plans for review. Include all details in the plans developed by the Design-Build Team, including the size and spacing of required reinforcement necessary to fabricate the precast panels. Have a North Carolina Registered Professional Engineer check, seal and date the aforementioned plans.

(C) ALTERNATE WALL TYPE

Walls that have been assigned “Approved” or “Approved for Provisional Use” status by the Product Evaluation Program will be considered for substitution to the detailed Standard Sound Barrier Wall only when approved by the Department in writing. Alternate walls shall meet all design and construction requirements of this RFP. Alternate wall structural stability and connection details shall conform to the current edition of the AASHTO LRFD Bridge Design Specifications.

Prior to submittal of Working Drawings, as described herein, submit a copy of the signed NCDOT Product Status Notification Letter and two sets of preliminary plans for review and acceptance. Include material specifications for all components. Once preliminary plans are accepted, submit Working Drawings in accordance with all applicable portions of the requirements herein, including details necessary to fabricate and construct the proposed alternate.

Have a North Carolina Registered Professional Engineer check, seal and date the plans developed by the Design-Build Team and, when requested, calculations.

MATERIALS AND FABRICATION

Provide materials and fabricate members in accordance with the *Architectural Concrete Surface Treatment* Project Special Provision found elsewhere in this RFP, and the requirements of Division 10 of the 2018 *Standard Specifications for Roads and Structures*.

Provide precast panels that are nominally four inches ± ¼ inch thick with a simulated stone masonry textured surface on both faces. All texture shall extend outward from the nominal panel thickness. Furnish three 24" x 24" samples for approval which establish the acceptable variations in color, texture and uniformity. After the color, texture and uniformity of the furnished samples are approved, produce a full-scale panel unit meeting design requirements. This mock-up and the furnished samples establish the standard quality for determining approval of the panels. When producing the final installed panels, use fine and coarse aggregate, retarder, and cement from the same source as those used in the approved sample panels.

CONSTRUCTION METHODS

Complete the final survey of existing ground profile after clearing the sound barrier wall area, but prior to submitting any Working Drawings. Submit the final groundline survey with the Working Drawings.

Excavate holes with the diameters shown on the plans developed by the Design-Build Team. Perform pile excavation to the depths shown on the aforementioned plans and install piles as shown on the plans developed by the Design-Build Team with a tolerance of ½-inch per foot from vertical. Backfill excavations with concrete after placing piles.

(A) Pile Excavation

Use equipment of adequate capacity and capable of drilling through soil and non-soil including rock, boulders, debris, man-made objects and any other materials encountered. Blasting shall not be permitted to advance the excavation. Blasting for core removal shall only be permitted when approved by the Engineer. Dispose of drilling spoils in accordance with Section 802 of the 2018 *Standard Specifications for Roads and Structures* and as directed by the Engineer. Drilling spoils shall consist of all excavated material, including but not limited to water removed from the excavation either by pumping or drilling tools.

If unstable, caving or sloughing soils are anticipated or encountered, stabilize excavations with either slurry or steel casing. When using slurry, submit slurry details including product information, manufacturer’s recommendations for use, slurry equipment information and written approval from the slurry supplier that the mixing water is acceptable before beginning drilling. When using steel casing, use either the sectional type or one continuous corrugated or non-corrugated piece. Steel casings shall consist of clean watertight steel of ample strength to withstand handling and driving stresses and the pressures imposed by

concrete, earth or backfill. Use steel casings with an outside diameter equal to the hole size and a minimum wall thickness of ¼-inch.

(B) Concrete Placement

Before placing concrete, center and support the pile in the excavation and check the water inflow rate in the excavation after any pumps have been removed. If the inflow rate is less than six inches per half hour, remove any water and free fall the concrete into the excavation. Ensure that concrete flows completely around the pile. If the water inflow rate is greater than six inches per half hour, propose a concrete placement procedure to the Engineer. The Engineer shall approve the concrete placement procedure before placing any concrete.

Fill the excavation with Class A concrete in accordance with Section 1000 of the 2018 *Standard Specifications for Roads and Structures*, except as modified herein. Provide concrete with a slump of six to eight inches. Use an approved high-range water reducer to achieve this slump. Place concrete in a continuous manner and remove all casings.

WORKING DRAWINGS

In accordance with Article 1077-2 of the 2018 *Standard Specifications for Roads and Structures*, submit casting drawings for the precast face panels for approval prior to casting. Show the inserts, method of handling, and support details used for transportation on casting drawings. Submit metalwork fabrication drawings for approval prior to fabrication of steel wall components. Submit an erection plan and concrete face panel placing plan, including location of various heights of panels, for review and acceptance prior to fabrication of metalwork. Submit five sets of detail drawings for review and acceptance.

ARCHITECTURAL CONCRETE SURFACE TREATMENT

(1-28-15) (Rev. 11-16-17)

1.0 GENERAL

The work covered by this Project Special Provision shall consist of constructing a stained, simulated stone masonry textured surface on both faces of pre-cast concrete panels used in sound barrier walls and exposed faces of retaining walls (excluding sheet pile walls) as indicated on the plans developed by the Design-Build Team and herein. The Design-Build Team shall furnish all materials, labor, equipment and incidentals necessary for the construction of architectural concrete surface treatment using simulated stone masonry form liners (molds) and a compatible concrete coloring system.

The Design-Build Team shall use the same source of form liner and color stains for all sound barrier wall panels and retaining walls. The architectural concrete surface treatment shall match the appearance (stone size, stone shape, stone texture, pattern and relief) of natural stone to resemble an ashlar stone pattern with panel staining **on both sides** of pre-cast concrete panels used in sound barrier walls, and exposed faces of retaining walls to match the Gray Palette Color # FS 36270 found in the *Federal Standard 595B – Colors Used in Government Procurement*. All texture shall be in addition to the nominal thickness

of the pre-cast sound barrier wall panel thickness and retaining wall face thickness, ± ¼ inch. Maximum relief of the textured surface shall be 1¼ inch or less. The top 1'-0" of the top panel within each sound barrier wall segment shall have a smooth, non-textured and non-stained finish to resemble faux coping. Concrete columns shall remain unstained in their natural concrete color. There shall be an appreciable contrast between the colors of the unstained concrete columns and the stained panels. For information purposes only, sources of form liners in the ashlar stone pattern include, but are not limited to:

Scott System, Inc.
10777 E. 45th Avenue
Denver, Colorado 80239
http://www.scottsystem.com/
Pattern: Ashlar Stone # 167B

Architectural Polymers, Inc.
1220 Little Gap Road
Palmerton, Pennsylvania 18071
http://www.architecturalpolymers.com/
Pattern: Ashlar Stone # 904A

Fitzgerald Form Liners
1500 East Chestnut Avenue
Santa Ana, California 92701
http://formliners.com/
Pattern: Georgia Ashlar # 16999

The Design-Build Team has the option of supplying an alternative pattern of simulated stone form liner, as long as the pattern selected is approved, in writing, as an equal or approved alternative by the Engineer.

2.0 SUBMITTALS

Shop Drawings - The Design-Build Team shall submit for review and acceptance, plan and elevation views and details showing overall simulated stone pattern, joint locations, form tie locations, and end, edge or other special conditions. The drawings shall include typical cross sections of applicable surfaces, joints, corners, stone relief, stone size, pitch / working line, mortar joint and bed depths. If necessary, the Design-Build Team shall revise the shop drawings until the proposed form liner patterns and arrangement have been accepted by the Engineer. Shop drawings shall be of sufficient scale to show the detail of all stone and joint patterns. The size of the sheets used for the shop drawings shall be 22" x 34".

The form liner shall be patterned such that long continuous horizontal or vertical lines do not occur on the finished exposed surface. The line pattern shall be random in nature and shall conceal construction joint lines. Special attention shall be given to details for wrapping form liners around corners.

Shop drawings shall be reviewed and accepted prior to fabrication of any form liners.

Sample Wall Panels - After shop drawings have been reviewed and accepted by the Engineer, the Design-Build Team shall construct three 24" x 24" transportable sample panel(s) at the project site. The materials used in construction of the sample panel(s) shall comply with Section 420 of the 2018 *Standard Specifications for Roads and Structures*. The sample panel(s) shall be constructed using form liners approved by the Engineer. Any sample panel that is not approved by the Engineer shall be removed from the project site and a new sample panel produced at no additional expense to the Department.

After the color, texture and uniformity of the furnished samples are approved by the Engineer, produce a full-scale unit meeting the design requirements. This mock-up and the furnished samples shall establish the standard quality for determining the panel approval.

Architectural surface treatments and patterns of the finished work shall achieve the same final effect as demonstrated on the approved sample panel(s). Upon approval by the Engineer, the sample panel(s) shall be used as the quality standard for the project. After the approval of the completed structure, the Design-Build Team shall dispose of the sample panels, as directed by the Engineer.

3.0 MATERIAL REQUIREMENTS

Form Liner - The form liner shall be a high quality, reusable product manufactured of high strength urethane rubber or other approved material which attaches easily to the form work system and shall not compress more than ¼-inch when concrete is poured at a rate of ten vertical feet per hour. The form liners shall be removable without causing deterioration of the surface or underlying concrete.

Form Release Agent - Form release agent shall be a non-staining petroleum distillate free from water, asphaltic, and other insoluble residue, or an equivalent product. Form release agents shall be compatible with the color system applied and any special surface finish.

Form Ties - Form ties shall be set back a minimum of two inches from the finished concrete surface. The ties shall be designed so that all material in the device to a depth of at least two inches back of the concrete face (bottom of simulated mortar groove) can be disengaged and removed without spalling or damaging the concrete. The Design-Build Team shall submit the type of form ties to the Engineer for approval.

Concrete Color System / Stain - Special surface color system shall be performed using approved coloring systems / stains suitable for the purpose intended and applied in a manner consistent with the design intent of the project. The approved sample panel shall be the basis for determining the appropriate color / stain application.

Color stains shall be a special penetrating stain mix as provided by the manufacturer and shall be medium to dark gray to achieve a full, natural color in the finished surface. The stain shall create a surface finish that is breathable (allowing water vapor transmission), and that resists deterioration from water, acid, alkali, fungi, sunlight, and / or weathering.

Stain mix shall meet the requirements for mildew resistance of Federal Test Method Standard 144, Method 6271, and requirements for weathering resistance of 1,000 hours accelerated exposure measures by Weatherometer, in accordance with ASTM G 26. Color samples shall be submitted for approval by the Engineer. Final coloring system and the Gray Palette Color # FS 36270 shall be subject to approval by the Engineer.

Anti-Graffiti Coating - The Design-Build Team shall apply anti-graffiti coating that is compatible with the concrete color system / stain. After application, the anti-graffiti coating shall be dry to the touch within one hour and shall achieve a final cure within three hours. The color of the anti-graffiti shall be clear after full cure. The Design-Build Team shall provide one gallon of graffiti remover, thinners, dryers and all necessary components recommended by the manufacturer to the North Carolina Department of Transportation Materials and Tests Unit, Chemical Testing Engineer.

Quality Standards - Manufacturer of simulated stone masonry form liners and custom coloring system shall have at least five years' experience making stone masonry molds and color stains to create formed concrete surfaces to match the natural stone shapes, surface textures and colors.

The Design-Build Team shall schedule a pre-installation conference with a manufacturer representative and the Engineer to assure understanding of simulated stone masonry form liner use, color application, requirements for construction of sample panel(s), and to coordinate the work. The Design-Build Team shall disclose their source of simulated stone masonry manufacturer and final coloration contractor at the Preconstruction Conference.

4.0 CONSTRUCTION

Form Liner Preparation - Prior to each concrete pour, the form liners shall be clean and free of build-up. Each liner shall be visually inspected for blemishes and tears. Repairs shall be made in accordance with the manufacturer's recommendations. Repairs shall be approved by the Engineer before being used. Form liner panels that do not perform as intended or are no longer repairable shall be replaced.

Form Liner Attachment - Form liners shall be securely attached to forms in accordance with the manufacturer's recommendations, with less than a ¼-inch seam. Blend form liner butt joints into the stone pattern and finish off the final concrete surface. Create no visible vertical or horizontal seams or conspicuous form liner butt joint marks. At locations where the form liners are joined, carefully blend to match the balance of the stone pattern. Form liners shall be installed to withstand anticipated concrete placement pressures without leakage and without causing physical or visual defects. Wall ties shall be coordinated with the form liner system. The Design-Build Team shall have a technical representative from the form liner manufacturer on site for technical supervision during the installation and removal of form liners. Unless allowed by the Engineer, installation and removal of form liners shall not be permitted if the aforementioned technical representative is not present.

Form Release Agent - Form release agent shall be applied in accordance with the manufacturer's recommendations. The material shall be compatible with the form liner

material and the concrete coloring system and in accordance with this Project Special Provision. Form release agent shall be worked into all areas, especially pattern recesses.

Patching - Using patching materials and procedures in accordance with the manufacturer's recommendations, all form tie holes and other defects in finished uncolored surface shall be filled or repaired within 48 hours of form removal.

Surface Finish - All surfaces that are to receive coloring agent application shall be free of all laitance, dirt, dust, grease, efflorescence, paint or any other foreign material prior to the application of coloring agent. Cleaning of surfaces shall be accomplished by pressure washing with water set at 3000 psi to remove laitance. The fan nozzle shall be held perpendicular to the surface at a distance of one to two feet. Sandblasting shall not be permitted.

Final surface shall be free of blemishes, discolorations, surface voids, and other irregularities. All patterns shall be continuous without visual disruption.

Reinforced concrete shall be finished in accordance with the 2018 *Standard Specifications for Roads and Structures*, except that curing of concrete shall be done to accommodate the application of coloring and surface finish treatment.

Grout Pattern Joints - Grout pattern joints shall be constructed to simulate the appearance of mortared joints produced in laid up masonry work. Grout pattern joints shall be produced in accordance with the form liner / concrete color system manufacturer.

Color / Stain Application - Finished concrete and patches shall stand in place 30 days after form liners are removed prior to application of coloring / staining agent. Maintain the concrete temperature between 40° F and 85° F during color / stain application and for 48 hours after color / stain application. Consult the manufacturer's recommendations for preparation, application, curing and storage of coloring agents / stains. Treated surfaces located adjacent to exposed soil or pavement shall be temporarily covered to prevent dirt or soil splatter from rain.

Anti-Graffiti Coating Application - The Design-Build Team shall apply anti-graffiti coating after full cure of the color coating. The anti-graffiti coating shall be applied by brush, roller or airless spray when the ambient temperature is between 45° F and 90° F, and the surface temperature is between 50° F and 100° F. Ensure the surface is clean and dry before applying the anti-graffiti coating. The minimum dry film thickness of the anti-graffiti coating shall be 2.0 mils.

Following the completion of all work, repairs of any damage made by other construction operations shall be made to the form lined and colored surfaces, as directed by the Engineer.

Experience and Qualifications - The Design-Build Team shall have a minimum of three consecutive years' experience in architectural concrete surface treatment construction on similar types of projects. The Design-Build Team shall furnish to the Engineer five references who were responsible for supervision of similar projects and will testify to the

successful completion of these projects. Include name, address, telephone number, and specific type of application.

DIAMOND GRINDING CONCRETE PAVEMENT

(4-15-08) (Rev. 9-11-17) DBI 7-09

Description

Perform the work covered by this provision including but not limited to diamond grinding and regrinding concrete pavement to meet final surface testing requirements in accordance with Article 710-7 of the 2018 *NCDOT Standard Specifications for Roads and Structures*, selecting diamond tipped saw blades and configuration of cutting head; continual removal of residual slurry from pavement and disposal; furnishing all labor, materials, supplies, tools, equipment and incidentals as necessary.

Equipment

Use equipment with diamond tipped saw blades gang mounted on a power driven self-propelled machine with a minimum wheel base length of 15 feet that is specifically designed to smooth and texture Portland Cement Concrete pavement. Utilize equipment that does not cause ravels; aggregate fracture; spalls or disturbance to the longitudinal or transverse joints; or damage and / or strain to the underlying surface of the pavement. Should any of the above problems occur immediately suspend operations.

Provide a minimum three-foot wide grinding head with 50 to 60 evenly spaced grooves per foot. Prior to designing the grinding head, evaluate the aggregate hardness of the concrete pavement and select the appropriate diamond size, diamond concentration and bond hardness for the individual saw blades.

Provide vacuuming equipment to continuously remove slurry residue and excess water from the pavement as part of the grinding operation. Do not allow the slurry material to flow into a travel lane occupied by traffic or into any drainage facility.

Method of Construction

Grind the pavement surface to a uniform appearance with a high skid resistant longitudinal corduroy type texture. Provide grooves between 0.09 and 0.15 inch wide with the land area between the grooves between 0.06 and 0.13 inch wide. Ensure a ridge peak of approximately 0.0625 inch higher than the bottom of the grooves.

Begin and end diamond grinding at lines normal to the pavement centerline. Grind only in the longitudinal direction. All grooves and adjacent passes shall be parallel to each other with no variation. Completely lap adjacent passes with no unground surface remaining between passes and no overlap of more than 1½ inches. Adjacent passes shall be within 1/8 inch of the same height as measured with a three-foot straightedge. Maintain positive cross-slope drainage for the duration of the grinding operation.

Grind all concrete travel lanes with not less than 98 percent of the specified surface being textured by grinding. Grinding of the bridge decks and concrete shoulders will not be required. Remove a minimum 0.0625 inch at all locations except dips. Extra grinding to eliminate minor depressions is not required. It is anticipated that extra grinding will be required on the high side of existing faults in the pavement. There shall be no ridge between lanes. In a separate operation, transition the grinding of any remaining ridges greater than 1/8 inch in height on the outside edge next to the shoulder or at a tie to an existing facility to the satisfaction of the Engineer.

Disposal of Residual Slurry

Diamond grinding slurry disposal shall be in accordance with the Statewide Permit for Land Application of Diamond Grinding Slurry (DGS), Permit No. WQ0035749 dated March 1, 2019. Land Application on NCDOT right of way directly from the diamond grinding machine or from the tanker truck shall not be allowed. The Design-Build Team shall use one of the following methods to dispose of the DGS:

1) Transport DGS beyond the project limits to a permitted disposal site approved to accept the DGS.

2) Land application on private property in accordance with Permit No. WQ0037549. Construction of temporary lined inground pits / earthen storage structures on NCDOT right of way or private property for temporary storage of DGS will also be allowed, provided the Design-Build Team obtains all required approval, permits, etc. The Design-Build Team is cautioned that using lined inground pits / earthen storage structures for temporary storage of DGS on NCDOT right of way or private property is not permitted under Permit No. WQ0035749 for Land Application of DGS. The N.C. Department of Environmental Quality (NCDEQ) requires that temporary lined inground pits / earthen storage structures be handled as a separate permit modification to Permit No. WQ0035749 that must be obtained prior to construction of each structure. The Department will not honor any requests for additional contract time or compensation for any efforts required in order to obtain the permit modification(s), including but not limited to additional design effort, additional construction effort, and / or additional environmental agency coordination and approvals. Additionally, the Design-Build Team shall provide a reclamation plan to the Engineer for review and acceptance if the pit is located on private property.

3) Mechanical dewatering of DGS

   - The reclaimed water shall be returned to the grinding operation and the dewatered solids shall be disposed of as follows:

     - Concrete grinding residues (CGR) that are not liquid and otherwise not hazardous may be disposed of in a municipal solid waste landfill or utilized as an alternate daily cover (ADC). If the sanitary landfill operator requests the use of this material as ADC, the Design-Build Team shall obtain written confirmation that the landfill owner has obtained approval from the NCDEQ to use the material as ADC. The definition of a solid, for solid waste disposal

purposes, shall be a material that passes a Paint Filter test. CGR's may be eligible for disposal or use as ADC in an unlined sanitary landfill or a construction and demolition debris landfill. Prior to disposing CGR in an unlined-landfill, the Design-Build Team shall submit a blended representative sample of 500 milliliters by volume (minimum 125 grams) of the material to a certified laboratory to verify that the CGR does not exceed Resource Conservation and Recovery Act (RCRA) regulatory limits for the following metals: Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium and Silver.

- Dewatered CGR's that are not liquid may be beneficially reused within the NCDOT project limits or areas under NCDOT control as beneficial fill. Dewatered CGR's that meet the aforementioned solid waste definition and solid waste definition for inert debris, as per North Carolina General Statute 130A-290(a)(14), may also be used within the roadbed at rates approved by the Engineer for soil modification purposes. Prior to disposing CGR as beneficial fill within the NCDOT project limits or areas under NCDOT control, the Design-Build Team shall submit a blended representative sample of 500 milliliters by volume (125 grams minimum) of the material to a certified laboratory to verify that the CGR does not exceed RCRA regulatory limits for the following metals: Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium and Silver.

- Any residuals not mechanically processed or failing to meet the dewatered disposal requirements shall be disposed of at a permitted disposal facility approved to accept DGS.

Submit a slurry disposal plan to the Engineer detailing method of handling and disposing of slurry from the diamond grinding operation a minimum of 45 days prior to the desired diamond grinding operation start date. The Engineer will review the slurry disposal plan and the Engineer's acceptance of the slurry disposal plan shall be received, in writing, prior to beginning the diamond grinding operation. No additional payment shall be made for transporting and / or processing of this slurry material for disposal.

At the direction of the Engineer, the Design-Build Team shall install wattles and silt fence at inlets and channels adjacent to the grinding operation to prevent the migration of any accidental discharge. Silt fence shall be installed in accordance with Section 1605 of the NCDOT 2018 *Standard Specifications for Roads and Structures*.

For more detailed requirements, reference the NCDOT *Guidelines on the Management and Disposal of Concrete Grinding Residual*s on the website noted below:

https://connect.ncdot.gov/resources/Environmental/Environmental%20Permits%20and%20Guidelines/NCDOT%20Statewide%20Permit%20Guidelines%20Management%20%20Disposal%20of%20Concrete%20Grinding%20Residuals%205219.pdf

CUTTING OF STEEL SIGN HANGERS ON OVERHEAD SIGNS

(2-29-16) SPI

Description

Cut and dispose of the portion of the sign hangers that is extended below the bottom edge of the signs for the mounting of sign lighting. Cut and dispose of the portion of the sign hangers that extends above the top edge of the signs that have been repositioned on the overhead sign structure.

Materials

Organic Non-Aerosol Zinc Repair Paint ……...……Article 1080-9

Construction Methods

The sign hangers shall be cut at a distance specified by the Engineer. The hangers shall be cut in a manner that does not damage existing signing components or roadway facility. Areas disturbed or damaged in performance of this work shall be repaired by the Design-Build Team at no cost to the Department.

Cutting of the sign hangers shall be done by a method approved by the Engineer. Oxygen cutting shall be done in accordance with Section 1072-11 of the 2018 *Standard Specifications for Roads and Structures*. Repair the cut and / or any damaged members of the sign hangers with two coats of an approved organic non-aerosol zinc repair paint. Paint materials used shall be in accordance with Section 1080-9 of the 2018 *Standard Specifications for Roads and Structures*.

All material shall be removed and disposed of in accordance with State and Local codes, regulations, and ordinances and shall be in accordance with the Section 907 of the 2018 *Standard Specifications for Roads and Structures*.

SILANE DECK TREATMENT

(SPECIAL)

DESCRIPTION

This work consists of preparation of concrete bridge deck surfaces and the furnishing and application of alkylalkoxysilane (silane) penetrant sealers, with 100% solids, to seal bridge deck surfaces and cracks. Prepare the surface of the concrete deck and apply the silane bridge deck sealer in accordance with this special provision and as indicated on the plans developed by the Design-Build Team or as approved by the Engineer.

Work shall include: bridge deck surface preparation, placement of silane deck sealer, and any incidentals necessary to complete the project, as specified or as indicated on the plans developed by the Design-Build Team.

SUBMITTALS

Submit for approval the following requested items and any other relevant documents:

- A safety data sheet (SDS) for each shipment of the silane materials.
- Silane material information and manufacturer's written preparation and application instructions.
- Certification from an independent testing laboratory that the materials meet the requirements of these provisions. Do not incorporate these materials into the project until the Engineer has accepted and approved the certification for the material.
- The dates of manufacture of the silane materials, their lot numbers and date of shelf-life expiration for each lot number.
- A table indicating the likely cure time, in minutes, to allow vehicular traffic on the silane-treated deck surface. Provide time for the allowable ambient temperature range, in increments of 10º F.
- A work plan for each structure that includes estimated times for surface preparation and silane application.

MATERIAL DELIVERY AND STORAGE

Store at the site sufficient quantities of silane materials to perform the entire application.

Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Ensure that each container is clearly marked by the manufacturer with the following information:

a. Manufacturer's name and address.
b. Product name.
c. Date of manufacture.
d. Expiration date.
e. LOT identification number.
f. Container serial number.

Provide the Engineer a certification from the manufacturer, confirming that the silane materials meet the requirements of this special provision. Do not incorporate these materials into the project until the Engineer has accepted and approved the certification for the material. Submit such certification for each LOT of material delivered to the project. In each certification, identify the serial or LOT numbers of the containers certified.

The Engineer may require samples from each LOT or container of materials delivered to the project or from containers at the point of use. When samples are required, furnish samples in accordance with the Engineer's instructions.

Store silane materials in unopened containers in a clean, dry area between 40° F and 90° F. Store containers in a manner that prevents leakage or spillage.

MANUFACTURER'S REPRESENTATIVE

Provide a manufacturer's representative on site for the duration of the surface preparation and silane application work, to provide expert assistance on surface preparation, storage, mixing, application, clean-up, and disposal of materials.

MATERIALS

Provide silane from a single manufacturer and provide silane that conforms to requirements indicated in Table 1, below.

Table 1
SILANE PROPERTIES

Property	Test Method	Requirement
Silane Content		100%
VOC content	EPA method 24	Less than 350 g/l
Surface Appearance after Application		Unchanged
Flash Point	ASTM D3278	140° F, minimum
Resistance to Chloride Ion Penetration	AASHTO T259 and T260	Less than: 0.52 pounds/yd^3(criteria of 1.5) at 1/2 inch level; 0.00 pounds/yd^3(criteria of 0.75) at 1 inch level
Water absorption test	ASTM C 642	0.50% maximum/48 hours; 1.5% maximum/50 days
Scaling resistance	ASTM C 672	(non-air-entrained concrete) 0 rating "No Scaling" (100 cycles)
NCHRP 244		
Water weight gain	Series II - cube test	85% reduction, minimum
Absorbed chloride		87% reduction, minimum
Absorbed chloride	Series IV - Southern climate	95% reduction, minimum

SURFACE PREPARATION

Prepare the surface of the concrete deck for application of the silane by shotblasting in order to remove all existing asphalt, grease, slurry, oils, paint, dirt, striping, curing compound, rust, membrane, weak surface mortar, or any other contaminants that could interfere with the proper adhesion, penetration, and the curing of the silane material.

Prepare a final surface that adheres to the following requirements:

1) For areas to receive deck seal treatment, clean by shotblasting. Where approved by the Engineer, abrasive sandblasting may be used in areas that cannot be accessed by the shotblaster. Select the size of shot or sand, and travel speed of the equipment to provide a uniformly clean surface with a uniform profile. Remove striping to the maximum extent determined to be practical by the Engineer using up to three passes with shotblasting, sandblasting, or other approved equipment. Do not expose cleaned surfaces to vehicular traffic unless approved by the Engineer. If the deck becomes contaminated before placing the silane deck sealer, shotblast or abrasive sandblast the contaminated areas to the satisfaction of the Engineer, at no additional cost.

2) Prior to silane application, protect cracks on the concrete bridge deck from materials that can interfere with the penetration and the curing of the silane material. Just prior to placement of the silane, remove, by magnets and oil-free compressed air and vacuuming, any loose particles, such that no excess particles remain. The concrete deck shall be completely dry. Power washing will not be allowed.

3) The silane manufacturer may suggest cleaning and preparation methods other than those detailed by this special provision. The Engineer must approve such alternative methods prior to implementation.

SILANE APPLICATION

Test Area

- Test a small area of the surface (minimum five-foot by five-foot) before general application to ensure desired performance results, aesthetics, and application rates and to verify application technique. Allow five - seven days for the product to react fully before evaluating. Application rates may vary depending on field conditions.
- Conduct at least one absorption test in the test area, using a Rilem Tube Test. Acceptable results are no loss of water in the Rilem tube over a period of 20 minutes. Adjust application to achieve required repellent performance.
- The manufacturer’s representative shall assist the Design-Build Team in determining the application rates. Use test applications on actual surfaces to determine accurate application rates. Extremely porous surfaces may require two coats of silane.
- Do not begin production application of silane until Engineer has approved the test area, including approval of aesthetics, color, texture, and appearance.

Application

Immediately before placing silane, all exposed surfaces shall be completely dry and blown clean with oil-free compressed air to remove any loose dust and debris. Apply silane as soon as practical after the exposed surfaces have been properly prepared and conditions are satisfactory:

- Stir material thoroughly before and during application.
- Apply silane with low-pressure spray or by flooding, followed by brooming or squeegeeing for even distribution, in accordance with manufacturer's instructions.
- Maintain operating pressures in sprayers used for application of the silane sealer material sufficiently low so that atomization or misting of the material does not occur.
- Begin the application of the silane at the lowest elevation and proceed upward, toward higher elevations, unless otherwise approved by the Engineer.
- Apply even distribution of silane. Avoid ponding of silane; take care when applying the silane, so that running or puddling does not occur.
- Apply silane in a single application to the concrete deck surface with enough material to saturate the surface. Remove excess material with a broom or squeegee and dispose of excess material appropriately. If a second coat is required, it shall be applied "wet on wet" before first coat dries.
- Application of sealant by spray methods will not be permitted when wind speeds are 20 mph or higher, or if in the opinion of the Engineer, unsatisfactory results will be obtained. Other application methods or rescheduling will be required.
- Avoid application with hand pump sprayers. For small areas of silane application, the use of hand pump sprayers must be approved by the Engineer.
- The Design-Build Team shall protect from overspray all pedestrians, vehicles, plants and vegetation, and other areas not receiving silane application.
- Allow product to penetrate the bridge deck and dry, as required by the manufacturer, prior to opening to traffic.

LIMITATIONS OF OPERATIONS

- Prior to application of any silane sealer, cure concrete or concrete repairs for a minimum of 21 days.
- Do not use silane material after the shelf life date.
- Do not return unused material in opened containers to storage for later use. Either apply such material to appropriate areas on concrete deck surfaces or remove and appropriately dispose of it at offsite locations provided by the Design-Build Team.
- 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.
- Pick up and store all blast media and contaminants in a vacuum unit. Do not create dust during the blasting operation that will obstruct the view of motorists in adjacent roadways. Store, handle, and dispose of blast media and contaminants in accordance with all applicable local, state, and federal requirements.
- Cover deck joint seal and elastomeric material, plug deck drain scuppers, seal cracks on underside of deck, and use other necessary protective measures to prevent leakage of silane below the concrete deck, to protect waterways, bridge components, pedestrians, vehicles, roadway, vegetation, and any other items or areas below or near the bridge.
- Application of sealant by spray methods will not be permitted during windy conditions, if in the opinion of the Engineer, unsatisfactory results will be obtained. Other application methods or rescheduling will be required.

- Avoid application with hand pump sprayers. For small areas of silane application, the use of hand pump sprayers might be allowed, but must be approved by the Engineer.
- Protect traffic from rebound, dust, overspray, and construction activities. Provide appropriate shielding, as required and / or directed by the Engineer.
- The Design-Build Team shall provide suitable coverings (e.g. heavy-duty drop cloths) as needed to protect all exposed areas not to receive silane treatment, such as asphalt pavement, curbs, sidewalks, parapets, etc.
- Clean and / or repair all damage or defacement resulting from the Design-Build Team's operations to the Engineer's satisfaction at no additional cost to the Department.
- The equipment used for silane application must be clean of foreign materials and approved by the Engineer before use.
- The surface to receive the treatment shall be dry for at least 48 hours before treatment and shall be free from sand, surface dust and dirt, oil, grease, chemical films, and other contaminants prior to application of the silane.
- The surface, air, and material temperatures shall be between 40° F and 90° F during application.
- Do not apply silane materials during cold, hot, or wet weather conditions or when adverse weather conditions are forecast within twelve (12) hours of the completion of the silane application. Correct any coating damaged by rain or moisture by an additional application or as required by the silane manufacturer.
- Protect prepared surfaces from precipitation and heavy dew during and after the application of the silane.
- Conduct the work in a continuous operation, with the silane application as soon as practical following surface preparation.
- Apply silane during the lowest temperature period of the day, typically between 1:00 a.m. and 9:00 a.m., when the cracks are open to the greatest extent.
- Clean up, dispose of any surplus material, and restore any disturbed areas unless otherwise directed.
- 100% Silane is a combustible liquid; take appropriate precautions during handling, storage, and operations. KEEP AWAY FROM OPEN FLAME.
- Work crews shall wear appropriate personal protection equipment and follow manufacturer's recommendations when applying silane. Refer to the SDS and all applicable local, state, and federal laws, and rules and regulations of authorities having jurisdiction over the project, for specific guidance for personal and environmental protection and safety requirements.

POLYMER CONCRETE BRIDGE DECK OVERLAY

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 in the plans developed by the Design-Build Team or as approved by the Engineer. Unless noted otherwise elsewhere in this RFP, all requirements specified for the bridge deck shall also be required for the approach slabs.

The Design-Build Team shall select one of the PC overlay systems below:

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

Work shall include, (1) placement of resin primer, (2) placement of PC surface patching and / or overlay, and (3) all incidentals necessary to complete the project, as specified or as shown in the plans developed by the Design-Build Team.

The System Provider is the manufacturer that provides the PC system for the PC overlay. The System Provider shall include the necessary and appropriate PC components, as well as the necessary and appropriate resin primer components. The Design-Build Team shall not change System Providers during project, without written approval from the Engineer.

QUALIFICATIONS AND SUBMITTALS

A. General

The Design-Build Team shall submit the following required items and all other relevant documents at least two weeks prior to a PC Overlay Pre-placement Conference. Prior to incorporation, these submittals shall be approved by the Department.

B. Overlay System

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

C. System Provider Qualifications

The Design-Build Team shall install an overlay system with all components provided through a single System Provider with documented experience successfully supplying at least five PC overlay projects of similar size and scope installed within the past five years. The Design-Build Team shall submit documentation of the System Provider's project experience including the following:

- Project location
- Owner agency
- Project construction date
- Overlay quantities
- Reference name and contact information for owner agency

D. Design-Build Team Qualifications

The Design-Build Team 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 years. A minimum of two employees on site must have the equivalent aforementioned work experience qualifications. The documentation of the Design-Build Team's qualifications shall include the following:

- Project location
- Owner agency
- Project construction date
- Overlay quantities
- Reference name and contact information for owner agency

E. 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 years of experience with PC overlay systems, and be completely competent in all aspects of the work, including but not limited to surface preparation, mixing, placement, curing, and testing of the PC overlay system. The System Provider Technical Representative shall have experience on a minimum of five successful projects of similar size and scope. The Design-Build Team shall submit documentation of the System Provider Technical Representative's experience including the following:

- Years of experience with PC overlay systems
- Project location
- Project construction date
- Overlay quantities
- Reference name and contact information for owner agency

The System Provider Technical Representative shall be available on site, for a minimum of three days per bridge, to give the installer advice and guidance on the installation of PC overlay systems. This includes, but is not limited to (1) deck concrete surface preparation, (2) PC overlay materials, (3) PC overlay application, (4) PC overlay curing, and (5) any time there are questions or issues that may arise. The System Provider 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.

F. Overlay Placement Plan

The Design-Build Team shall submit an Overlay Placement Plan that includes the following:

- Schedule of overlay work and testing for each bridge
- Anticipated concrete deck repair locations and repair method

- Staging plan describing overlay placement sequence including:
  - Construction joint locations - Longitudinal construction joints between passes shall be located along the centerline of travel lanes or edge of travel lanes.
  - Sequence of placement
  - Placement widths
  - Anticipated placement lengths
  - Placement direction
  - Joint locations
  - Location of proposed trial overlay(s)
- Description of equipment used for:
  - Surface preparation, including but not limited to grinding and shotblasting
  - Applying resin primer
  - Measuring, mixing, placing and finishing the PC overlay
  - Applying surface finish sand
- Method of protecting and finishing inlets and bridge drains
- Method for isolating expansion joints
- Method for measuring and maintaining overlay thickness and profile
- Cure time for PC overlay
- Storage and handling of resin primer and PC overlay components
- Procedure for disposal of excess resin primer, PC overlay materials and containers
- Procedure for cleanup of mixing and placement equipment

G. Equipment

The Design-Build Team shall submit documentation of current certification that mixing equipment has been calibrated (Caltrans California test CT 109 or similar accepted). Prior to placing PC overlays, the Design-Build Team shall submit a documented history of the use of the placement equipment to successfully place PC overlays on bridges, and the Engineer shall review and approve the documentation.

MATERIALS

A. General

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 project special provision.

Verification

The Design-Build Team shall submit a Certified Test Report from independent labs for all of the materials associated with the PC overlay in accordance with this project special provision.

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 Design-Build Team shall notify the Engineer in writing ten 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.

Sampling

NCDOT reserves the right to retain and test samples of components of the PC overlay system. This includes but is not limited to requiring submittal of samples prior to the first installation and on-site sampling during construction.

The Design-Build Team shall only use materials that are specified for the selected PC overlay system. Mixing materials from different PC overlay systems shall not be permitted.

B. Polyester Polymer Concrete (PPC)

Materials shall consist of a polyester resin binder, a High Molecular Weight Methacrylate (HMWM) primer and aggregate.

Polyester Resin Binder

Polyester resin binder shall have the following properties:

- Be an unsaturated isophthalic polyester-styrene co-polymer. The resin content shall be 12% +/-1% of the weight of the dry aggregate.
- Contain at least one percent, by weight, gamma-methacryloxypropyltrimethoxysilane, an organosilane ester silane coupler.
- Be used with a promoter that is compatible with suitable methyl ethyl ketone peroxide and cumene hydroperoxide initiators.
- 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 Technical Representative.

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.		

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 Technical Representative.

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		

C. Epoxy Polymer Concrete (EPC)

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

Epoxy Resin Binder / Primer

Epoxy resin binder / primer shall have the following properties:

- Be a low viscosity epoxy resin. The resin content shall be 12% +/-1% of the weight of the dry aggregate.
- Be 100% solids epoxy
- Be a two-part, low modulus epoxy resin
- Be moisture insensitive
- Meet the required values for the material properties shown in Table 3, below

Accelerators or inhibitors shall 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	55 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

* Test shall be performed before adding initiator

D. Aggregates

PC overlay aggregate shall be used for PPC and EPC and shall have the following properties:

- 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

- Fine aggregate consisting of natural sand only
- Weighted-average aggregate absorption of no more than 1.0 percent when tested under AASHTO Test Methods T84 and T85
- 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
- Moh's hardness of seven or greater
- 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

E. Sand / Fine Aggregate

Sand or fine aggregate for an abrasive finish shall be used for PPC and EPC and shall have the following properties:

(1) Commercial-quality blast sand
(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

F. 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

Prior to placing PC overlay on any structure, the Design-Build Team shall provide a minimum 48-hour written notice to the Engineer.

(C) Trial Application

Prior to placing the PC overlay on any structure, one or more trial application(s) 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 shall 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 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 placement of the overlay. Prior to placement, the location of the trial application(s) shall be approved by the Engineer. If the Engineer requires removal, The Design-Build Team shall properly dispose of the trial applications off-site.

The number of required trial applications shall be as many as necessary for the Design-Build Team to demonstrate the ability to construct an acceptable trial overlay section and competency to perform the work, in the Department's sole discretion. However, the installer or proposed equipment / techniques may be rejected if not shown to be acceptable after three trials.

Overlay direct tension bond testing shall be performed in accordance with the Overlay Direct Tension Bond Testing section of this project 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 Technical Representative's recommendations, as approved by the Engineer prior to commencement of any work.

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* Project Special Provision found elsewhere in this RFP.

Mixing Equipment

A continuous automated mixer shall be used for all PC overlay applications.

The continuous automated mixer shall have the following properties:

- Employ an auger screw / chute device capable of sufficiently mixing catalyzed resin with dry aggregate
- 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.
- Be equipped with an automatic metering device that measures and records aggregate and resin volumes. Record volumes at least every five minutes, including time and date. Submit recorded volumes at the end of the work shift to the Engineer.
- Have a visible readout gage that displays volumes of aggregate and resin being recorded.
- 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 Technical Representative and approved by the Engineer, may be used for all PC patching applications and for smaller area overlay applications if approved by the Engineer.

Finishing Equipment

Finishing shall be accomplished with a Self-Propelled Slip-Form Paving Machine or Vibratory Screed.

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 herein, may be used for PC overlay applications.

The self-propelled slip-form paving machine shall have the following properties:

- Employ a vibrating pan to consolidate and finish the PC overlay
- 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.
- Be calibrated for the requirements herein, and calibrated periodically following the manufacturers recommendations
- Have sufficient engine power and weight to provide adequate vibration of the finishing pan while maintaining consistent forward placement speed
- Be capable of both forward and reverse motion under its own power

Vibratory Screed

A vibratory screed may be used for finishing the PC overlay, but must be approved by the Engineer, in writing, at least two weeks prior to PC overlay placement.

(E) 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* Project Special Provision found elsewhere in this RFP. Placement of concrete for deck repair material shall be Polymer Concrete in accordance with this project special provision. Prepare all concrete deck and repaired deck surfaces in accordance with the requirements of the *Overlay Surface Preparation for Polymer Concrete* Project Special Provision found elsewhere in this RFP.

(F) Application of Overlay

Methods indicated in this project special provision are typical of general installations and may be modified per the System Provider Technical Representative's recommendations, as approved by the Engineer, in writing. 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 hours, or as directed by the System Provider 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.

- For PPC overlays, the concrete surface temperature shall be between 40° and 100° F.
- 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 Design-Build Team 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 the overlay application shall be cleaned and / or repaired to the Engineer's satisfaction at no additional cost to the Department.

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 Technical Representative's recommendations. Primer shall be placed within five minutes of mixing at approximately 90 - 100 ft^2/ 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 all areas that appear dry prior to overlay placement.

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

PC Overlay Application

The PC overlay shall be applied during the interval between 15 minutes and two hours after the primer has been applied. The PC overlay shall be placed prior to gelling and within 15 minutes following addition of initiator, unless otherwise recommended by the System Provider Technical Representative.

The resin binder shall be initiated and blended completely. Aggregate shall be added and mixed sufficiently when a portable mechanical mixer is used.

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.

- 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.
- 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 developed by the Design-Build Team. 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 developed by the Design-Build Team.

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 project 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 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 Design-Build Team in the manner recommended by the System Provider Technical Representative and approved by the Engineer, in writing, 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 plans developed by the Design-Build Team or approved by the Engineer.

Unless otherwise indicated on the plans developed by the Design-Build Team, groove the deck surface in accordance with Subarticle 420-14(B) of the 2018 *Standard Specifications for Roads and Structures*. 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 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 developed by the Design-Build Team.

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 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, in writing.

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 Design-Build Team 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:

- Project Number
- Bridge Number
- Date and Time
- Location of Placement (Lane and Station Limits or location and length of placement along the length of the bridge)
- Aggregate Weight
- Resin Binder Weight

The tickets shall be available on site for Inspection personnel.

Curing

The Design-Build Team 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 used as approved by the Engineer, in writing.

(G) 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 Design-Build Team.

Overlay Direct Tension Bond Testing

Direct tension bond (pull-off) tests shall be performed after 24 hours by the Design-Build Team in accordance with ASTM C1583. At a minimum, three 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 shall 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 Design-Build Team shall repair all direct tension test locations with PC overlay in accordance with this project special provision.

Direct tension bond testing shall be performed by an independent testing firm and shall be arranged by the Design-Build Team. The Design-Build Team 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.

Smoothness Quality Testing

As soon as practical after the PC overlay has hardened sufficiently, the Design-Build Team 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 ⅛" in ten feet. The Design-Build Team shall remove all high areas in the hardened surface in excess of ⅛" in ten feet 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 developed by the Design-Build Team by more than 0.3" over any 50-foot length. If approved by the Engineer, in writing, correct low areas in an acceptable manner.

(H) Corrective Work

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.

Correction for Smoothness

Areas showing high spots of more than ⅛" in ten feet shall be marked and ground until the high spot does not exceed ⅛" in ten feet. Ground surface may be sawcut grooved to restore the texture if ordered by the Engineer. Areas showing low spots of more than ⅛" in ten feet 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 Technical Representative and approved by the Engineer, in writing.

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 Design-Build Team's expense. The Design-Build Team shall submit a written corrective work proposal to the Engineer, which shall include the methods and procedures that will be used. The Design-Build Team shall not commence corrective work until the methods and procedures have been approved by the Engineer, in writing. The Engineer's approval shall not relieve the Design-Build Team of the responsibility of producing work in conformity with the Contract.

Repair of Cracking

If cracks are in the overlay after a one-week cure period, the Design-Build Team 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.

OVERLAY SURFACE PREPARATION FOR POLYMER CONCRETE (SPECIAL)

DESCRIPTION

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

Work shall include: (1) removal of unsound and sound bridge deck concrete and existing patches in deck repair areas; (2) preparation of repair areas prior to placement of PC bridge deck repair material; (3) bridge deck surface preparation prior to placement of PC overlay; and (4) any incidentals necessary to prepare the bridge deck for placement of PC repair material or PC overlay, as specified or as shown in the plans developed by the Design-Build Team.

DEFINITIONS

Scarification shall consist of the removal of any asphalt wearing surface and concrete surface to the uniform depth and limits shown in the plans developed by the Design-Build Team.

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. The Design-Build Team 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 Technical Representative's recommendations, as approved by the Engineer, in writing, prior to commencement of any work:

- Scarifying equipment that is a power-operated, mechanical grinder capable of removing a minimum depth of ¼" for each pass.
- Shotblasting and sandblasting equipment to adequately prepare the bridge deck substrate, as required in this project special provision. The Design-Build Team shall provide equipment to supply oil-free and moisture-free compressed air for final surface preparation.
- Equipment capable of sawing concrete to the depth specified in the plans developed by the Design-Build Team.
- Power driven hand tools for removal of unsound concrete shall be required that meet the following requirements:
    - Pneumatic hammers weighing a nominal 15 lbs. or less
    - Pneumatic hammer chisel-type bits that do not exceed the diameter of the shaft in width
- Hand tools, such as hammers and chisels, for removal of final particles of unsound concrete
- Self-propelled vacuum capable of picking up dust and other loose material from prepared deck surface
- Equipment to supply oil-free and moisture-free compressed air for final surface preparation

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 Design-Build Team. The Design-Build Team 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.

OSP PLAN SUBMITTAL

Prior to beginning surface preparation activities, the Design-Build Team shall submit for review, and the Department shall accept, the Overlay Surface Preparation (OSP) Plan. The OSP Plan developed by the Design-Build Team shall detail the type of equipment that is intended to be used and the means by which the Design-Build Team shall achieve the following requirements:

- Estimate depth of reinforcing steel
- Scarification of deck to depth required
- Measure depth of scarification to show completed within limits
- Measure depth of shotblasting to show completed within limits

The OSP Plan developed by the Design-Build Team 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 Design-Build Team shall 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, in writing. The Design-Build Team 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. The Design-Build Team shall perform any additional approach work required to provide a smooth transition to the scarified surface before opening to traffic at no additional cost to the Department. The OSP Plan developed by the Design-Build Team shall clearly show the Design-Build Team's intended plan and order of scarifying and placing PC on all bridges with associated timeframes. The OSP Plan developed by the Design-Build Team and associated scarification timeframes must be approved by the Engineer, in writing, 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.

The Design-Build Team shall remove all existing asphalt overlays and all loose, disintegrated, unsound or contaminated concrete to the limits shown in the plans developed by the Design-Build Team 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 Design-Build Team 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

Prior to beginning any demolition, seal all expansion joints subject to run-off water from the scarification, shotblasting, and PC placement process with material approved by the Engineer. 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 and 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

The Design-Build Team shall 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 in the plans developed by the Design-Build Team.

The Design-Build Team shall determine the amount of cover for the reinforcing steel. Prior to scarification, use a pachometer or other approved device, as approved by Engineer, in writing. 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.

Estimated average cover to top mat:

Bridge Number: __" +/-_"

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 and 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.

The Design-Build Team shall 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 developed by the Design-Build Team 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 developed by the Design-Build Team.

(C) Class II Surface Preparation (Partial Depth)

At locations specified in the plans developed by the Design-Build Team 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.

All patches shall be removed under Class II Surface Preparation. If any patch cannot be removed by means of scarification, the Design-Build Team shall use hand tools to remove the patch. Areas indicated in the plans developed by the Design-Build Team that require Class II Surface Preparation, including the locations of existing patches, are from the best information available. Prior to surface preparation, the Design-Build Team shall verify 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 plans developed by the Design-Build Team or as directed by the Engineer. Remove existing spalled or unsound areas of the bridge concrete deck by methods approved by the Engineer.

The Design-Build Team shall provide a one-inch-deep saw cut around the perimeter of areas noted for bridge deck or patch removal. Remove, using the type of tools listed above in this project special provision, all concrete or patch material within the sawcut to a minimum depth of one inch 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 project special provision.

The Design-Build Team shall 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 will be permitted unless the Engineer directs otherwise. Overhang support shall be required for areas removed greater than 0.60 ft2 / ft length of bridge. Prior to beginning work the Design-Build Team shall submit, and the Department shall approve, the overhang support details.

(D) Class III Surface Preparation (Full Depth)

At locations specified in the plans developed by the Design-Build Team 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 will be permitted. For larger areas, support forms by blocking from the beam flanges, or other approved method.

Overhang support shall be required for full depth removal adjacent to bridge rails. Prior to beginning work the Design-Build Team shall submit, and the Department shall approve, the overhang support details.

(E) Preparation of Reinforcing Steel

The Design-Build Team shall remove concrete without cutting or damaging existing steel unless noted otherwise in the plans developed by the Design-Build Team. 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 shall meet the material requirements of Section 1070 of the 2018 *Standard Specifications for Roads and Structures*.

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 Design-Build Team's expense.

Reinforcing steel exposed and satisfactorily cleaned and prepared will not require additional cleaning, if encased in concrete within seven days. Rebar exposed for more than seven 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 in the plans developed by the Design-Build Team or as directed by the Engineer.

(F) Concrete Deck Repair

The Design-Build Team shall 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 developed by the Design-Build Team, 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 Technical Representative, and shall be applied and prepared as required by the PC System Provider Technical Representative. For concrete deck repairs with PC:

- Removal and surface preparation of the repair area shall be in accordance with this project special provision.
- Materials, equipment, placement, and finishing of PC used for concrete deck repairs shall meet the requirements of the *Polymer Concrete Bridge Deck Overlay* project special provision found elsewhere in this RFP.

PC repair material may be placed up to one 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 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:

- 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.

- 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, in writing. If the deck becomes contaminated before placing the overlay, the Design-Build Team shall shotblast or abrasive sandblast the contaminated areas to the satisfaction of the Engineer at no additional cost to the Department.

- Prior to the overlay placement, all loose particles shall be removed by magnets, oil free compressed air, and vacuuming, such that no trapped particles remain. Power washing shall not be allowed.

- Just prior to placement of the primer, the areas to be overlaid shall be blown off with oil and moisture free compressed air, and shall be completely dry.

- Cleaning methods other than those detailed by specification may be suggested by the PC System Provider Technical Representative and approved by the Engineer.

- 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

The Design-Build Team shall 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 Design-Build Team 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.

The Design-Build Team shall provide adequate lighting when performing deck preparation activities at night. Prior to beginning night work, the Design-Build Team shall submit, and the Department shall approve, a lighting plan.

SILANE BARRIER RAIL TREATMENT (SPECIAL)

DESCRIPTION

This work consists of preparation of bridge concrete barrier rail surfaces and the furnishing and application of alkylalkoxysilane (silane) penetrant sealers, with 100% solids, to seal bridge concrete barrier rail surfaces and cracks. Prepare the bridge concrete barrier rail surfaces and apply the silane bridge concrete barrier rail sealer in accordance with this special provision and as indicated on the plans developed by the Design-Build Team, or as approved by the Engineer.

Work shall include: bridge concrete barrier rail surface preparation, placement of silane penetrant sealer, appropriate removal and disposal of excess and waste material, and any incidentals necessary to complete the project, as specified or as indicated on the plans developed by the Design-Build Team.

SUBMITTALS

Submit for approval the following requested items and any other relevant documents:

- A safety data sheet (SDS) for each shipment of the silane materials.
- Silane material information and manufacturer's written preparation and application instructions.
- Certification from an independent testing laboratory that the materials meet the requirements of these provisions. Do not incorporate these materials into the project until the Engineer has accepted and approved the certification for the material.
- The dates of manufacture of the silane materials, their lot numbers and date of shelf-life expiration for each lot number.
- A table indicating the likely cure time, in minutes, to allow vehicular traffic on the bridge where the concrete barrier rail surface has been treated. Provide time for the allowable ambient temperature range, in increments of 10º F.
- A work plan for each structure that includes estimated times for surface preparation and silane application.

MATERIAL DELIVERY AND STORAGE

Store at the site sufficient quantities of silane materials to perform the entire application.

Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Ensure that each container is clearly marked by the manufacturer with the following information:

a. Manufacturer's name and address.
b. Product name.

c. Date of manufacture.
d. Expiration date.
e. LOT identification number.
f. Container serial number.

Provide the Engineer a certification from the manufacturer, confirming that the silane materials meet the requirements of this special provision. Do not incorporate these materials into the project until the Engineer has accepted and approved the certification for the material. Submit such certification for each LOT of material delivered to the project. In each certification, identify the serial or LOT numbers of the containers certified.

The Engineer may require samples from each LOT or container of materials delivered to the project or from containers at the point of use. When samples are required, furnish samples in accordance with the Engineer's instructions.

Store silane materials in unopened containers in a clean, dry area between 40° F and 90° F. Store containers in a manner that prevents leakage or spillage.

MANUFACTURER'S REPRESENTATIVE

Provide a manufacturer's representative on site for the duration of the surface preparation and silane application work, to provide expert assistance on surface preparation, storage, mixing, application, clean-up, and disposal of materials.

MATERIALS

Provide silane from a single manufacturer and provide silane that conforms to requirements indicated in Table 1, below.

Table 1
SILANE PROPERTIES

Property	Test Method	Requirement
Silane Content		100%
VOC content	EPA method 24	Less than 350 g/l
Surface Appearance after Application		Unchanged
Flash Point	ASTM D3278	140° F, minimum
Resistance to Chloride Ion Penetration	AASHTO T259 and T260	Less than: 0.52 pounds/yd^3(criteria of 1.5) at 1/2 inch level; 0.00 pounds/yd^3(criteria of 0.75) at 1 inch level
Water absorption test	ASTM C 642	0.50% maximum/48 hours; 1.5% maximum/50 days
Scaling resistance	ASTM C 672	(non-air-entrained concrete) 0 rating "No Scaling" (100 cycles)
NCHRP 244		
Water weight gain	Series II - cube test	85% reduction, minimum
Absorbed chloride		87% reduction, minimum
Absorbed chloride	Series IV - Southern climate	95% reduction, minimum

SURFACE PREPARATION

Prepare the bridge concrete barrier rail surfaces for application of the silane 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, penetration, and the curing of the silane material.

Prepare a final surface that adheres to the following requirements:

1) For areas to receive silane treatment, clean by sandblasting or shotblasting. Select the size of shot or sand, and travel speed of the equipment to provide a uniformly clean surface with a uniform profile. Do not expose cleaned surfaces to vehicular traffic unless approved by the Engineer. If the bridge concrete barrier rail surfaces become contaminated before placing the silane treatment, shotblast or abrasive sandblast the contaminated areas to the satisfaction of the Engineer, at no additional cost.
2) Power washing of the bridge concrete barrier rail may be allowed as approved by the Engineer, but the concrete barrier shall be allowed to dry a minimum of 48 hours prior to application of the silane treatment.

3) Prior to silane application, protect cracks on the bridge concrete barrier rail from materials that can interfere with the penetration and the curing of the silane material. Just prior to placement of the silane, remove, by magnets and oil-free compressed air and vacuuming, any loose particles, such that no excess particles remain.
4) Prior to silane application, the bridge concrete barrier rail shall be completely dry.
5) The silane manufacturer may suggest cleaning and preparation methods other than those detailed by this special provision. The Engineer must approve such alternative methods prior to implementation.

SILANE APPLICATION

Test Area

- Test a small area of the surface (minimum two-foot by two-foot) before general application to ensure desired performance results, aesthetics, and application rates and to verify application technique. Allow five - seven days for the product to react fully before evaluating.
- Application rates may vary depending on field conditions and the substrate to be treated.
- Conduct at least one absorption test in the test area, using a Rilem Tube Test. Acceptable results are no loss of water in the Rilem tube over a period of 20 minutes. Adjust application to achieve required repellent performance.
- The manufacturer's representative shall assist the Design-Build Team in determining the application rates. Use test applications on actual surfaces to determine accurate application rates. Extremely porous surfaces may require two coats of silane.
- Do not begin production application of silane until Engineer has approved the test area, including approval of aesthetics, color, texture, and appearance.

Application

Immediately before placing silane, all areas to receive silane treatment shall be completely dry and blown clean with oil-free compressed air to remove any loose dust and debris. Apply silane as soon as practical after the areas to receive silane treatment have been properly prepared and conditions are satisfactory:

- Stir material thoroughly before and during application.
- Apply silane using low-pressure pumping equipment with a wet fan type spray nozzle. Rollers with a 1" nap or brushes are permitted. On vertical surfaces, apply the silane in a flooding application from the bottom upward, in accordance with manufacturer's instructions.
- Maintain operating pressures in sprayers used for application of the silane sealer material sufficiently low, so that atomization or misting of the material does not occur.
- Apply even distribution of silane. Take care when applying the silane, so that running or puddling does not occur.
- Apply silane in a single application to the barrier rail surface with enough material to saturate the surface. Remove excess material with a roller or brush and dispose of excess material appropriately. If a second coat is required, it should be applied "wet on wet" before first coat dries.

- Application of sealant by spray methods will not be permitted when wind speeds are 20 mph or higher, or if in the opinion of the Engineer, unsatisfactory results will be obtained. Other application methods or rescheduling will be required.
- Avoid application with hand pump sprayers. For small areas of silane application, the use of hand pump sprayers must be approved by the Engineer.
- The Design-Build Team shall protect from overspray all pedestrians, vehicles, plants and vegetation, and other areas not receiving silane application. Damages that occur due to overspray shall be the responsibility of the Design-Build Team.
- Allow product to penetrate the bridge concrete barrier rail and dry, as required by the manufacturer, prior to opening to traffic.

LIMITATIONS OF OPERATIONS

- Prior to application of any silane sealer, cure concrete or concrete repairs for a minimum of 28 days or as required by the silane manufacturer.
- Do not use silane material after the shelf life date.
- Do not return unused material in opened containers to storage for later use. Either apply such material to appropriate areas on barrier rail surfaces or remove and appropriately dispose of it at offsite locations provided by the Design-Build Team.
- Pick up and store all blast media and contaminants in a vacuum unit. Do not create dust during the blasting operation that will obstruct the view of motorists in roadways adjacent, above, below, or surrounding the silane treatment area. Store, handle, and dispose of blast media and contaminants in accordance with all applicable local, state, and federal requirements.
- Cover deck joint seal and elastomeric material, plug deck drain scuppers, seal cracks on underside of deck, and use other necessary protective measures to prevent leakage of silane below the concrete deck and beyond the concrete barrier rail, to protect waterways, bridge components, pedestrians, vehicles, roadway, vegetation, and any other items or areas below or near the bridge.
- Application of sealant by spray methods will not be permitted during windy conditions, if in the opinion of the Engineer, unsatisfactory results will be obtained. Other application methods or rescheduling shall be required.
- Avoid application with hand pump sprayers. For small areas of silane application, the use of hand pump sprayers might be allowed, but must be approved by the Engineer.
- Protect traffic from rebound, dust, overspray, and construction activities. Provide appropriate shielding, as required and / or directed by the Engineer. Damages that occur due to the Design-Build Team's operations shall be the responsibility of the Design-Build Team.
- The Design-Build Team shall provide suitable coverings (e.g. heavy-duty drop cloths) as needed to protect all exposed areas not to receive surface preparation and silane treatment.
- Clean and / or repair all damage or defacement resulting from the Design-Build Team's operations to the Engineer's satisfaction at no additional cost to the Department.
- The equipment used for silane application must be clean of foreign materials and approved by the Engineer before use.

- The surface to receive the treatment shall be dry for at least 48 hours before treatment and shall be free from sand, surface dust and dirt, oil, grease, chemical films, and other contaminants prior to application of the silane.
- The surface, air, and material temperatures shall be between 40° F and 90° F during application.
- Do not apply silane materials during cold, hot, or wet weather conditions or when adverse weather conditions are forecasted within twelve (12) hours of the completion of the silane application. Correct any coating damaged by rain or moisture by an additional application or as required by the silane manufacturer.
- Protect prepared surfaces from precipitation and heavy dew during and after the application of the silane.
- Conduct the work in a continuous operation, with the silane application as soon as practical following surface preparation.
- Apply silane during the lowest temperature period of the day, typically between 1:00 a.m. and 9:00 a.m., when the cracks are open to the greatest extent.
- Clean up, dispose of any surplus material, and restore any disturbed areas unless otherwise directed.
- 100% Silane is a combustible liquid; take appropriate precautions during handling, storage, and operations. KEEP AWAY FROM OPEN FLAME.
- Work crews shall wear appropriate personal protection equipment and follow manufacturer's recommendations when applying silane. Refer to the SDS and all applicable local, state, and federal laws, and rules and regulations of authorities having jurisdiction over the project, for specific guidance for personal and environmental protection and safety requirements.

FOAM JOINT SEALS FOR PRESERVATION (SPECIAL)

SEALS

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

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

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

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

BONDING ADHESIVE

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

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

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

SAWING THE JOINT

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

When sawing the joint to receive the foam seal, always use a rigid guide to control the saw in the desired direction. To control the saw and to produce a straight line as indicated on the plans developed by the Design-Build Team, 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 one inch 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 developed by the Design-Build Team. Prevent any chipping or damage to the sawed edges of the joint.

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

PREPARATION OF SAWED JOINT FOR SEAL INSTALLATION

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

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

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

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

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

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

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

SEAL INSTALLATION

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

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

Begin installation by protecting the top edges of the concrete deck adjacent to the vertical walls of the joint as a means to minimize clean up. Stir each epoxy bonding agent component independently, using separate stirring rods for each component to prevent premature curing of the bonding agent. Pour the two (2) components, at the specified mixing ratio, into a clean mixing bucket. Mix the components with a low speed drill (400 rpm max.) until a uniform gray color is achieved without visible marbling. Apply bonding agent to both sides of the joint concrete, as well as both sides of the joint seal, making certain to fill completely the grooves with epoxy. With gloved hands, compress the joint seal and with the help of a blunt probe, push the seal into the joint opening until the seal is recessed approximately ¼" below the surface. When pushing down on the joint seal, apply pressure only in a downward direction. Do not push the joint seal into the joint opening at an angle that would stretch the material. Seals that are stretched during installation shall be removed and rejected. Once work on placing a seal begins, do not stop until it is completed. Clean the excess epoxy from the top of the joint seal immediately with a trowel. Do not use solvents or any cleaners to remove the excess epoxy from the top of the seal. Remove the protective cover at the joint edges and check for any excess epoxy on the surface. Remove excess epoxy with a trowel, the use of solvents or any cleaners will not be allowed.

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

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 one inch above the roadway surface at all points. Block sidewalk sections and secure an unnozzled water hose delivering approximately one 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 shall be closely examined for leakage. The foam seal expansion joint shall be 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 will not be 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.

CLEANING AND PAINTING EXISTING BEARINGS WITH HRCSA (SPECIAL)

DESCRIPTION

These items of work shall consist of cleaning, preparation, and field application of the specified paint system to existing steel bridge bearings and for all labor, materials, tools and equipment necessary, to complete the work to the limits shown on the plans developed by the Design-Build Team, described in this Project Special Provision, or as directed by the Engineer.

The bridge bearings shall be cleaned using hand tools, power tools, and high pressure water equipment. Using dry compressed air, connections and crevices will be dried completely. Rust penetrant will be applied to all open connections, crevices, pack rust and rust scale areas. A paint system with a co-polymerized high ratio of 'active' calcium sulfonate (HRCSA) shall be used as a stripe coat at all connections / crevices and as a topcoat over the bearings.

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

TWELVE-MONTH OBSERVATION PERIOD

The Design-Build Team maintains responsibility for the coating system for a 12-month observation period beginning upon the satisfactory completion of all the work required in the plans developed by the Design-Build Team or as directed by the Engineer. The Design-Build Team shall guarantee the coating system under the payment and performance bond (refer to Article 109-10 of the 2018 *Standard Specifications for Roads and Structures*). To complete successfully the observation period, the coating system shall meet the following requirements after 12 months service:

(A) No visible rust, contamination or application defect is observed in any coated area.

(B) Painted surfaces have a uniform color and gloss.

(C) Painted surfaces have an adhesion that meets an ASTM D3359, 3A rating.

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

SUBMITTALS

Submit all of the following to the Engineer for review and approval before scheduling the pre-construction meeting. Allow at least two (2) weeks for the review process.

(A) The existing paint systems include toxic substances such as red lead oxide, which are considered hazardous if improperly removed. The Design-Build Team shall be currently Society for Protective Coatings (SSPC) Quality Program (QP) 2, Category A certified, and have successfully completed lead paint removal and field painting on similar structures within 18 months prior to this bid. Lead abatement work completed within the 18-month period shall have been completed in accordance with contract specifications, free of citation from safety or environmental agencies. Lead abatement work shall include, but not be limited to: abrasive blasting; waste handling, storage and disposal; worker safety during lead abatement activities (fall protection, personal protective equipment (PPE), etc.); and containment. This requirement is in addition to the Design-Build Team pre-qualification requirements covered by Article 102-2 of the 2018 *Standard Specifications for Roads and Structures*.

The Design-Build Team shall submit a list of projects for which QP 2 work was performed within the last 18 months including contact information and submit to the Engineer a "Lead Abatement Affidavit". This form may be downloaded from:

https://www.ncdot.gov/initiatives-policies/Transportation/bridges/Documents/leadabatementaffidavit.pdf

(B) Work schedule which shall be kept up to date, with a copy of the revised schedule being provided to the Engineer in a timely manner.
(C) Containment system plans and design calculations in accordance with SSPC Guide 6, Class 2A and other project requirements, signed and sealed by a Professional Engineer licensed by the State of North Carolina.
(D) Bridge wash water sampling and disposal plan.
(E) Subcontractor identification.
(F) Lighting plan for night work in accordance with Section 1413 of the 2018 *Standard Specifications for Roads and Structures*.
(G) Traffic Control Plans with NCDOT certified supervisors, flaggers and traffic control devices.
(H) Health and safety plan addressing at least the required topics as specified by the SSPC QP 1 and QP 2 program and including hazard communication, respiratory health, emergency procedures, and local hospital and treatment facilities with directions and phone numbers, disciplinary criteria for workers who violate the plan and accident investigation. The plan shall address the following: hazardous materials, personal protective equipment, general health and safety, occupational health and environmental controls, fire protection and prevention, signs signals, and barricades, materials handling, storage, use, and disposal, hand

and power tools, welding and cutting, electrical, scaffolds, fall protection, cranes, derricks, hoists, elevators, and conveyors, ladders, toxic and hazardous substances, airless injection and high pressure water jet (HPWJ).

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

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

(K) Environmental Compliance Plan.

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

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

(N) Abrasive Blast Media:

(1) Product Data Sheet.
(2) Blast Media Test Reports in accordance with Article 1080-12 of the 2018 *Standard Specifications for Roads and Structures*.

(O) Coating Material:

(1) NCDOT HICAMS Test Reports (testing performed by NCDOT Materials and Tests Unit).
(2) Product Data Sheets.
(3) Material Safety Data Sheets.
(4) Product Specific Repair Procedures.
(5) Acceptance letters from paint manufacturer's for work practices that conflict with special provisions and / or paint manufactures product data sheets.

PRE-CONSTRUCTION MEETING

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

CONTAINMENT SYSTEM

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

Prior to performing any construction or painting operations on the structure, the Design-Build Team shall furnish the Engineer with plans developed by the Design-Build Team that include design calculations for a sufficiently designed containment system, which shall provide access for any repairs on structural steel members, cleaning and surface preparations for structural steel members, and coating operations for structural steel members of the bridge. The containment system shall not be installed, and no work shall begin, until the Engineer has reviewed and approved, in writing, the submitted containment system plans and design calculations. Containment system plans and design calculations shall be prepared, sealed, and signed by a Professional Engineer licensed by the State of North Carolina.

The containment system shall meet or exceed the requirements of Class 3W containment in accordance with SSPC Guide 6. The Design-Build Team shall determine the required capacity of the containment system, which, at a minimum, shall include loads due to wind, repair materials and repair operations, equipment, and tools; however, the capacity shall not be less than that required by Federal or State regulations. Design steel members to meet the requirements of the *American Institute of Steel Construction Manual*. Design timber members in accordance with the *National Design Specification for Stress-Grade Lumber and Its Fastenings* of the National Forest Products Association. The containment system shall be constructed of materials capable of withstanding damage from any of the work required on this project and shall provide a two (2) hour resistance to fire.

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

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

The Design-Build Team shall be responsible for certifying the containment system has been constructed in accordance with the approved plans developed by the Design-Build Team.

The containment system shall be cleaned after each workday.

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

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

WASH WATER SAMPLING AND DISPOSAL PLAN

All wash water shall be collected and sampled prior to disposal. Representative sampling and testing methodology shall conform to North Carolina Administrative Code

15A NCAC 02B.0103, "Analytical Procedures". Wash water shall be tested for pollutants listed in 15A NCAC 02B.0211(3), 15A NCAC 02T.0505(b)(1) and 15A NCAC 2T.0905(h). Depending on the test results, wash water disposal methods shall be described in the disposal plan. Wash water shall be disposed of in accordance with all current Federal and State regulations. See link for NCDOT Guidelines for Managing Bridge Wash Water:

https://www.ncdot.gov/initiatives-policies/Transportation/bridges/Documents/WashWater.pdf

WASTE HANDLING OF PAINT AND ABRASIVES

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

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

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

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

https://files.nc.gov/ncdeq/Waste%20Management/DWM/HW/Compliance/Generator%20Compliance%20Manual.pdf

After award of the contract, arrange for waste containers, sampling, testing, transportation, and disposal of all waste. No work shall begin until the Design-Build Team furnishes the Engineer with a written waste disposal plan. Any alternative method for handling waste shall be pre-approved by the Engineer. The Design-Build Team shall us a waste management company that is prequalified by NCDOT in *Discipline Code 3040 - Contaminated Material Removal* from the following link:

https://www.ebs.nc.gov/VendorDirectory/search.html?s=wc&a=new

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

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

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

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

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

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

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

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

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

https://deq.nc.gov/about/divisions/waste-management/hw/provisional-notification

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

https://slphreporting.ncpublichealth.com/Certification/CertifiedLaboratory.asp

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

(A) For leachable lead:

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

Area sampling will be performed for the first two (2) days at each bridge location. The area sample shall be located within five (5) feet of the containment and where the highest probability of leakage will occur (access door, etc.). Results from the area sampling shall be given to the Engineer within 72 hours of sampling (excluding weekends). If the results of the samples exceed 20 $\mu g/m^3$, corrective measures shall be taken and monitoring shall be continued until two (2) consecutive sample results are less than 20 $\mu g/m^3$.

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

Where schools, housing and / or buildings are within 500 feet of the containment, the Design-Build Team shall perform initial Total Suspended Monitoring (TSP) Lead monitoring for the first ten (10) days of the project during abrasive blasting, vacuuming and containment removal. Additional monitoring shall be required during abrasive blasting two (2) days per month thereafter. Results of the TSP monitoring at any location shall not exceed 1.5 $\mu g/m^3$.

EQUIPMENT MOBILIZATION

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

QUALITY CONTROL INSPECTOR

Provide a quality control (QC) inspector in accordance with the SSPC QP guidelines to ensure that all processes, preparation, blasting and coating application are in accordance with the requirements of the contract. The inspector shall have written authority to perform QC duties to include continuous improvement of all QC internal procedures. The presence of the engineer or inspector at the work site shall in no way lessen the Design-Build Team's responsibility for conformity with the contract.

QUALITY ASSURANCE INSPECTOR

The quality assurance inspector which may be a Department employee or a designated representative of the Department shall observe, document, assess, and report that the

Design-Build Team is complying with all of the requirements of the contract. Inspectors employed by the Department are authorized to inspect all work performed and materials furnished. Such inspection may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. The inspector is not authorized to alter or waive the requirements of the contract. Each stage in preparing the structure to be coated which includes but not limited to washing, blasting, coating testing and inspection shall be inspected and approved by the Engineer or an authorized representative.

SUBLETTING OF CONTRACT

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

PREPARATION OF SURFACES

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

Soil, concrete, debris, and other foreign material that might be on or attached to the bearings, plates, or any other bearing components shall be removed. Removal of such material may require the use of brooms, brushes, hand tools, hammers, chisels, pneumatic hammers, or other tools or power tools. Pneumatic hammers used for removal of such material shall weigh a nominal 15 pounds or less. Exercise care to avoid nicking or gouging the bearing components during removal of soil, concrete, debris, and other foreign material. Should damage occur, repairs shall be made to the bearings at no cost to the Department.

(B) Cleaning and Removal of Pack Rust

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

(C) High Pressure Water Cleaning (HPWC)

The bearings shall be cleaned with water at a minimum pressure of 5,000 psi, at five (5) gallons per minute, with a rotating tip, at a maximum four (4) inch standoff distance from the steel surface, held as perpendicular to the steel surface as possible.

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

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

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

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

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

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

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

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

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

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

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

(D) Compressed Air Drying

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

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

application.

PAINTING OF STEEL

(A) Penetrating Sealer

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

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

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

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

(B) HRCSA - Striping and Topcoat

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

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

The Design-Build Team shall provide paint brushes, rollers, and spray equipment to conduct the work as specified in this Project Special Provision.

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

(1) Pole guns for spray painting.

(2) Mitts, daubers, or other methods to supplement brush application.

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

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

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

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

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

Prior to placing the subsequent coats, the Design-Build Team shall ensure that the prior coat is clean of all foreign matter, such as grease, dirt, bird waste, etc., before application of the subsequent coat.

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

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

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

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

Paint applied containing unauthorized thinners, paint applied to contaminated surfaces, and paint applied contrary to this Project Special Provision shall result in the re-cleaning and re-painting of the surface. The work of re-cleaning, re-painting, or over-coating, if required, shall be performed within ten (10) working days following notification by the Engineer and shall be done by the Design-Build Team to the satisfaction of the Engineer, at no additional cost to the Department.

MATERIALS

(A) Penetrant and Paint System

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

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

(1) The proposed coating system shall be an HRCSA coating as defined by this Project Special Provision and shall be submitted for approval.
   (a) Primer / Topcoat (Minimum 9.5% active sulfonate) must maintain a 9-11 to 1 ratio Total Base Number to Active Sulfonate, i.e., total base number of 85 to 104 to 9.5% Active Sulfonate, as determined by Percent Active Sulfonate Content by Cationic Titration (Hyamine) testing, Procedure No. 817/4.9/T1409A.
   (b) Formulations with greater than 27% Alkyd or co-polymer are not valid HRCSA.

(c) Zero Volatile Organic Compounds (VOC), 100% Solids Penetrant / Sealer approved by HRCSA manufacturer (Minimum 15% active sulfonate, a total base number of 135 to 165, must maintain a 9-11 to 1 ratio Active Sulfonate to Total Base Number as determined by Total Base Number Determination testing, Procedure No. 817/4.9/T1401.

(2) The proposed coating system shall be certified in writing by the coating manufacturer that the HRCSA Primer / Topcoat and the HRCSA Penetrant Sealer meets the HRCSA special provision and has been verified by the testing titration protocols indicated above. The Engineer may choose to perform verification testing using the same protocols on materials delivered to the job site.

(3) The proposed coating formulation shall have independent laboratory tests showing that the HRCSA coating, as supplied, has been tested to ASTM D5894 with a 24-hour freeze-thaw cycle and has passed a minimum 5,000 hours with no rust creepage at the scribe. The manufacturer shall certify that the currently manufactured formulation used is the same as the formulation that was tested, and can supply supporting documentation.

Lighting shall be equipped with explosion-proof fixtures.

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

Material Safety Data Sheets (MSDS) sheets for all materials shall be maintained on file and provided to the Engineer prior to receipt of the material from the manufacturers.

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

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

(B) Penetrant and Paint Storage

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

All storage of paint, solvents, and other materials applied to structures shall be stored in accordance with Subarticle 442-9(C) of the 2018 *Standard Specifications for Roads and Structures* or the manufacturers' requirements. The more restrictive requirements shall apply.

(C) Testing of Paint Samples

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

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

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

If the laboratory test results show that the material being used does not comply with the requirements specified in this Project Special Provision, the Design-Build Team will be directed to stop painting work and remove non-complying paint; pay for testing; re-paint surfaces coated with rejected paint; or remove rejected paint from previously painted surfaces if, upon re-painting with specified paint, the two (2) coatings are not compatible.

INSPECTION

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

(A) Quality Assurance Inspection

The Design-Build Team furnishes all necessary OSHA approved apparatus such as ladders, scaffolds and platforms as required for the inspector to have reasonable and safe access to all parts of the work. The Design-Build Team illuminates the surfaces to be inspected to a minimum of 50-foot candles of light. All access points shall be illuminated to a minimum of 20-foot candles of light.

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

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

(B) Inspection Instruments

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

(1) Sling Psychrometer - ASTM E337 - bulb type
(2) Surface Temperature Thermometer

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

(C) Quality Control

Maintain a daily quality control record in accordance with Subarticle 442-12(D) of the 2018 *Standard Specifications for Roads and Structures* and make such records available at the job site for review by the inspector and submit to the Engineer, as directed. In addition to the information required on Form M&T-610, submit all Dry Film Thickness (DFT) readings on a form equivalent to Form M&T-611. These forms can be found at:

https://connect.ncdot.gov/resources/Materials/Pages/Materials-Manual-by-Material.aspx?Order=MM-03-02

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

Each spot is an average of three (3) to five (5) individual gage readings as defined in SSPC PA-2. No spot average shall be less than 80% of minimum film thickness for each layer applied; this does not apply to stripe coat application. These non-conforming areas shall be corrected by the Design-Build Team prior to applying successive coats.

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

REPAIR OF DAMAGED COATINGS

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

COATING MANUFACTURER'S REPRESENTATIVE

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

SAFETY AND ENVIRONMENTAL COMPLIANCE PLANS

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

HEALTH AND SAFETY RESPONSIBILITIES

This project may involve toxic metals such as arsenic, lead, cadmium and hexavalent chromium. It shall be the Design-Build Team's responsibility to test for toxic metals and if found, comply with all OSHA regulations, which may include medical testing.

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

Comply with Subarticle 442-14(B) of the 2018 *Standard Specifications for Roads and Structures*.

Comply with Subarticle 442-14(D) of the 2018 *Standard Specifications for Roads and Structures*. Ensure employee blood sampling test results are less than 50 micrograms per deciliter. Remove employees with a blood sampling test of 50 or more micrograms per deciliter from work activities involving any lead exposure.

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

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

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

STORAGE OF PAINT AND EQUIPMENT

Provide a location for materials, equipment, and waste storage. Spread tarpaulins over all pavements and surfaces underneath equipment used for abrasive recycling and other waste handling equipment or containers. All land and or lease agreements that involve private property

shall disclose to the property owner that heavy metals may be present on the Design-Build Team's equipment. Prior to storing the Design-Build Team's equipment on private property, provide a notarized written consent signed by the land owner received by the Engineer at least forty-eight (48) hours before using property. All storage of paint, solvents, and other materials applied to structures shall be stored in accordance with Subarticle 442-9(C) of the 2018 *Standard Specifications for Roads and Structures* or the manufacturers' requirements. The more restrictive requirements shall apply.

UTILITIES

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

FIBER OPTIC CONDUIT SYSTEM (RGC - HANGING)

A. GENERAL

The work covered by this provision consists of furnishing and installing a conduit system suspended beneath structures and buried. This conduit system is for the installation of a future fiber optic cable. Perform all work in accordance with this special provision, the plans developed by the Design-Build Team, and the National Electrical Code (NEC). Install the conduit system in accordance with NEC requirements as an approved raceway for electrical circuits.

The Contractor performing the work described in this special provision shall have a license of the proper classification from the North Carolina State Board of Examiners of Electrical Contractors.

The licensed Electrical Contractor shall be available on the job site when the work is being performed or when requested by the Engineer. The licensed Electrical Contractor shall have a set of plans and special provisions in his possession on the job site, and shall maintain accurate As-Built Plans.

B. MATERIALS

Submit catalog cuts and / or drawings electronically for all proposed materials for the Engineer's review and approval. Include the brand name, stock number, description, size, rating, manufacturing specification, and applicable contract item number(s) on each submittal. Allow forty (40) days for submittal review. The Engineer will advise the Design-Build Team of reasons for rejected submittals and will return approved submittals to the Design-Build Team. Do not deliver material to the project prior to submittal approval.

Use terminations to seal the open ends of each conduit to provide watertight protection.

Use rigid galvanized conduit (RGC) in accordance with UL 6 "Rigid Metallic Conduit" with rigid full weight galvanized threaded fittings. Provide factory installed reverse-spin couplings with three set screws, to allow assembly without turning the outer duct, and prevent the coupling from backing off before and after installation. Provide an O-ring gasket in the coupling body to

resist pullout and to create a watertight seal. Do not use materials provided by more than one manufacturer.

When deflection couplers are detailed on the plans developed by the Design-Build Team, use deflection couplers that are designed for use with RGC raceways, and meet all the requirements for RGC conduit stated above. Provide deflection couplers that allow a 30-degree bend in any direction and ¾-inch mis-alignment in all axis. Provide factory installed reverse-spin couplings with three set screws, to allow assembly without turning the conduit, and prevent the coupling from backing off before and after installation. Provide deflection couplers with a middle section consisting of a rubber boot attached by spin couplings and galvanized straps.

Use expansion joints that are designed for use with RGC raceways, and meet the requirements for RGC stated above. Provide expansion joints that allow eight inches of longitudinal movement. Use expansion joints consisting of a female end with a lead-in coupling body and spin coupling, and an exterior sliding joint. Provide expansion joints that have factory installed reverse-spin couplings with three set screws, to allow assembly without turning the conduit and prevent the coupling from backing off before and after installation.

Use transition adapters that allow RGC raceway and PVC raceway to be coupled together. Provide adapters consisting of a threaded female adapter, an outer duct adapter, and a modified coupling body with a sleeve, thin wall couplings and an end spacer.

Provide concrete inserts made of galvanized malleable iron, with internal threads for suspending loads from a fixed point beneath a concrete ceiling or deck where no lateral adjustment is required. Use inserts that can be secured to the concrete forms, preventing movement during concrete placement.

For stabilizers and hangers, use galvanized rods that conform to ASTM-A36 or A-575. Galvanized rods shall be threaded on both ends or threaded continuously. Use steel stabilizer clamps and attachment brackets, sized as noted in the plans developed by the Design-Build Team and hot dipped galvanized per ASTM-A123. Provide high strength bolts, nuts and washers that are galvanized in accordance with Article 1072-5 of the 2018 *Standard Specifications for Roads and Structures*.

Use adjustable clevis-type pipe hangers that allow for vertical adjustment and limited movement of the pipe. Use galvanized pipe hangers that are listed with Underwriters Laboratories, or are Factory Mutual approved for the size conduit shown in the plans developed by the Design-Build Team. Use hangers that comply with Federal Specification WW-H-171E Type 1 and Manufacturers Standardization Society SP-69 Type 1. Plastic-coat the saddle area of the hanger.

Provide pull lines specifically designed for pulling rope through conduit. Use pull lines made of two-ply line, with a tensile strength of 240 pounds minimum. Use rot and mildew resistant pull lines that are resistant to tangling when being dispensed.

Use mastic that is a permanent, non-hardening, water sealing compound that adheres to metal, plastic, and concrete.

Provide jute that is a burlap-like material used for filling voids and protecting components from waterproofing and adhesive compounds.

Provide zinc rich paint conforming to Section 1080-9 of the 2018 *Standard Specifications for Roads and Structures*.

C. INSTALLATION

To ensure against corrosion in the area where hot dipped galvanizing has been damaged, cover all raw metal surfaces with a cold galvanized, zinc rich paint.

Stub the raceway out at an accessible location and seal with termination kits designed specifically for that purpose. Use termination kits of the same material as the raceway.

Install Stabilizers as shown on the plans developed by the Design-Build Team to assure proper movement of the conduit expansion joints. Securely fasten the clamps with attachment brackets and stabilizer rods to the conduit at the indicated locations to assure these locations remain stationary. Install the stabilizer rods parallel to the alignment of the conduit, and tilt rod upward at an orientation of 45 degrees to the bottom of the bridge deck.

Insert a pull line in each inner duct with sufficient slack for future use.

Securely fasten all components to prevent movement during concrete placement.

Smooth all sleeve ends and make them flush with surrounding concrete surfaces. Remove burrs and rough edges by filing or grinding. A torch shall be used to cut the ends of metal sleeves. Use shields to protect all surfaces during torch-cutting operations.

Place backfill in accordance with Section 300-7 of the 2018 *Standard Specifications for Roads and Structure*s.

Fill the space between the raceway and the sleeve with mastic and jute. Install the mastic with a minimum distance of 2 inches at each end of the sleeve and the remaining interior space filled with jute. Finish the mastic by making it smooth and flush with the concrete.

Coordinate electrical conduit system work with work by others and allow installation of circuitry or fiber optic cables during the construction process as directed by the Engineer.

Ensure that the concrete inserts are in the proper position and installed correctly, including when they are located in prestressed concrete deck panels.

Keep the raceway system clean of all debris during construction, with the completed system clean and ready for installation of circuitry or fiber optic cables.

The Engineer shall inspect and approve all work before concealment.

GENERAL

The State will not be bound by oral explanations or instructions given at any time during the bidding process or after award. Only information that is received in response to this RFP will be evaluated; reference to information previously submitted will not suffice as a response to this solicitation.

NO CONTACT CLAUSE

To ensure that information is distributed equitably to all short-listed Design-Build Teams, all questions and requests for information shall be directed to the State Contract Officer through the Design-Build e-mail address. This precludes any Design-Build team member, or representative, from contacting representatives of the Department, other State Agencies or Federal Agencies either by phone, e-mail or in person concerning the Design-Build Project.

USE OF TERMS

Throughout this RFP and all manuals, documents and standards referred to in the RFP the terms Contractor, Bidder, Design-Builder, Design-Build Team, Team, Firm, Company and Proposer are synonymous.

Throughout this RFP and all manuals, documents and standards referred to in the RFP, the terms NCDOT, Department, Engineer and State are synonymous.

Throughout this RFP and all documents referred to in the RFP, references to the Technical Proposal include all Technical Proposal supplemental information that may be submitted in response to a Best and Final Offer RFP.

DESIGN REFERENCES

Design references developed and published by NCDOT and those developed and published by other agencies and adopted for use by NCDOT which are to be used in the design of this project may be obtained by contacting the Contract Standards and Development Unit within the Field Support Division. Standard prices for materials, which the Department normally sells for a fee, will be in effect. The Design-Build Team shall be responsible for designing in accordance with the applicable documents and current revisions and supplements thereto.

REVIEW OF SUBMITTALS

Major design milestones and required design submittals shall be identified as activities on a CPM, bar chart or other scheduling tool. This schedule shall be submitted to the Design-Build Unit and Resident Engineer concurrently with the first design submittal, or within 30 days of the contract award, whichever is earlier. The schedule shall be revised and resubmitted as design milestones change or as directed by the Design-Build Unit. Submittals will be reviewed within the timeframe the Design-Build Team indicates on the design submittal or ten working days (15 days for temporary structures, overhead sign assemblies, MSE walls, FEMA compliance documents, curved steel girder working drawings and temporary shoring) from the date of receipt by NCDOT, whichever is greater, unless otherwise stipulated in the Scope of Work.

Unless allowed otherwise elsewhere in this RFP, all submittals shall be prepared and submitted in accordance with the *Design-Build Submittal Guidelines*, which by reference are incorporated and made a part of this contract. The Design-Build Team will not be required to provide the pre-requisites noted in the *Design-Build Submittal Guidelines* prior to submitting plans for the work required solely in ICT #1. All submittals shall be made simultaneously to the Design-Build Unit and the Resident Engineer. The Department will not accept subsequent submittals until prior submittal reviews have been completed for that item. For all design disciplines, the Design-Build Team shall inform the Design-Build Unit, in writing, of all proposed changes / revisions to the NCDOT preliminary design, the Design-Build Team's Technical Proposal and / or previously reviewed / accepted submittals, including but not limited changes / revisions to RFC Plans, and obtain approval prior to incorporation. Failure to provide the aforementioned written notification of changes / revisions with the appropriate design submittal could result in the Department 1) suspending the design submittal until documentation is provided and extending the contractual design submittal review timeframe by an amount of time equal to the time it takes for the Department to receive the required documentation, or 2) returning the unreviewed design submittal to the Design-Build Team and requiring a resubmittal. Unless noted otherwise elsewhere in this RFP, all proposed design changes / revisions shall be subject to the Department's review and acceptance, including but not limited to changes to RFP Plans. The Design-Build Team shall prioritize submittals in the event that multiple submittals are made based on the current schedule. All submittals shall include pertinent Special Provisions. No work shall be performed prior to Department review and acceptance of the design submittals.

OVERVIEW

The I-3306A / W-5707C Design-Build Project widens I-40 to six lanes, and modifies interchanges, including the I-40 / NC 86 interchange, from I-85 in Orange County to the Durham County Line. The Design-Build Project includes I-40 westbound temporary pavement marking and overhead lane use sign modifications near US 15-501 in Durham County. The project is approximately 13.0 miles long.

Project services shall include, but are not limited to:

- **Design Services** - completion of construction plans
- **Construction Services** - necessary to build and ensure workmanship of the designed facility
- **Intelligent Transportation System -** design and construction of ITS components, including CCTV cameras, dynamic message signs (DMS), fiber-optic communications cable and conduit, and ITS integration
- **Permit Preparation / Application** - development of all documents for required permits
- **Right of Way** - acquisition of right of way necessary to construct project
- **As-Constructed Drawings**
- **As-Built Plans**

Construction Engineering Inspection will be provided by the NCDOT Division personnel or will be performed under a separate contract.

The following project planning documents have been completed:

- The I-3306A Type III Categorical Exclusion (CE) was approved on March 29, 2019.
- The W-5707C Type I Categorical Exclusion (CE) was approved on July 11, 2017.

GENERAL SCOPE

The scope of work for this project includes design, construction and management of the project. The design work includes all aspects to widen approximately 11.4 miles of I-40 to a six-lane divided facility from I-85 in Orange County to the Durham County Line, including interchange modifications; and to temporarily modify the I-40 westbound pavement markings and overhead lane use signs near US 15-501 in Durham County. Unless allowed otherwise elsewhere in this RFP, the designs shall meet all appropriate latest versions of AASHTO *Policy on Geometric Design of Highways and Streets*, AASHTO *LRFD Bridge Design Specifications*, *Manual of Uniform Traffic Control Devices* and all NCDOT design policies that are current as of the Technical Proposal submittal date or the Best and Final Offer submittal date, whichever is later.

Unless noted otherwise elsewhere in this RFP, all documents referenced herein shall be the edition / version, including all interim revisions, effective on the Technical Proposal submittal date or the Best and Final Offer submittal date, whichever is later.

Construction shall include, but not be limited to, all necessary clearing, grading, roadway, drainage, structures, utility coordination and relocation, and erosion and sediment control work items for the proposed six-lane facility and installation of the control of access fence. Construction engineering and management shall be the responsibility of the Design-Build Team. Construction shall comply with 2018 NCDOT *Standard Specifications for Roads and Structures* and any special provisions.

Areas of work required for this project shall include, but are not limited to the following items:

Roadway Design
Structure Design
Permit Application
Hydraulic Design
Geotechnical Engineering
Railroad Coordination
Foundation Design for Structures and Roadway
Erosion and Sedimentation Control Design and Implementation
Transportation Management Plan Design and Implementation
Pavement Marking Design
Intelligent Transportation Systems (ITS) Design
Sign Design
Traffic Signals and Signal Communications
Construction
Project Management
Design and Construction Management
Lighting (Construction Only)
Utility Construction

R/W Utilities, Conflicts and / or Construction
Construction Surveying
Location and Surveys
Right of Way Acquisition
Public Involvement and Information

All designs shall be in Microstation format using Geopak software (current version used by the Department) or Bentley Open Roads Designer (ORD). If the Design-Build Team elects to use ORD, the Department will not honor any requests for additional contract time or compensation for any effort required to complete the designs using ORD.

DESIGN AND CONSTRUCTION PERFORMED BY DESIGN-BUILD TEAM

The design work consists of the preparation of all construction documents to widen approximately 11.4 miles of I-40, and modify interchanges, including the I-40 / NC 86 interchange, from I-85 in Orange County to the Durham County Line; and to temporarily modify the I-40 westbound pavement markings and overhead lane use signs near US 15-501 in Durham County, as outlined in the Scope of Work section of this RFP. The Design-Build Team shall prepare final designs, construction drawings and special provisions.

Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall acknowledge that project documents furnished by the Department are preliminary and provided solely to assist the Design-Build Team in the development of the project design. The Design-Build Team shall be fully and totally responsible for the accuracy and completeness of all work performed under this contract and shall save the State harmless and shall be fully liable for any additional costs and all claims against the State which may arise due to errors, omissions and negligence of the Design-Build Team in performing the work required by this contract.

There shall be no assignment, subletting or transfer of the interest of the Design-Build Team in any of the work covered by the Contract without the written consent of the State, except that the Design-Build Team may, with prior written notification of such action to the State, sublet property searches and related services without further approval of the State.

The Design-Build Team shall certify all plans, specifications, estimates and engineering data furnished by the Design-Build Team.

All work by the Design-Build Team shall be performed in a manner satisfactory to the State and in accordance with the established customs, practices, and procedures of the North Carolina Department of Transportation, and in conformity with the standards adopted by the American Association of State Highway Transportation Officials, and approved by the U.S. Secretary of Transportation as provided in Title 23, U.S. Code, Section 109 (b). The decision of the Engineer / State / Department shall control in all questions regarding location, type of design, dimension of design, and similar questions.

Alternate designs, details and / or construction practices (such as those employed by other states, but not standard practice in NC) are subject to Department review and approval, and will be evaluated on a case by case basis.

The Design-Build Team shall not change team members, subconsultants or subcontractors identified in the Statement of Qualifications (SOQ) or Technical Proposal without written consent of the Engineer or the State Contract Officer. In addition, subconsultants and subcontractors not identified in the SOQ or Technical Proposal shall not perform any work without written consent by the Engineer. Individual offices of the Design-Build Team not identified in the Statement of Qualifications or the Technical Proposal submitted shall not perform any work without written consent by the Engineer. Failure to comply with this requirement may be justification for removing the Team from further consideration for this project and disqualification from submitting on future Design-Build Projects.

All firms shall be prequalified by the Department for the work they are to perform. Joint Ventures, LLCs or any legal structure that are different than the existing prequalification status must be prequalified prior to the Price Proposal submittal deadline. Subcontractors need only be prequalified prior to performing the work. Design firms should be prequalified prior to the Technical Proposal submittal deadline. If not prequalified at the time of the Technical Proposal submittal deadline, the prime contractor shall be solely responsible for either (1) ensuring that the design firm is prequalified prior to its first design submittal or (2) replacing that firm with a prequalified firm.

ACCESS TO PROVIDED MATERIALS

To facilitate distribution of documents that may be helpful to the Design-Build Teams in their development of a Technical and Price Proposal and subsequent designs, project material will be made accessible through a secure web portal. Access to the web portal will be given to each short-listed prime contractor and lead design firm. No distribution of Provided Materials will be possible prior to the Department announcing the short-listed Design-Build Teams and establishing the access privileges.

Access privileges will only be given to the individuals listed in the prime contractor’s and lead design firm’s Active Directory Group. It shall be solely the prime contractor’s and lead design firm’s responsibility to maintain their Active Directory Group. Once access has been established, individuals may enter the “Connect” site and login with their NCID account. Once logged in, the Teamsite “I-3306A / W-5707C” link will be apparent on the left side of the webpage.

Please note that all material provided, including the material provided through this portal, is provided for informational purposes only and is provided solely to assist the Design-Build Team in the development of the project design, unless noted otherwise elsewhere in this RFP. By submitting a Technical Proposal and Price Proposal, the Design-Build Team acknowledges that they are fully and totally responsible for the project design, including the use of portions of the Department design, modification of such design, or other designs as may be submitted by the Design-Build Team, unless noted otherwise elsewhere in this RFP. The Design-Build Team further acknowledges that they are fully and totally responsible for the accuracy and completeness of all work performed, including the determination of the accuracy of the information provided through this portal, and to the extent that the Design-Build Team chooses to rely on such information.

ELECTRONIC PLAN SUBMITTALS AND E-SIGNATURES

The Design-Build Team shall submit all Release for Construction Plans in accordance with the NCDOT e-Signature requirements, including but not limited to providing signed and sealed searchable .pdf files. Reference the website noted below for additional information:

https://connect.ncdot.gov/projects/roadway/pages/private-engineering-firm-resources.aspx

ETHICS POLICY

Employees employed by the Design-Build Team or employees employed by any subconsultant for the Design-Build Team to provide services for this project shall comply with the Department's Ethics Policy. Failure to comply with the Ethics Policy will result in the employee's removal from the project and may result in removal of the Company from the Department's appropriate prequalified list.

APPROVAL OF PERSONNEL

The Department will have the right to approve or reject any personnel, assigned to a project by the Design-Build Team.

In the event of engagement of a former employee of the Department, the Design-Build Team and their subcontractors shall restrict such person or persons from working on any Design-Build procurement / project in which the person or persons were "formerly involved" while employed by the State. The restriction period shall be for the duration of the Design-Build procurement / project with which the person was involved. *Former Involvement* shall be defined as active participation in any of the following activities:

Drafting the contract or contract Scopes of Work
Design-Build Team selection
Negotiation of the contract cost (including calculating manhours or fees)
Contract administration

An exception to these terms may be granted when recommended by the Secretary and approved by the Board of Transportation.

The Design-Build Team and their subconsultants / subcontractors shall restrict all personnel embedded within the Department, including but not limited to Design Units and Divisions, from working on any Design-Build procurement / project. Except as allowed otherwise below, the Design-Build Team shall provide a list of all embedded personnel to the Department and a signed Confidentiality Agreement for each embedded employee, as well as their employer and NCDOT Unit Manager. If the Design-Build Team has previously provided a signed Confidentiality Agreement for an embedded employee who's employer and / or NCDOT Unit Manager have not changed, the Design-Build Team shall 1) indicate on the aforementioned list when the original Confidentiality Agreement was provided to the Design-Build Unit (date and TIP Project), 2) provide a copy of the original signed Confidentiality Agreement, or 3) provide a new signed Confidentiality Agreement. The Design-Build Team shall submit the aforementioned list and Confidentiality Agreements to Mr. Ronald E. Davenport, Jr., P.E., State Contract Officer,

within ten business days of the issuance of the Industry Draft RFP, and provide updated lists and Confidentiality Agreements, as appropriate, throughout the project procurement / duration.

Failure to comply with the terms stated above in this section may be grounds for termination of this contract and / or not being considered for selection of work on future contracts for a period of one year.

SUBMITTAL OF TECHNICAL AND PRICE PROPOSALS

Technical and / or Price Proposals that do not adhere to all the requirements noted below may be considered non-responsive and may result in the Department not considering the Design-Build Team for award of the contract or reading their Price Proposal publicly.

TECHNICAL PROPOSAL

Technical Proposals will be accepted until **4:00 p.m. Local Time on Tuesday, July 27, 2021** at the office of the State Contract Officer:

Mr. Ronald E. Davenport, Jr., PE
Contract Standards and Development
1020 Birch Ridge Drive
Century Center Complex - Building B
Raleigh, NC 27610

No Technical Proposals will be accepted after the time specified.

TECHNICAL PROPOSAL - Hard Copies

Hard copies of the Technical Proposal shall be submitted in a sealed package. The outer wrapping shall clearly indicate the following information:

Technical Proposal - Hard Copies
Submitted By: (Design-Build Team's Name)
Design-Build Team Address
Contract Number C204632
TIP Number I-3306A / W-5707C
Orange and Durham Counties
I-40 widening from I-85 in Orange County to the Durham County Line with interchange modifications, including the I-40 / NC 86 interchange; and I-40 westbound temporary pavement marking and overhead lane use sign modifications near US 15-501 in Durham County

Technical Proposals delivered in person shall be delivered to Door B3 of the Century Center Complex - Building B. The delivery person shall call Ms. Marsha Sample at (919) 707-6915 or Mr. Ken Kennedy, PE at (919) 707-6919 to accept delivery. If delivered by mail, the sealed package shall be placed in another sealed package that is addressed to the Contract Officer as stated in the Request for Proposals. The outer package shall also bear the statement "Technical Proposal for the Design-Build of State Highway Contract No. C204632". (Reference the *Submittal of Quantities, Fuel Base Index Price and Opt-Out Option* Project Special Provision

found elsewhere in this RFP for additional requirements that are concurrent with the Technical Proposal submittal.)

Technical Proposal Requirements

12 Copies

8 ½-inch by 11-inch pages
No fold out sheets allowed - 24-inch by 36-inch fold out sheets shall only be allowed to present interchange plans in the 11-inch by 17-inch plan sheets

Printed on one side only

Double-spaced

Font size 12 - Within embedded tables, charts, and graphics only, minimal font size 10 is permissible

Excluding the introductory letter to Mr. Ronald E. Davenport, Jr., P.E. (two-page maximum length), a copy of the Department's approval letter for each incorporated Formal ATC, and the 11-inch by 17-inch appropriate plan sheets, the maximum number of allowable pages shall be 50 pages.

The aforementioned introductory letter to Mr. Ronald E. Davenport, Jr., PE shall include a statement acknowledging that the NCDOT may destroy all Technical Proposals not retained by the Department, **or** a statement that the NCDOT should return all Technical Proposals not retained by the Department.

Project team members, identified in the Statement of Qualifications, shall not be modified in the Technical Proposal without written approval of the Department. Any such request should be sent to the attention of Mr. Ronald E. Davenport, Jr., PE, at the address below:

NCDOT- Contract Standards and Development
Century Center Complex - Building B
1020 Birch Ridge Drive
Raleigh, NC 27610

TECHNICAL PROPOSAL - Electronic Copy

An electronic copy of the Technical Proposal shall be submitted in a sealed package. The electronic copy 1) shall be in a searchable .pdf format, 2) shall not contain any hyperlinks, 3) shall be scaled to reproduce to the appropriate page format, as defined above, and 4) shall be created by converting the original MicroStation / GeoPak files. The outer wrapping shall clearly indicate the following information:

Technical Proposal - Electronic Copy
Submitted By: (Design-Build Team's Name)
Design-Build Team Address
Contract Number C204632
TIP Number I-3306A / W-5707C
Orange and Durham Counties
I-40 widening from I-85 in Orange County to the Durham County Line with interchange modifications, including the I-40 / NC 86 interchange; and I-40 westbound temporary pavement marking and overhead lane use sign modifications near US 15-501 in Durham County

Electronic copies of the Technical Proposals delivered in person shall be delivered to Door B3 of the Century Center Complex - Building B. The delivery person shall call Ms. Marsha Sample at (919) 707-6915 or Mr. Ken Kennedy, PE at (919) 707-6919 to accept delivery. If delivered by mail, the sealed package shall be placed in another sealed package that is addressed to the Contract Officer as stated in the Request for Proposals. The outer package shall also bear the statement "Technical Proposal for the Design-Build of State Highway Contract No. C204632".

PRICE PROPOSAL

Price Proposals will be accepted until **4:00 p.m. Local Time on Tuesday, August 10, 2021**, at the office of the State Contract Officer:

Mr. Ronald E. Davenport, Jr., PE
Contract Standards and Development
1020 Birch Ridge Drive
Century Center Complex - Building B
Raleigh, NC 27610

No Price Proposals will be accepted after the time specified.

Price Proposals shall be submitted in a sealed package. The outer wrapping shall clearly indicate the following information:

Price Proposal
Submitted by (Design-Build Team's Name)
Design-Build Team Address
Contract Number C204632
TIP Number I-3306A / W-5707C
Orange and Durham Counties
I-40 widening from I-85 in Orange County to the Durham County Line with interchange modifications, including the I-40 / NC 86 interchange; and I-40 westbound temporary pavement marking and overhead lane use sign modifications near US 15-501 in Durham County

The Price Proposal shall be submitted by returning the Request for Proposals with the item sheets completed, and all required signatures and bonds. Failure to execute the required documents may render the Price Proposal non-responsive.

Price Proposals delivered in person shall be delivered to Door B3 of the Century Center Complex - Building B. The delivery person shall call Ms. Marsha Sample at (919) 707-6915 or Mr. Ken Kennedy, PE at (919) 707-6919 to accept delivery. If delivered by mail, the sealed package shall be placed in another sealed package that is addressed to the Contract Officer as stated in the Request for Proposals. The outer package shall also bear the statement "Price Proposal for the Design-Build of State Highway Contract No. C204632".

EVALUATIONS

Decisions based on cost alone will not establish the design standards for the project. Technical Proposals shall address the technical elements of the design and construction of the project. The Technical Review Committee will consider the understanding of the project, the anticipated problems and the solutions to those problems, in addition to other evaluation criteria identified herein.

The Design-Build Team's Technical Proposal shall be developed using narratives, tables, charts, plots, drawings and sketches as appropriate. The purpose of the Technical Proposal is to document the Design-Build Team's understanding of the project, demonstrate the Design-Build Team's capabilities to complete the project, document their selection of appropriate design criteria and state their approach and schedule for completing all design and construction activities.

The review of design plans by the Department is not intended to reflect a reviewer's personal preferences, but rather to ensure that all contract requirements are met, sound engineering judgment is exercised by the Design-Build Team, and that the Design-Build Team adheres to all referenced documents, including but not limited to, design standards, codes, memos and manuals. As such, the Award of the Design-Build contract does not in any way imply that the NCDOT accepts the details of the Technical Proposal submitted by the Design-Build Team.

The Technical Proposal will be evaluated in each of the following major categories:

	EVALUATION FACTORS	POINTS
1.	Management	7
2.	Responsiveness to Request for Proposal	30
3.	Long Term Maintenance	3
4.	Schedule and Milestones	26
5.	Innovation	3
6.	Maintenance of Traffic and Safety Plan	26
7.	Oral Interview	5

TECHNICAL PROPOSAL EVALUATION CRITERIA

1. Management - 7 points

Provide a comprehensive Organizational Chart that identifies the design, quality and construction management, and the relationships with subconsultants / subcontractors. The Organizational Chart shall identify all firms and personnel changes (additions, substitutions, deletions) to the Design-Build Team since submittal of the Statement of Qualifications.

Design-Build Team Management

- Describe the Design-Build Team's concept of design management, and identify key positions and subordinate organizational units.
- Describe how the various design disciplines will be coordinated, including how designs developed by different firms and offices will be integrated / consistent.
- Describe how design personnel will interface with the construction personnel.
- List projects, including description and similarity to the subject project that the Design-Build Team's designer(s) have developed Pavement Marking Plans; Traffic Signal, Electrical Detail and Signal Communications Plans; ITS Plans and Signing Plans.
- List projects, including description and similarity to the subject project, that the Design-Build Team's right of way firm has performed right of way acquisition services.
- Describe the Design-Build Team's concept of the project construction management organization and how it interrelates with the other elements of the Design-Build Team's organization for the project.
- Describe the work categories that the Design-Build Team anticipates will be performed by the Design-Build Team's own direct labor force and those categories that will be performed by subcontractors.

Quality Management

- Describe how the Design-Build Team will comply with the design and construction quality control requirements. Specifically, include a narrative that describes the Design-Build Team's understanding of the Department's quality control philosophy and how the Design-Build Team will implement it for this project.
- Describe any significant design and / or construction quality control issues experienced on NCDOT projects in the last ten years and how those issues will be addressed for this project.

2. Responsiveness to RFP - 30 points

Natural Environmental Responsibility

- Describe the Design-Build Team's approach to addressing environmental concerns within the project boundaries.
- Identify efforts to minimize impacts on wetlands, streams, riparian buffers and other environmentally sensitive areas. Describe any temporary impacts and associated minimization approaches.
- Describe the Design-Build Team's understanding of the overall approach to permitting.
- Identify methods of construction in wetlands, streams, and riparian buffers.
- Describe all project / construction related Notice of Violations (NOVs) received by any team member within the last five years on projects in the United States and the disposition of each listed NOV.

- Describe the Design-Build Team's approach to Sedimentation and Erosion Control for the project.
- Provide a narrative overview of the Design-Build Team's Vegetation Management Procedure.

Design Features

- Show plan view of design concepts with key elements noted.
- Identify preliminary horizontal and vertical alignments of all roadway elements.
- Identify the appropriate design criteria for each feature, if not provided herein.
- Identify proposed design exceptions and justify why the design exception is necessary.
- Identify proposed deviations to the preliminary design provided by the Department, not required herein.
- Show mainline typical sections.
- **** NOTE **** Deleted bullet to specify the mainline pavement Alternate chosen.
- Specify the base option chosen (ABC or asphalt) for all -Y- Lines, ramps, loops, service roads and roundabouts.
- If applicable, specify where all underlying longitudinal joints will be located and demonstrate how the underlying longitudinal joint location will minimize reflective cracking.
- Indicate how longitudinal joints will be located on a lane line or lane midpoint.
- Identify drainage modifications and designs to be implemented.
- Provide a brief summary of the mainline hydroplaning risk assessment and proposed mitigation.
- Provide a *Box Culverts and Cross Pipes Hydraulic Deficiency Assessment and Proposed Mitigation Table* that contains the box culvert and cross pipe attributes noted in the Hydraulics Scope of Work found elsewhere in this RFP.
- Provide a *Box Culverts and Cross Pipes Hydraulic Assessment Table* that contains the box culvert and cross pipe attributes noted in the Hydraulics Scope of Work found elsewhere in this RFP.
- Identify the months the Department should schedule the Concurrence Point 4B Meeting and the Concurrence Point 4C Meeting.
- Discuss the extent and limits of an allowable rise in water elevation in the floodplain(s), identify potentially impacted insurable structures, specify areas anticipated to require additional surveys and estimate the anticipated additional right of way impacts outside the project construction limits.
- Identify all bridge types to be constructed, including any special design features or construction techniques needed.
- Indicate how the future SR 1009 (Old NC 86) and I-40 widening can be accomplished without the need to 1) reconstruct any of the substructure elements of the I-40 bridge(s) over SR 1009 (Old NC 86) or 2) obtain a future design exception.
- Indicate the type and number of bridge expansion joints.
- Identify types of any retaining walls and / or sound barrier walls, if applicable.

- Describe any geotechnical investigations to be performed by the Design-Build Team and note any deviations to NCDOT requirements for subsurface investigations noted in the Geotechnical Engineering Scope of Work found elsewhere in this RFP.
- Identify the approximate location of new permanent ITS devices and when they will be installed and operational in their permanent location.
- Identify any aesthetic considerations not required herein that will be part of the design.
- Describe how utility conflicts will be addressed and any special utility design considerations. Describe how the Design-Build Team's design and construction methods minimize the Department's utility relocation costs.
- Describe how the design will affect the Department's right of way costs.
- Provide a Preliminary Signing Concept Map that includes, at a minimum, all anticipated DMS locations, all proposed overhead sign structure locations, all overhead signs, and all ground mounted Type A and B guide signs.

3. Long Term Maintenance - 3 points

- Describe any special materials, not referenced elsewhere in this RFP, incorporated into the project that would result in long term reduction in maintenance.
- Describe any special designs or construction methods that would reduce future maintenance costs to the Department.
- Estimate a minimum ten-year cost saving resulting from incorporation of these special materials, design or construction methods into the project.

4. Schedule and Milestones - 26 points

- Provide a brief narrative description of the Design-Build Team's proposed plan for performing construction on the project. The description shall include at least the following:

  - Indicate if, and how, the Design-Build Team intends to divide the project into work segments to enable optimum construction performance.
  - Describe the Design-Build Team's plans and procedures to ensure timely deliveries of materials to achieve the project schedule.

- Provide a detailed schedule for the project including both design and construction activities. The schedule shall show the sequence and continuity of operations, as well as the month of delivery of usable segments of the project.
- Indicate the specific construction activities that will occur outside jurisdictional resources prior to obtaining the environmental permits and their anticipated start date.
- Indicate how the Design-Build Team will maintain the project schedule if the right of way acquisition process, railroad agreements and / or utility relocations are delayed.
- Identify any self-imposed liquidated damages and associated Intermediate Contract Time(s), if applicable.
- Specify the duration, in calendar days, for ICT #7, ICT #8, ICT #9, ICT #10, ICT #11, ICT #12, ICT #13, ICT #14, ICT#16 and ICT #17.

- The schedule shall also include the Design-Build Team's final completion date and, if proposed, their substantial completion date. **These dates shall be clearly indicated on the Project Schedule and labeled "Final Completion Date" and "Substantial Completion Date"**.
- The Intermediate Contract Time #1 completion date shall be clearly indicated on the Project Schedule and labeled "Intermediate Contract Time #1 Completion Date".

5. Innovation - 3 points

- Identify any aspects of the design or construction elements that the Design-Build Team considers innovative. Include a description of alternatives that were considered whether implemented or not.

6. Maintenance of Traffic and Safety Plan - 26 points

Maintenance of Traffic

- Provide a Transportation Management Phasing Concept (TMPC).
- Identify the type of positive median cross-over protection proposed and replacement / resetting requirements.
- Describe the traffic control measures that will be used for each construction phase.
- Describe how traffic will be maintained as appropriate and describe the Design-Build Team's understanding of any time restrictions noted in the RFP.
- Describe the Design-Build Team's approach to site access and material staging.
- Specifically describe how business, school and residential access will be maintained, if applicable.
- Address how hauling will be conducted, including but not limited to, hauling of materials to and from the site and hauling of materials within NCDOT right of way.
- Describe the Design-Build Team's approach to providing the public access to project personnel for inquiries on vehicular and pedestrian traffic impacts.
- If a temporary portable barrier system will be utilized, provide the type and why it is needed.
- If temporary shoring will be required, provide the type and why it is required.
- Include all proposed road closures, detour routes, durations and justifications.
- Address where and how law enforcement officers will be used.
- Identify a Traffic Control Supervisor and briefly describe their qualifications for this role.

Safety Plan

- Describe the safety considerations specific to the project.
- Discuss the Design-Build Team's overall approach to safety.
- Describe any proposed improvements that will be made prior to or during construction that will enhance the safety of the work force and / or travelling public both during and after the project construction.

7. Oral Interview - 5 points

- The Design-Build Team's Project Management Team shall present a brief introduction of the project team and design / construction approach.
- Introductory comments shall be held to no more than 30 minutes.
- The Department will use this interview to ask specific questions about the Design-Build Team's Technical Proposal, background, philosophies and project approach.
- Presentation, questions, and answers shall not exceed 90 minutes. No more than ten people from the Design-Build Team may attend.

The Department will use the information presented in the oral interview to assist in the Technical Proposal evaluation.

Additional Warranty and / or Guarantee

- **The Extra Credit for this project shall be a Maximum of 5 Points.**

A twelve-month guarantee, as outlined in the *Twelve-Month Guarantee* Project Special Provision found elsewhere in this RFP, is required for this project. However, the Design-Build Team may provide additional warranties and / or guarantees at their discretion. The Design-Build Team may be awarded additional points as "extra credit" to be added to the Technical Score.

The Design-Build Team may provide warranties and / or guarantees for major components of the project. Examples of major components are pavements, bridge components and sign structures. If additional warranties and / or guarantees are offered, the Design-Build Team shall indicate in the Technical Proposal the general terms of the warranties and / or guarantees, a list of the items covered, performance parameters, notification and response parameters for corrective action, and evaluation periods. The Department will be responsible for annual inspections of the components covered by all warranties and / or guarantees offered by the Design-Build Team that extend beyond the required twelve-month guarantee. The warranties and / or guarantees shall also define how disputes will be handled.

No direct payment will be made for warranties and / or guarantees. Payment will be considered incidental to the lump sum price for the contract.

SELECTION PROCEDURE

There will be a Technical Review Committee (TRC) composed of five or more senior personnel from involved engineering groups that will evaluate the Technical Proposal on the basis of the criteria provided in the Request for Proposals.

The selection of a Design-Build Team will involve both technical quality and price. The Technical Proposals will be presented to the TRC for evaluation. The TRC shall first determine whether the Technical Proposals are responsive to the Request for Proposals requirements. The Department reserves the right to ask for clarification on any item in the Technical Proposal. A written response to this request for clarification shall be provided to the Department prior to the opening of the Price Proposals. The contents of the written response may affect the Technical Review Committee's determination of the Technical Proposal's responsiveness and / or the

overall evaluation of the Technical Proposal. If any commitments or clarifications provided in the written response conflict with the contents of the Technical Proposal, the contents of the written response shall govern and be incorporated into the contract.

Each responsive Technical Proposal shall be evaluated based on the rating criteria provided in the Request for Proposals. The TRC will submit an overall consensus Technical Score for each Design-Build Team to the State Contract Officer.

Quality Credit Evaluation Factors for Technical Proposals

Management	7
Responsiveness to Request for Proposal	30
Long Term Maintenance	3
Schedule and Milestones	26
Innovation	3
Maintenance of Traffic and Safety Plan	26
Oral Interview	5
Maximum Score	**100**

The State Contract Officer will use a table based on the maximum quality credit percentage to assign a Quality Credit Percentage to each Technical Proposal based on that proposal's overall consensus Technical Score. The maximum quality credit percentage for this project will be **25%.** The Technical Review Committee may elect to assign point values to the nearest one-half of a point (e.g. 90.5). In this event, the Quality Credit Percentage will be determined by linearly interpolating within the table entitled "Quality Credit Percentage for Technical Proposals".

Quality Credit Percentage for Technical Proposals

Technical Score	Quality Credit (%)	Technical Score	Quality Credit (%)
100	25.00	84	11.67
99	24.17	83	10.83
98	23.33	82	10.00
97	22.50	81	9.17
96	21.67	80	8.33
95	20.83	79	7.50
94	20.00	78	6.67
93	19.17	77	5.83
92	18.33	76	5.00
91	17.50	75	4.17
90	16.67	74	3.33
89	15.83	73	2.50
88	15.00	72	1.67
87	14.17	71	0.83
86	13.33	70	0.00
85	12.50		

The maximum Technical Score, including any extra credit given for warranties or guarantees, shall not exceed 100 points in determining the Quality Credit percentage.

If any of the Technical Proposals are considered non-responsive, the State Contract Officer will notify those Design-Build Teams of that fact. The State Contract Officer shall publicly open the sealed Price Proposals and multiply each Design-Build Team's Price Proposal by the Quality Credit Percentage earned by the Design-Build Team's Technical Proposal to obtain the Quality Value of each Design-Build Team's Technical Proposal. The Quality Value will then be subtracted from each Design-Build Team's Price Proposal to obtain an Adjusted Price based upon Price and Quality combined. Unless all Technical Proposals are non-responsive or the Department elects to proceed with the Best and Final Offer process, the Department will recommend to the State Transportation Board that the Design-Build Team having the lowest adjusted price be awarded the contract. The cost of the Design-Build contract will be the amount received as the Price Proposal.

The following table shows an example of the calculations involved in this process.

An Example of Calculating Quality Adjusted Price Ranking

Proposal	Technical Score	Quality Credit (%)	Price Proposal ($)	Quality Value ($)	Adjusted Price ($)
A	95	20.83	3,000,000	624,900	2,375,100
B	90	16.67	2,900,000	483,430	2,416,570
C *	90	16.67	2,800,000	466,760	2,333,240
D	80	8.33	2,700,000	224,910	2,475,090
E	70	0.00	2,600,000	0	2,600,000
* Successful Design-Build Team - Contract Cost $2,800,000					

Opening of Price Proposals

Prior to opening the Price Proposals, the State Contract Officer will provide to each Design-Build Team their Technical Score in a sealed envelope. The sealed envelope will only contain that Design-Build Team's Technical Score.

At the time and date specified, the State Contract Officer will open the Price Proposals and calculate the percentage difference between the Price Proposals submitted and the Engineer's Estimate.

Should all of the Price Proposals be within an acceptable range or below the Engineer's Estimate, the State Contract Officer will proceed to calculate the quality credit and publicly read the Price Proposals, Technical Scores and Adjusted Prices as outlined in the selection procedure above.

Should any one or more of the Price Proposals be within an acceptable range or below the Engineer's Estimate and the remaining Price Proposals exceed an acceptable range of the Engineer's Estimate, the State Contract Officer will go to a separate location to calculate the quality credit and determine if the Design-Build Team with the lowest Adjusted Price is within an acceptable range of the Engineer's Estimate. Should the Price Proposal of the Design-Build Team with the lowest Adjusted Price be within an acceptable range of the Engineer's Estimate or below the Engineer's Estimate, the State Contract Officer will proceed to publicly read the Price Proposals, Technical Scores and Adjusted Prices. Should the Price Proposal of the Design-Build Team with the lowest Adjusted Price exceed an acceptable range of the Engineer's Estimate, the State Contract Officer will publicly read the Price Proposals only and the Department will then determine whether to proceed to request a Best and Final Offer (BAFO) as outlined below.

Should all Price Proposals submitted exceed an acceptable range of the Engineer's Estimate, the State Contract Officer will publicly read the Price Proposals only. The Department will then determine whether to proceed to request a Best and Final Offer (BAFO) as outlined below.

In the event that the Department elects not to proceed with a Best and Final Offer (BAFO), then the State Contract Officer will schedule a date and time to publicly reiterate all Price Proposals, and read all Technical Scores and Adjusted Prices.

Provided the Department elects to proceed to request a Best and Final Offer (BAFO), at the date and time specified, the State Contract Officer will open the Best and Final Offer Price Proposals and proceed to publicly read all Price Proposals, Technical Scores and Adjusted Prices.

Best and Final Offer

In the event initial Price Proposals exceed an acceptable range of the Engineer's Estimate or if the Department feels it is necessary, for any reason, the Department may choose to make amendments to the details of the RFP and request a Best and Final Offer from all the previously short-listed teams. Alternately, the Department may choose to redistribute to the short-listed Design-Build Teams another RFP for the project with no amendments to the RFP scope.

After receipt of the redistributed RFP, the Design-Build Team has the option of changing the Technical Proposal details to adhere to the RFP modifications. If the Design-Build Team changes any component of the Technical Proposal, the TRC will review those amended components of the Technical Proposal and reevaluate the scores accordingly. The Design-Build Team shall highlight the changes to bring them to the Department's attention. A revised consensus Technical Score will be calculated, if appropriate, based on these amendments to the Technical Proposal.

Additional oral interviews will not be held. The Design-Build Teams shall submit both a revised Price Proposal and a revised Technical Proposal (if applicable) at the time, place and date specified in the redistributed RFP. A revised Quality Credit Percentage (if required) and Adjusted Price will be determined. This will constitute the Design-Build Team's Best and Final Offer. Award of the project may be made to the Design-Build Team with the lowest Adjusted Price on this Best and Final Offer.

Stipend

A stipulated fee of **$75,000.00** will be awarded to each short-listed Design-Build Team that provides a responsive, but unsuccessful, Design-Build Proposal. If a contract award is not made, all short-listed Design-Build Teams that provide a responsive Design-Build Proposal shall receive the stipulated fee. Once award is made, or a decision is made not to award, unsuccessful Design-Build Teams can apply for the stipulated fee by notifying the State Contract Officer in writing and providing an original invoice within 60 days of Award. If the Design-Build Team accepts the stipulated fee, the Department reserves the right to use any ideas or information contained in the Design-Build Proposal and / or Alternative Technical Concepts, whether incorporated into the Design-Build Proposal or not, in connection with any contract awarded for the project, or in connection with any subsequent procurement, with no obligation to pay additional compensation to the unsuccessful Design-Build Team. The stipulated fee shall be paid to eligible Design-Build Teams within ninety days after the contract award or the decision not to award. Unsuccessful Design-Build Teams may elect to refuse payment of the stipulated fee and retain any rights to its Design-Build Proposal and the ideas and information contained therein.

In the event that the Department suspends or discontinues the procurement process prior to the Technical Proposal or Price Proposal submittal date current at the time of the suspension, no stipulated fee will be paid.

ROADWAY SCOPE OF WORK (7-12-21)

Throughout this RFP, references to the Preliminary Roadway Plans shall denote the I-3306A Public Meeting Map, I-3306AB 25% Approved Plans, 02-23-2021 I-3306A I-85_I-40 Split Exit 163 Exit Lane Configuration.pdf file and Preliminary W-5707C Signing and Pavement Marking Plans. Please note, the I-3306AB 25% Approved Plans (excluding areas of the mainline with less than three lanes in each direction) and the 02-23-2021 I-3306A I-85_I-40 Split Exit 163 Exit Lane Configuration.pdf file shall supersede the I-3306A Public Meeting Map.

Throughout this RFP, references to the mainline and -L- Line shall denote I-40.

Project Details

- From the I-85 / I-40 interchange to the existing median barrier west of US 15-501 (Exit 270), the Design-Build Team shall design and construct a six-lane divided facility. Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall design and construct the mainline, including all ramps and loops, providing the same or better access, widening, improvements and traffic measures of effectiveness, in the Department's sole discretion, included in the Preliminary Roadway Plans provided by the Department. The mainline, including all ramps and loops, construction limits shall be of sufficient length to tie to existing based upon the current NCDOT guidelines and standards. The mainline shall be designed and constructed to meet a 70-mph design speed for a rolling rural freeway designed to interstate standards. The mainline shall be designed and constructed in accordance with the 2018 AASHTO *A Policy on Geometric Design of Highways and Streets*, Table 3-10 (e_{max} = 8%). The Design-Build Team shall provide all other design criteria in the Technical Proposal.

- Along I-40, excluding locations where existing bridge piers do not allow the construction of 14-foot outside shoulders, the Design-Build Team shall design and construct minimum 14-foot outside shoulders (12-foot useable shoulder width plus two feet), 12-foot of which shall be full depth paved shoulders, including all acceleration, deceleration and auxiliary lanes, and ramps / loops to the back of the gore (12-foot width). At locations where existing bridge piers do not allow the construction of 14-foot outside shoulders, the Design-Build Team shall design and construct the maximum allowable shoulder width, including but not limited to modifying the existing slope protection.

- Excluding the transitions required to 1) tie to the existing median width at the eastern project limits, 2) widen the existing bridges on I-40 over Norfolk Southern Railway (NSR) and SR 1725 (Millhouse Road), and 3) replace the existing bridges on I-40 over SR 1009 (Old NC 86), the Design-Build Team shall design and construct a 22-foot full depth paved median along the mainline.

  In the vicinity of the Norfolk Southern Railroad and SR 1725 (Millhouse Road), the Design-Build Team shall shift and / or widen the aforementioned mainline full-depth paved median to achieve the minimum bridge rail offsets. The median widening shall only be to a width necessary to provide the minimum bridge rail offsets, in the Department's sole

discretion, and shall not exceed a 36-foot width. (Reference Pavement Management Scope of Work found elsewhere in this RFP)

In the vicinity of the SR 1009 (Old NC 86), the Design-Build Team shall shift and / or widen the aforementioned mainline full-depth paved median to achieve the minimum bridge rail offsets. The median widening shall only be to a width necessary to provide the minimum bridge rail offsets and shall not exceed a 27-foot width unless the Design-Build Team demonstrates, in the Department's sole discretion, that additional width is required for construction activities between the bridges. However, the median width shall not exceed a 37-foot width.

Throughout the I-40 construction limits, excluding areas that consist solely of pavement marking obliterations / revisions, the Design-Build Team shall design and construct Type "T" double-faced concrete median barrier or a single slope concrete median barrier on the aforementioned full depth median pavement. Should the Design-Build Team elect to use the single-slope concrete median barrier, the Design-Build Team shall submit the barrier design to the Department for review and acceptance prior to incorporation. At a minimum, the single-slope concrete median barrier shall be the same height as the Type "T" double-faced concrete median barrier and shall meet the same crash test rating.

Alternative Technical Concepts (ATCs) that do not provide a paved median with Type "T" double-faced concrete median barrier or single slope concrete median barrier along the mainline are not permitted and shall not be evaluated or considered.

- The Design-Build Team shall not modify the I-40 / NC 86 (Martin Luther King, Jr. Boulevard) interchange configuration (ramp in Quadrants B, C and D and loop in Quadrant B). Alternative Technical Concepts (ATCs) that modify the I-40 / NC 86 (Martin Luther King, Jr. Boulevard) interchange configuration provided by the Department are not permitted and shall not be evaluated or considered.

- At the I-40 / NC 86 (Martin Luther King, Jr. Boulevard) interchange, the Design-Build Team shall not impact the existing Duke Energy Transmission Tower in Quadrant B.

- The Design-Build Team shall design and construct one-lane ramps that provide a minimum 16-foot lane width. The Design-Build Team shall design and construct two-lane ramps that provide minimum 12-foot lanes. All ramps shall have 14-foot outside shoulders, four-foot of which shall be full depth paved shoulders and 12-foot inside shoulders, four-foot of which shall be full depth paved shoulders.

- The Design-Build Team shall design and construct loops that adhere to Tables 3-27 and Table 3-28, *Design Widths of the Traveled Way for Turning Roadways* and *Design Width Modifications for Edge Conditions of the Traveled Way for Turning Roadways*, shown in the 2018 AASHTO *A Policy on Geometric Design of Highways and Streets* - Case II / Condition C for one-lane loops; Case III / Condition C for two-lane loops. All loops shall have 12-foot outside shoulders, four-foot of which shall be full depth paved shoulders. All loops shall have 2'-6" curb and gutter along the inside edge of pavement, with a 14-foot berm. The minimum loop design shall be 30 mph with a minimum 230-foot radius.

- Unless noted otherwise elsewhere in this RFP, the maximum allowable cut and fill slopes shall be 2:1. (Reference the Geotechnical Engineering Scope of Work found elsewhere in this RFP) The slopes in the interchange area shall follow the requirements set forth in the *Roadway Design Guidelines for Design-Build Projects* located on the Design-Build website.

- Unless noted otherwise elsewhere in is RFP, the Design-Build Team shall design and construct -Y- Lines, service roads and cul-de-sacs / turnarounds providing the same or better access, widening, improvements and traffic measures of effectiveness, in the Department's sole discretion, included in the Preliminary Roadway Plans provided by the Department. The limits of -Y- Line and service road construction shall be of sufficient length to tie to existing based upon the current NCDOT guidelines and standards.

- Excluding intersections at the I-40 / NC 86 (Martin Luther King, Jr. Boulevard) interchange, the Design-Build Team shall design and construct at-grade intersections with the lane configurations noted in the February 3, 2014 I-3306A *Traffic Capacity Analysis Report* provided by the Department unless noted otherwise elsewhere in this RFP. The Design-Build Team shall design and construct the at-grade intersections at the I-40 / NC 86 (Martin Luther King, Jr. Boulevard) interchange with the lane configurations noted in the *I-3306A I-40 at NC-86 Recommended Storage Lengths* diagram provided by the Department, unless noted otherwise elsewhere in this RFP. Unless noted otherwise elsewhere in this RFP, at all intersections impacted by the Design-Build Team's design and / or construction, excluding resurfacing, the Design-Build Team shall design and construct turn lanes that adhere to the greater of the following:

  - All turn lane lengths shall adhere to the NCDOT minimum turn lane lengths as defined in the NCDOT *Roadway Design Manual* (Reference Section 9-1, Figure 4).

  - All lengths for the turn lanes required by the February 3, 2014 I-3306A Traffic *Capacity Analysis Report* and the *I-3306A I-40 at NC-86 Recommended Storage Lengths* diagram provided by the Department, as applicable, shall adhere to the NCDOT Recommended Treatment for Turn Lanes. These lengths shall be determined by adding the storage length defined in the aforementioned Memorandum and the minimum deceleration length, as defined in the NCDOT *Roadway Design Manual* (Reference Section 9-1, Figure F-4A).

  - Right turn lanes / tapers shall be provided in accordance with the NCDOT Right Turn Lane Warrants, as defined in the NCDOT *Roadway Design Manual* (Reference Section 9-1, Figure F-4C).

  At the I-40 / SR 1723 (New Hope Road) interchange, the Design-Build Team will not be required to widen SR 1723 (New Hope Church Road) or relocate the -Y3- Ramp C / Ramp D ramp terminals solely to achieve the minimum turn lane lengths noted above.

- For all interchange / intersection design modifications, the Design-Build Team shall provide a traffic analysis that adheres to the July 1, 2015 NCDOT *Congestion Management Capacity Analysis Guidelines* for the Department's review and acceptance.

- The Design-Build Team will not be required to design or construct ramps or bridges to accommodate future loops or future auxiliary lanes.

- The Design-Build Team shall design and construct all -Y- Lines such that the through movement is not required to change lanes throughout the project limits.

- Unless noted otherwise elsewhere in this RFP, all roundabouts shall adhere to the design and operation parameters as detailed in NCHRP Report 672: *Roundabouts: An Informational Guide* - Second Edition. Prior to incorporating any roundabout not shown on the Preliminary Roadway Plans provided by the Department or any roundabout not required herein, the Design-Build Team shall provide a traffic analysis of the proposed roundabout(s), utilizing the I-3306A *Traffic Forecast Report* - 2040 Future Year - Build traffic volumes and SIDRA Intersection 8.1 or higher analysis software, for NCDOT review and acceptance. In addition to the requirements noted above all roundabouts shall adhere to the following:

  - The Design-Build Team shall design and construct all roundabouts to accommodate a WB-67 design vehicle without the cab of the truck traversing over the center truck apron or the trailer traversing over the exterior 2'-6" curb and gutter.

  - The Department prefers a maximum 25 mph roundabout entry speed. Thus, justification, in the Department's sole discretion, shall be provided for all entry speeds that exceed 25 mph. The Design-Build Team shall perform a fastest path performance check and provide the results to the Department for review and acceptance.

  - The Department prefers that all roadway grades approaching a roundabout are 4.0% or less. Thus, justification, in the Department's sole discretion, shall be provided for all roadway approach grades that are steeper than 4.0%.

  - The Design-Build Team shall design and construct all single-lane circular roundabouts with a minimum Inscribed Circle Diameter (ICD) of 130 feet.

  - The Design-Build Team shall design all roundabouts with an angle of intersection not less than 75 degrees for each leg.

  - The Design-Build Team shall design and construct chicanes along the approach roadway when the approach roadway design speed is greater than 50 mph. The Design-Build Team will not be required to provide chicanes between roundabouts located at adjacent ramp terminals.

  - The Design-Build Team shall design and construct splitter islands along the approach roadway when the approach roadway design speed is 50 mph or less. At a minimum, the splitter islands shall be 100 feet in length and extend beyond the end of the exit curve.

  - The Design-Build Team shall design and construct all chicanes and splitters islands with a minimum six-foot width.

- The Design-Build Team shall design and construct five-inch keyed-in monolithic concrete islands for all roundabout approach / departure channelization islands, including the chicane and splitter islands.

- The roundabout center island shall be capped with four inches of concrete. All roundabout approach / departure channelization islands shall be designed and constructed with concrete.

- Unless noted otherwise elsewhere in this RFP, when roundabouts are constructed at adjacent ramp terminals, the Design-Build Team shall design and construct a continuous minimum 16-foot wide concrete median island, with nine-inch offsets to each adjacent travel lane, between the roundabouts. The aforementioned median island shall be a five-inch keyed-in monolithic concrete island.

- Along the outside edge of the roundabout pavement, the Design-Build Team shall design and construct 2'-6" curb and gutter, with a minimum ten-foot berm. At a minimum, the 2'-6" curb and gutter shall extend along all approach / departing roadways to the approach / departing curve radius point.

- The Design-Build Team shall design and construct minimum 16-foot travel lanes inside the roundabout.

- The Design-Build Team shall design and construct 1'-6" mountable curb and gutter between the roundabout lane and the concrete truck apron. The slope of the 1"-6" curb and gutter shall the match the travel lane pavement slope. The Design-Build Team shall design and construct 9" x 18" concrete curb between the truck apron and the center island.

- At all intersections with restricted movements impacted by the Design-Build Team's design and / or construction methods, excluding resurfacing, the Design-Build Team shall provide five-inch keyed-in concrete monolithic channelization islands, regardless of the island dimensions. (Reference Roadway Standard Drawing No. 852.01)

- The Design-Build Team shall design and construct minimum four-foot wide five-inch keyed-in concrete monolithic channelization islands, with nine-inch offsets to the adjacent lanes, that delineate and separate all dual left turn lanes from the opposing through lanes.

- The Design-Build Team shall provide cul-de-sacs on all paved roads that are dead-ended. All cul-de-sacs shall be designed and constructed with a minimum 30-foot radius. The Design-Build Team shall provide turnarounds on all nonpaved roads that are dead-ended. All turnarounds shall accommodate a S-BUS-36 and be constructed with 8" ABC.

- The I-40 grade point and crown point shall be located on the outside edge of the median lane such that the median lane in each direction of travel slopes towards the median and the remaining lanes slope towards the outside. The I-40 median lane normal crown cross slope shall be 1) 0.02 or 2) the slope that achieves a 0.04 roll-over between the median lane and the

existing adjacent travel lane cross slope, whichever is flatter. Outside the areas of normal crown, the I-40 median lane superelevation shall match the superelevation of the existing adjacent I-40 travel lanes. Prior to the beginning of the I-40 six-lane divided typical section at the western project limits, the Design-Build Team shall transition the mainline crown point / grade point to tie to existing. (Reference the Hydraulics Scope of Work found elsewhere in this RFP)

- I-40 is a full control of access facility. The Design-Build Team shall bring to the Design-Build Unit's attention any deviations from the proposed control of access and / or right of way shown on the Preliminary Roadway Plans provided by the Department. The proposed control of access and / or right of way limits may deviate in proximity to cultural, historic, or otherwise protected landmarks, including cemeteries, to eliminate / minimize impacts. Prior to negotiating right of way, easements and / or control of access with property owners, the Department shall accept the Right of Way Plans developed by the Design-Build Team.

- Prior to installation, the Design-Build Team shall be responsible for coordinating with, and obtaining approval from, the NCDOT for the control of access fence placement. The Design Build Team shall be responsible for installation of the control of access fence as noted below:

  - Throughout the construction limits, excluding areas that consist solely of pavement marking obliterations / revisions, the Design-Build Team shall replace, in kind, all existing damaged control of access fence and all control of access fence that is damaged during construction.

  - The Design-Build Team shall install all missing control of access fence, matching the adjacent fence type.

- The Department will provide an approved I-3306AC Interchange Modification Report (IMR) based on the I-3306A Public Meeting Map provided by the Department. Based on the Preliminary Roadway Plans provided by the Department, an approved IMR / Interchange Access Report (IAR) is only required at the I-40 / NC 86 (Martin Luther King, Jr. Boulevard) interchange (Exit 266). The Design-Build Team shall not revise the roadway design such that the approved I-3306AC IMR will become nullified. (Elimination of the superstreet improvements as shown in the I-3306AB 25% Approved Plans provided by the Department will not nullify the approved I-3306AC IMR.) If the Design-Build Team revises the roadway design such that an approved IAR is required for other interchanges, the Design-Build Team shall re-analyze the interchange(s) and complete an IAR, as necessary, for NCDOT and FHWA review and approval. The Department will not honor any requests for additional contract time or compensation for any effort required to complete the aforementioned activities, including but not limited to additional design effort, additional construction effort, FHWA coordination / approvals, and / or environmental agency coordination / approvals.

- Except as required elsewhere in this RFP and / or to eliminate a design exception, the Design-Build Team shall not further impact any cultural, historical or otherwise protected landmark or topographic feature beyond that shown on the Preliminary Roadway Plans provided by the Department. Unless approved otherwise by the Department, in writing, the Design-Build Team

shall not acquire right of way, easements and / or control of access from a parcel with the aforementioned features unless shown on the Preliminary Roadway Plans provided by the Department.

- The Design-Build Team shall design and construct all retaining walls a minimum of ten feet inside the right of way.

- In accordance with the NCDOT Roadway Standard Drawings, the Design-Build Team shall provide milled rumble strips along the mainline outside and median paved shoulders, including ramp and loop terminals, and acceleration, deceleration and auxiliary lanes.

- For all bridges over roadways and railroads, the Design-Build Team shall submit vertical and horizontal clearance design calculations at all critical points. The Design-Build Team shall submit post construction survey points for the aforementioned critical points that verify construction adhered to the vertical and horizontal clearances accepted by the Department. The Design-Build Team shall be responsible for all costs associated with correcting vertical and horizontal clearances resulting from any construction variation from the design accepted by the Department.

- Excluding construction areas that 1) consist solely of pavement marking obliterations / revisions that are uniformly overlaid, 2) consist solely of guardrail replacement at bridges that are being rehabilitated, 3) consist of mainline concrete widening, 4) consist solely of paved shoulder replacement, guardrail replacement and shoulder berm gutter installation, 5) consist solely of guardrail replacement and shoulder berm gutter installation along the outside shoulders of I-85, 6) consist solely of median barrier and overhead sign assembly foundation installations to replace two diagrammatic overhead sign assemblies that are located west of the proposed I-40 eastbound exit lane taper west of SR 1134 (Dimmocks Mill Road), and 7) consist of milling the existing ultra-thin bonded wearing course and overlaying with an ultra-thin bonded wearing course, the Design-Build Team shall design and construct resurfacing grades for all roadways impacted by construction. Unless noted otherwise elsewhere in this RFP, all uniform overlays and resurfacing grades shall 1) completely cover the entire pavement surface (travel lanes and paved shoulders) and 2) be extended on a one-way roadway of a divided facility, as required, to provide the same limits for both directions of travel, including but not limited to I-40 eastbound within the W-5707C project limits. The Design-Build Team will not be required to resurface the I-85 southbound lanes solely to adhere to the requirement of resurfacing a one-way roadway of a divided facility.

  All resurfacing grades shall adhere to the design criteria and standards, provide all required pavement wedging and adhere to the minimum requirements noted below. For purposes of determining the required resurfacing limits only, the term “construction” below will not apply to construction areas that consist solely of pavement marking obliterations / revisions. (Reference the Pavement Management Scope of Work found elsewhere in this RFP)

  - The Design-Build Team shall resurface all lanes and shoulders of an undivided facility throughout the limits of proposed widening and construction.

- Unless noted otherwise elsewhere in this RFP, for both divided and undivided facilities, the Design-Build Team shall resurface all lanes and shoulders within the outermost construction limits of all proposed widening and construction, including **all** gaps along the facility where construction activities are not required.

- The Design-Build Team will not be required to resurface the I-40 / I-85 lanes or shoulders between the construction activities required to replace two diagrammatic overhead sign assemblies that are located west of the proposed I-40 eastbound exit lane taper west of SR 1134 (Dimmocks Mill Road) and the beginning of the aforementioned proposed taper solely to adhere to the requirement of resurfacing gaps along a facility where construction activities are not required.

- The Design-Build Team will not be required to resurface the I-85 southbound to I-40 eastbound flyover lanes or shoulders solely to adhere to the requirement of resurfacing gaps along a facility where construction activities are not required.

- Excluding the modifications required herein, the Design-Build Team shall inform the Design-Build Unit, in writing, of all proposed design revisions, including but not limited to the following:

  - The Design-Build Team shall note in the Technical Proposal any proposed deviations to the preliminary design shown on the Preliminary Roadway Plans provided by the Department. The Design-Build Team shall be responsible for all activities, as deemed necessary by the Department or the FHWA, resulting from changes to the NCDOT preliminary design, including but not limited to, public involvement, NEPA re-evaluation and / or coordination with other stakeholders. The Department will not honor any requests for additional contract time or compensation for completion of the required activities resulting from changes to the NCDOT preliminary design.

  - After the contract has been Awarded, the Design-Build Team shall inform the Design-Build Unit, in writing, of all proposed changes to the design shown in the Technical Proposal.

  - After the Department has reviewed and accepted the Design-Build Team's design submittals, the Design-Build Team shall inform the Design-Build Unit, in writing, of any changes to previously reviewed submittals, including but not limited to changes to RFC Plans.

  The proposed design revisions noted above shall be subject to the Department's review and acceptance.

- Excluding locations where horizontal curvature reduces the mainline stopping sight distance along the median paved shoulder, and locations where bridge piers, concrete barrier, or overhead sign assemblies reduce the mainline median shoulder width to less than ten feet, design exceptions will not be allowed for the -L- Line, including all ramps and loops. The Department prefers not to have design exceptions for the -Y- Lines and service roads. If the

Design-Build Team anticipates any design exceptions, they shall be clearly noted in the Technical Proposal. Prior to requesting / incorporating a design exception into the Preliminary Plans developed by the Design-Build Team, the Design-Build Team must obtain prior conceptual approval from the Design-Build Unit. If conceptual approval is obtained, the Design-Build Team shall be responsible for the development and approval of all design exceptions. A design exception will only be approved if the design exception request demonstrates, in the Department's sole discretion, that a design exception is warranted and that it cannot be reasonably and / or feasibly eliminated.

- Prior to recording the Right of Way Plans, the Design-Build Team shall locate and install iron pins and metal caps with fiberglass right of way markers that delineate the proposed right of way and proposed permanent easements for all parcels within the project limits. The Design-Build Team shall replace all existing and proposed right of way and permanent easement markers / monuments damaged and / or relocated during construction. A Professional Land Surveyor registered in North Carolina shall certify the placement of all right of way and permanent easement markers / monuments. In accordance with NCDOT Policy, the Department will furnish the metal caps with fiberglass markers.

- The Department will provide an accepted I-3306A Traffic Noise Report (TNR) and an accepted I-3306A Traffic Noise Report Addendum that is based on the Department's preliminary design. The Design-Build Team shall evaluate the **entire** I-3306A project and develop a Design Noise Report (DNR) based on the plans developed by the Design-Build Team, regardless of changes to the Department's preliminary design. (The Design-Build Team will not be required to evaluate the W-5707C project or develop a Design Noise Report for the W-5707C project.) The Design-Build Team shall complete TNM model validation, including but not limited to the collection of additional noise measurement data, regardless of what was included in the TNR and TNR Addendum. The DNR shall be developed in accordance with the NCDOT 2016 Traffic Noise Policy and the NCDOT 2016 Traffic Noise Manual; and be reviewed and accepted by NCDOT. Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall include all design and construction costs for all sound barrier walls required by the accepted DNR, as well as all costs associated with performing any additional geotechnical investigations necessary to design the foundations, in the lump sum price bid for the entire project. However, the Design-Build Team will not be required to include any designs associated with the proposed sound barrier walls in the Technical Proposal. Prequalification under Discipline Code 441 shall be required for the firm developing the DNR.

  The Design-Build Team is cautioned that the TNR and TNR Addendum are provided to show the general location of potential walls. Thus, as with all information provided by the Department, the TNR and TNR Addendum are provided for informational purposes only; and the Department will not honor any requests for additional contract time or compensation for any variations between the accepted TNR and / or the accepted TNR Addendum, and the approved DNR.

  In addition to the residential units at the Carols Woods Retirement Community, the Design-Build Team shall model the following areas of frequent human use: rotation garden, farmer's garden, dog park and Harknesss Circle Trail.

The Department will ballot all benefited receptors to determine which sound barrier walls recommended in the accepted DNR will be constructed. The Design-Build Team shall (1) develop and provide the information required by the Department to complete the balloting process, and (2) attend and / or speak at all balloting meetings and workshops. The Department will require four months to complete the balloting process. The Department will not honor any requests for additional contract time or compensation for the sound barrier wall construction unless the aforementioned four-month timeframe is exceeded. If time were granted, it would only be for that time exceeding the four-month period, which shall begin on the date the Department accepts the DNR developed by the Design-Build Team. The Design-Build Team shall not construct any sound barrier walls until the balloting process has been completed by the Department.

In accordance with Subarticle 104-8(A) of the 2018 Standard Specifications for Roads and Structures, if the accepted DNR and balloting process require more than 90,000 square feet (sf) of sound barrier wall, the amount over 90,000 sf will be paid for as extra work at the unit price of $40.00 per square foot. All work tasks required to design and construct the additional sound barrier walls, including but not limited to traffic control, pavement, drainage, concrete barrier, geotechnical investigation and earthwork shall be considered inclusive in the aforementioned unit price. The amount of extra work shall be determined by deducting all additional sound barrier wall square footage required as a result of horizontal and / or vertical alignment changes to the Preliminary Roadway Plans provided by the Department from the accepted DNR and balloting process sound barrier wall total square footage.

The Design-Build Team shall only credit the Department the construction cost of all sound barrier walls eliminated by the balloting process. The construction costs of all sound barrier walls eliminated solely by the balloting process shall be deducted from the lump sum amount bid for the entire project at the aforementioned unit price.

The Design-Build Team shall provide absorptive-faced sound barrier walls at the following locations:

- Where a sound barrier wall is located on the opposite side of the highway from impacted noise sensitive receptors that are not receiving a sound barrier wall and the receptors are located within ten times the proposed sound barrier wall height.

- Where the parallel barrier analysis (PBA), including PBAs for a single wall configuration with a minimum six-foot high retaining wall on the opposite side of the highway, shows that the noise reduction degradation results in noise levels and / or insertion loss values cause the sound barrier wall to not be feasible and reasonable.

- Where the PBA, including PBAs for a single wall configuration with a minimum six-foot high retaining wall on the opposite side of the highway, results in impacted receptors no longer being benefited.

At all sound barrier walls, the Design-Build Team shall provide 1) a four-foot berm between the wall and fill / cut slopes steeper than 6:1 and 2) a parallel concrete ditch at locations where the final grade slopes toward the wall.

The Design-Build Team shall design and construct all sound barrier walls a minimum of ten feet inside the right of way.

For all sound barrier walls, the Design-Build Team shall design and construct maintenance access points, as necessary and / or as directed by the Engineer.

To satisfy the FHWA's Abatement Measure Reporting requirements, the Design-Build Team shall prepare and concurrently submit a summary of the sound barrier walls to be constructed on the project with the final sound barrier wall working drawings submittal. The Design-Build Team shall submit the sound barrier wall summary directly to the NCDOT Traffic Noise and Air Quality Group and include the information noted in Title 23 Code of Federal Regulations Part 772 Section 772.13(f), including but not limited to overall cost and unit cost per square foot.

General

- Unless noted otherwise elsewhere in this RFP, the design shall be in accordance with the 2018 AASHTO *A Policy on Geometric Design of Highways and Streets*, and 2019 Errata, 2002 NCDOT *Roadway Design Manual*, including all revisions effective on the Technical Proposal submittal date, January 2018 NCDOT *Roadway Standard Drawings*, or as superseded by detail sheets located at **https://connect.ncdot.gov/resources/Specifications/Pages/2018-Roadway-Standard-Drawings.aspx,** *Roadway Design Policy and Procedure Manual, Roadway Design Guidelines for Design-Build Projects*, 2018 NCDOT *Standard Specifications for Roads and Structures*, the Highway Capacity Manual, 6th Edition, and the 2011 AASHTO *Roadside Design Guide*, 4th Edition and 2015 Errata.

- If the NCDOT *Roadway Design Manual*, including all revisions, the 2018 AASHTO *A Policy on Geometric Design of Highways and Streets* and 2019 Errata, the 2018 NCDOT *Roadway Standard Drawings* and / or any other guidelines, standards or policies have desirable and / or minimum values, the Design-Build Team shall use the desirable values unless noted otherwise elsewhere in this RFP. Similarly, in case of conflicting design parameters, and / or ranges, in the various resources, the proposed design shall adhere to the most conservative values, unless noted otherwise elsewhere in this RFP.

- The Design-Build Team shall provide a Drainage Summary Sheet, Earthwork Summary Sheet, Guardrail Summary Sheet, (permanent and temporary) and Pavement Removal Summary Sheet in the Final Roadway Plans and RFC Roadway Plans.

- At all intersections, the Design-Build Team shall not exceed a 0.05 roll-over between the outside edge of travel lane of the primary roadway and the beginning of the proposed grade for the secondary roadway.

- Unless noted otherwise elsewhere in this RFP, all bridge rail offsets shall be the greater of 1) the bridge rail offset as indicated in the NCDOT *Roadway Design Manual*, 2) the approach roadway paved shoulder width, or 3) the offset required to achieve stopping sight distance (maximum 12-foot). Narrower bridge rail offsets based on bridge length will not be allowed. The Design-Build Team will not be required to widen existing bridges solely to provide the aforementioned minimum bridge rail offsets.

- Outside the project limits, the Design-Build Team will not be allowed to use the NCDOT right of way and / or property for borrow or waste sites. Within the project limits, the Design-Build Team shall adhere to the following:

  - Only clean waste material may be wasted within the NCDOT right of way or property.

  - Excluding crushed concrete, debris shall not be buried within the NCDOT right of way or property.

  - Normal grading operations shall occur, including but not limited to, grading to drain all existing embankments supporting removed roadway sections.

- Unless noted otherwise elsewhere in this RFP, all guardrail / guiderail placement shall be in accordance with the NCDOT *Roadway Standard Drawings* and / or approved details in lieu of standards. Along all 3:1 fill slopes, constructed at fill heights that are equal to or greater than 12 feet, the Design-Build Team shall install guardrail. Along all fill slopes steeper than 3:1, constructed at fill heights that are equal to or greater than six feet, the Design-Build Team shall install guardrail. Excluding construction areas that consist solely of pavement marking obliterations / revisions, the Design-Build Team shall upgrade all existing guardrail 1) in the construction limits, 2) at bridges on -Y- Lines that consist solely of bridge rehabilitation construction activities, 3) along the outside shoulders of I-85 within the I-85 / I-40 interchange, 4) along I-40 westbound from the I-85 southbound / I-40 westbound gore to the western limits of the bridge on I-40 westbound over I-85, and 5) along the I-85 southbound to I-40 eastbound flyover in accordance with the aforementioned requirements and the requirements noted below, regardless if the Design-Build Team's design and / or construction impacts the guardrail.

  - For 1) existing guardrail that extends 100 feet or less outside the construction limits, and 2) existing guardrail at bridges on -Y- Lines that consist solely of bridge rehabilitation construction activities, the Design-Build Team shall replace all the existing guardrail.

  - For existing guardrail that extends more than 100 feet outside the construction limits, the Design-Build Team shall tie the proposed guardrail to the existing guardrail outside the construction limits.

  - At bridges on -Y- Lines that consist solely of bridge rehabilitation construction activities, the Design-Build Team will not be required to widen the existing shoulders, install

shoulder berm gutter, or pave to the face of guardrail. (Reference the Structures Scope of Work and Pavement Management Scope of Work found elsewhere in this RFP)

- Along 1) the existing outside shoulders of I-85 within the I-85 / I-40 interchange, 2) I-40 westbound from the I-85 southbound / I-40 westbound gore to the western limits of the bridge on I-40 westbound over-I-85, and 3) the I-85 southbound to I-40 eastbound flyover the Design-Build Team will not be required to widen the existing shoulders.

The guardrail / guiderail design shall be submitted for review with the Preliminary Roadway Plans submittal.

- The total outside shoulder width for all facilities with defined usable shoulders shall equal the usable shoulder plus two feet.

- The Design-Build Team shall provide continuous single face concrete barrier between two segments of single face concrete barrier when 1) the two segments are less than 300 feet apart, and 2) guardrail would be required between the two segments.

- At all locations where back to back single face concrete barrier is provided, including but not limited to bridge piers and sign supports, the Design-Build Team shall fill the area between the single face concrete barriers with gravel and cap with four inches of concrete when the area is ten feet wide or less.

- The Design-Build Team shall be responsible for the evaluation of the algebraic difference in rates of cross slope (roll-over) between existing shoulders and roadways and the associated suitability for carrying traffic during construction, if necessary. In the event that the roll-over is found to be unacceptable for the proposed temporary traffic patterns, the Design-Build Team shall be responsible for providing cross slopes that meet design standards and eliminate roll-over concerns.

- Unless noted otherwise elsewhere in this RFP, the design speed for all roadways shall be the greater of the minimum design speed for the facility type, as specified in the 2018 AASHTO *A Policy on Geometric Design of Highways and Streets*, or the anticipated / actual posted speed plus five mph. If a speed limit is not physically posted on an existing facility, General Statues mandate the speed limit as 55 mph, resulting in a 60-mph design speed.

- The NCDOT shall review and accept the Design-Build Team's Design Criteria prior to the Preliminary Roadway Plans submittal.

- In accordance with the March 19, 2019 memo from Ms. Brenda Moore, PE, former State Roadway Design Engineer, and Mr. Brian Hanks, PE, State Structures Engineer, the Design-Build Team will not be required to submit separate Structure Recommendations. Instead, in accordance with the aforementioned Memo, the Design-Build Team shall submit the roadway design information required to develop the Structure General Drawings with the Preliminary Roadway Plans submittal.

- Within the vehicle recovery area, the Design-Build Team shall design and construct single face concrete barrier in front of the traffic face of all shoulder piers, sound barrier walls, retaining walls, and all elements acting as a retaining wall. Excluding the outside concrete barrier beneath the bridge on NC 86 bridge over I-40, the aforementioned concrete barrier shall be located 1) beyond the typical section shoulder point and / or 2) a minimum of 12-foot behind the face of curb and gutter, requiring the Design-Build Team to widen the outside shoulder / berm beyond the typical section width. Between the single face concrete barrier and all shoulder piers, sound barrier walls, retaining walls, and all elements acting as a retaining wall, the Design-Build Team shall install minimum one-inch thick joint material. (Reference Section1028-1 of the 2018 *Standard Specifications for Roads and Structures*)

- The Design-Build Team shall design and construct all depressed grass medians and raised medians in accordance with the following:

  - The minimum width of all depressed grass medians shall be eight feet. At all locations where a depressed grass median becomes narrower than eight feet, the Design-Build Team shall design and construct a five-inch keyed-in concrete monolithic island in lieu of the depressed grass median.

  - The Design-Build Team shall install a four-inch concrete cap on all raised medians that are eight feet wide or narrower, measured face to face from the surrounding mountable concrete curb and gutter.

  - All grass covered raised medians shall be designed and constructed with topsoil and appropriate cross slope and median drain with pipe to prevent groundwater and surface water infiltration into the subgrade and / or pavement structure. Prior to construction of the grass covered raised median and / or median drain with pipe, the Design-Build Team shall submit to the Design-Build Unit, for review and acceptance, the proposed number of drains, drain locations within the typical section, topsoil specifications and construction details. Within all proposed grass covered raised median limits, the Design-Build Team shall completely remove and dispose of the existing pavement structure.

- Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall design and construct all lane drops from the outside travel way.

- A sag vertical curve low point will not be allowed on any proposed bridge or approach slab.

- At all -Y- Line / -Y- Line intersection radius points, including service roads, the minimum -Y- Line pavement width shall be 30 feet.

- Excluding grades required to tie to existing, the minimum longitudinal grade shall be 0.30%.

- At all intersections impacted by the Design-Build Team's design and / or construction methods, excluding resurfacing, the following design vehicles shall be required for all turning movements:

  - WB-67 at all ramp / loop intersections with -Y- Lines (For side-by-side turning maneuvers, WB-67 for the outside movement only and SU-30 for inside movement)

  - WB-62 at all other intersections (For side-by-side turning maneuvers, WB-62 for the outside movement only and SU-30 for inside movement)

  - At all intersections, with existing / proposed pedestrian facilities, impacted by the Design-Build Team's design and / or construction methods, the Design-Build Team shall retrofit / upgrade all existing substandard curb ramps to current standards.

- Any variations in the Department's proposed design and / or construction methods that nullify any decisions reached between the Department and the environmental agencies; and / or require additional coordination with the environmental agencies shall be the sole responsibility of the Design-Build Team. The Department will not allow any contract time extensions or additional compensation associated with any coordination or approval process resulting from design and / or construction modifications. (Reference the Environmental Permits Scope of Work found elsewhere in this RFP)

- Excluding parcels restricted by Control of Access and undeveloped parcels, the Design-Build Team shall design and construct a minimum of one driveway per parcel. The Design-Build Team shall design and construct all driveways to adhere to the NCDOT *Policy on Street and Driveway Access to North Carolina Highways* and the minimum requirements noted below. Excluding the maximum grade requirement, if the NCDOT *Policy on Street and Driveway Access to North Carolina Highways* and the requirements noted below have conflicting design parameters, the proposed design shall adhere to the aforementioned Policy:

  - The Design-Build Team shall provide horizontal and vertical alignments for all driveways that require 100 feet or longer to tie to existing.

  - Unless shown on the Preliminary Roadway Plans provided by the Department, driveways shall not be installed in roundabouts, right turn lanes, including their taper, or within the limits of splitter islands and chicanes.

  - Excluding grades required to tie to existing, the maximum driveway grade shall be 10.0%.

  - For shoulder sections, the minimum driveway turnout for residential and commercial properties shall be 16'-0" and 24'-0", respectively, or the existing width, whichever is greater.

  - For curb and gutter sections, the minimum driveway turnout for residential and commercial properties shall be 20'-0" and 28'-0", respectively, or the existing width, whichever is greater.

- The Design-Build Team shall contact Mr. Gary W. Thompson, North Carolina Geodetic Survey Director, prior to disturbing any geodetic monument.

- The project shall follow the NCDOT-FHWA Oversight Agreement. This Agreement will be provided. Any changes that affect previous approvals shall be re-submitted by the Design-Build Team for FHWA acceptance.

- The Design-Build Team shall identify the need for any special roadway design details (i.e. any special drainage structures, rock embankment, rock plating, special guardrail, retaining walls, concrete barrier designs, etc.) and shall provide special design drawings. The Contract Standards and Development Unit may have special details available that can be provided to the Design-Build Team upon request.

- A 4:1 back slope shall extend from the back of the expressway gutter to the clear zone limit. Beyond that, a maximum 2:1 cut slope (3:1 in Triassic soils) will be acceptable. The expressway gutter centerline shall be located at the hinge / shoulder point. Expressway gutter shall not be installed in fill sections. Expressway gutter shall only be used to minimize impacts to existing structures, and / or cultural, historical or otherwise protected landmarks or topographic features.

- Excluding locations to minimize impacts to existing structures, and / or cultural, historical or otherwise protected landmarks or topographic features, the front slope of all roadway ditches, including special drainage cut ditches, shall be in accordance with the desirable front slopes for the facility classification.

- At all locations with paved shoulders that extend beyond the typical width (i.e. to the face of single face barrier, guardrail, edge of expressway / shoulder berm gutter, etc.), the Design-Build Team shall taper the wider paved shoulder width to the typical paved shoulder width using an 8:1 taper. (Reference the Pavement Management Scope of Work found elsewhere in this RFP)

- Unless noted otherwise elsewhere in this RFP, shoulder berm gutter shall be installed in fill sections with guardrail and fill slopes steeper than 4:1, including but not limited to areas of guardrail replacement. Shoulder berm gutter shall not be installed in cut sections.

- Cut and fill slope transitions shall not exceed one increment (e.g. 3:1 to 4:1) per 50 feet.

- The Design-Build Team shall design and construct horizontal and vertical curves at all Points of Intersections (PIs) on the horizontal and vertical alignments, respectively.

- All paved shoulders shall be tapered at 8:1 to the existing pavement at tie-in points.

NCDOT Information Supplied

- The NCDOT will provide copies of the I-3306A and W-5707C Categorical Exclusions, the latest list of environmental commitments, municipal agreements and all pertinent approvals and correspondence. Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall adhere to all commitments stated in the environmental documents.

- The NCDOT will provide electronic surveys to the Design-Build Team. Any supplemental surveys, including but not limited to additional topography, existing and proposed roadway, structure sites, underground and overhead utilities, existing and proposed drainage, wetland delineation, right of way, parcel names, and deed research and descriptions shall be the responsibility of the Design-Build Team to acquire and process. All supplemental surveys shall adhere to the Location and Survey Unit's September 28, 2018 *Proc 2018-4 - L&S Implementation of SharePoint Site Guidelines* and *Proc 2018-6 - L&S Required PEF Attestations for Individually Developed Survey Products* Memorandums. The Design-Build Team shall modify / incorporate boundary information used for the determination and valuation of property solely under the direct supervision of a Professional Land Surveyor registered in North Carolina. Known existing utilities have been located and will be included with the survey data. The Design-Build Team shall be responsible for confirming the location of the utilities and the type / size of facilities. All supplemental Subsurface Utility Engineering (SUE) work shall be the responsibility of the Design-Build Team.

- The NCDOT will provide the I-3306A Public Meeting Map, I-3306AB 25% Approved Plans, electronic design files, the 02-23-2021 I-3306A I-85_I-40 Split Exit 163 Exit Lane Configuration.pdf file and Preliminary W-5707C Signing and Pavement Marking Plans. The Design-Build Team is cautioned that the preliminary designs shown on the aforementioned Map, electronic design files, and plans are provided solely to assist the Design-Build Team in the development of the project design. The Design-Build Team shall be fully and totally responsible for the accuracy and completeness of the project design, including, but not limited to, the use of the NCDOT's design, the use of portions of the NCDOT's design or modifications to the NCDOT's design.

- The NCDOT will provide final pavement designs for I-3306A / W-5707C. The Design-Build Team shall be responsible for all temporary pavement designs. (Reference the Pavement Management Scope of Work found elsewhere in this RFP)

- The NCDOT will provide a Geotechnical Subsurface Investigation for I-3306A. The Design-Build Team shall be responsible for any additional geotechnical information, all geotechnical recommendations, as well as supplemental structural and roadway investigations. (Reference the Geotechnical Engineering Scope of Work found elsewhere in this RFP)

ENVIRONMENTAL PERMITS SCOPE OF WORK (7-13-21)

General

The Design-Build Team shall prepare all designs and documents necessary for the Department to obtain the environmental permits for the project construction. Permit applications shall be required for the US Army Corps of Engineers (USACE) Section 404 Permit and the NC Department of Environmental Quality (DEQ) Division of Water Resources (NCDWR) Section 401 Water Quality Certification and Neuse Riparian Buffer Authorization.

The Design-Build Team shall not begin ground-disturbing activities, including utility relocations, in jurisdictional areas until the environmental permits have been issued (this does not include investigative borings covered under a Nationwide Permit No. 6).

The Design-Build Team shall coordinate with the Design-Build Unit to determine if a Preconstruction Notification (PCN) is required for the Nationwide Permit No. 6. If a PCN is required, the Design-Build Team shall submit all necessary documents and forms to the Design-Build Unit for submittal to the appropriate agencies; and shall not perform any geotechnical investigative work within the jurisdictional resource(s) requiring a PCN prior to obtaining the required approval. If a PCN is not required, the Design-Build Team may proceed with geotechnical investigations inside and outside jurisdictional resources, provided all of the Nationwide Permit No. 6 General Conditions are followed.

The Design-Build Team may begin construction activities prior to obtaining the aforementioned environmental permits provided that (1) the Department has reviewed and accepted the appropriate design submittal(s); (2) the Department is notified in writing and provides written approval prior to beginning work; and (3) such activities are outside jurisdictional resources. The Design-Build Team is encouraged to advance as many construction activities as possible outside jurisdictional resources prior to issuance of the environmental permits. The Design-Build Team shall indicate the specific construction activities that will occur outside jurisdictional resources prior to obtaining the environmental permits and their anticipated start date in the Technical Proposal.

The Department will not allow any direct contact between the Design-Build Team and representatives of the environmental agencies. No contact between the Design-Build Team and the environmental agencies shall be allowed either by phone, e-mail or in person, without representatives of the Department's Environmental Analysis Unit (EAU) - Environmental Coordination and Permitting Group (ECAP) or the Division's Environmental Officer (DEO) present. A representative from the Design-Build Unit shall be included on all correspondence.

For I-3306A, the Department has reached Concurrence Point 4A in the Merger Process used by the environmental agencies and the Department to obtain environmental permits. The Design-Build Team shall participate and present information for Concurrence Point 4B and Concurrence Point 4C that are necessary to complete the Merger Process. Project W-5707C is not in the aforementioned Merger Process. However, the Design-Build Team shall present proposed impacts associated with W-5707C during the Concurrence Point 4B Meeting and the Concurrence Point

4C Meeting. The Design-Build Team shall follow the appropriate details in the *Section 404 / NEPA Merger Process Information* document on the website noted below:

https://connect.ncdot.gov/resources/Environmental/EPU/Merger/Pages/default.aspx

Unless stipulated otherwise in the Technical Proposal, the Department will schedule the Concurrence Point 4B Meeting and Concurrence Point 4C Meeting for January 2022 and April 2022, respectively. The Design-Build Team shall clearly identify in the Technical Proposal what months they would like the Department to schedule these meetings. Failure on the part of the Design-Build Team to meet the dates shown in the Technical Proposal shall place all responsibility for delays resulting from missing these dates solely in the hands of the Design-Build Team.

Any variations in the Department's proposed design and / or construction methods that nullify any Concurrence Point obtained or decision reached between the Department and the environmental agencies; and / or require additional coordination with the environmental agencies shall be the sole responsibility of the Design-Build Team. The Department will not allow any contract time extensions or compensation associated with this additional coordination.

Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall be bound by the terms of all signed planning documents, and approved minutes and commitments of all interagency / concurrence meetings. The Design-Build Team shall be held accountable for meeting all permit conditions. The Design-Build Team shall be required to staff any personnel necessary to provide permit compliance.

Unless noted otherwise elsewhere in this RFP, the Department will not honor any requests for additional contract time or compensation for any efforts required in order to obtain any permit or permit modification, including but not limited to public involvement, additional design effort, additional construction effort, and / or additional environmental agency coordination and approvals.

Permit Application Process and Timeframe for all Permits except the Nationwide Permit No. 6 for Geotechnical Investigations

It shall be the Design-Build Team's responsibility to acquire information and prepare permit drawings that reflect the impacts and minimization efforts resulting from the Merger Process, and from the project as designed by the Design-Build Team. Further, it shall be the Design-Build Team's responsibility to provide permit impact sheets (drawings) depicting the design and construction details to the Department as part of the permit application. The aforementioned permit impact sheets shall be reviewed and accepted by the Department prior to the permit application submittal. The Design-Build Team shall be responsible for developing the permit application for all jurisdictional impacts. The permit application shall include all utility relocations required by the project.

At a minimum, the permit application shall consist of the following:

- Cover Letter
- Completed forms (PCN, Section 404 ENG 4345, etc.) appropriate for impacts
- NCDOT Mitigation Site debit ledger and / or Division of Mitigation Acceptance Letter
- Minutes from the Concurrence Point 4B Meeting and the Concurrence Point 4C Meeting
- Stormwater Management Plan
- Permit drawings with and without contours and, if necessary, utility drawings with and without contours.
- Wetland Permit Impact Summary Sheets
- Half-size plans
- Mitigation Plan (if required by the Design-Build Team's design and / or construction methods)

The Department will re-verify and update, as needed, the required environmental data that expires prior to permit issuance. These include, but are not limited to, federally protected species, re-verification of wetland jurisdictional areas, historic and archaeological sites, and 303d (impaired) streams.

Excluding the Nationwide Permit No. 6 for geotechnical investigations, the Design-Build Team shall submit one permit application for the entire project. The Design-Build Team shall not submit multiple applications to develop a "staged permitting" process to expedite construction activities in a phased fashion.

Any temporary construction measures, including de-watering, construction access, etc. shall be addressed in the permit application. Impacts that result from so-called temporary measures may not be judged to be temporary impacts by the environmental agencies. These issues shall be addressed by the Design-Build Team and reviewed by EAU prior to the Concurrence Point 4B Meeting and the Concurrence Point 4C Meeting; and resolved with the environmental agencies during the aforementioned meetings.

The Design-Build Team shall clearly indicate the location and impacts of haul roads and utility relocations in jurisdictional areas. The Design-Build Team shall also identify all proposed borrow and waste sites. Further, the Design-Build Team shall describe the construction methods for all structures that impact jurisdictional resources. The temporary impact descriptions (haul roads, utility relocations, work bridges, etc.) shall include restoration plans, schedules and disposal plans. The aforementioned information, descriptions and details shall be presented during the Concurrence Point 4B Meeting and the Concurrence Point 4C Meeting, and be included in the permit application.

The NCDOT hereby commits to ensuring, to the greatest extent practicable, that the footprint of the impacts in areas under the jurisdiction of the Federal Clean Water Act will not be increased during the Design-Build effort. In accordance with the Department of Water Resources' NCG 010000, all fill material shall be stabilized and maintained to prevent sediment from entering adjacent waters or wetlands. The Design-Build Team shall be responsible for ensuring that the design and construction of the project will not impair the movement of aquatic life.

Permit modification requests are strongly discouraged and shall only be allowed if the Engineer determines it to be in the best interest of the Department. The Design-Build Team shall not take an iterative approach to hydraulic design issues. Prior to submitting the permit application, the hydraulic design shall be complete and accepted by the Department.

Direct coordination between the Design-Build Team, the Design-Build Unit, Resident Engineer, DEO, Hydraulics Unit, and EAU shall be necessary to ensure proper permit application development. Upon completion of the draft permit application, the Design-Build Team shall concurrently forward the permit application to the Design-Build Unit, Resident Engineer, DEO, Hydraulics Unit and EAU for review and approval. After all revisions are complete, the Department will subsequently forward the "complete" permit application to the appropriate environmental agencies.

The Design-Build Team should expect it to take up to seven months to accurately and adequately complete all designs necessary for the permit application, and develop the permit application. The Design-Build Team shall assume the environmental agencies will take up to 120 days to review the complete permit application and issue the permits and certifications. No requests for additional contract time or compensation will be allowed if the environmental agencies issue the permits and certifications within this 120-day period. The Department will only consider requests for contract time extensions for the environmental agencies' review if the 120-day period has been exceeded. If time were granted, it would be only for that time exceeding the 120-day period. The 120-day period is considered to begin on the date the Department submits a fully complete and 100% accurate permit application to the environmental agencies; and does not include the time required for commitment reconciliation or obtaining signatures after the permits and certifications are received from the environmental agencies.

Mitigation Responsibilities of the Design-Build Team

As required by the NEPA Process and the USACE / EPA Section 404(b)(1) Guidelines, to offset potential wetland and stream impacts, the Department has reviewed the roadway project corridor for potential on-site mitigation opportunities. Since no on-site mitigation opportunities were identified, the Department will acquire compensatory mitigation for unavoidable impacts to wetlands and streams due to the I-3306A project construction from the NC Division of Mitigation Services. The amount of mitigation acquired will be based on impacts, as identified in the I-3306A Concurrence Points 2A, 3 and 4A Concurrence Meeting Package. Based on the Department's preliminary design, no impacts to jurisdictional resources were identified for the W-5707C project.

Any changes proposed by the Design-Build Team to any design or construction details provided by the Department shall be approved by the Department prior to being submitted to the environmental agencies for their approval.

Should additional jurisdictional impacts result from design revisions that are not required elsewhere in this RFP and / or construction methods, suitable compensatory mitigation for wetlands and / or streams shall be the sole responsibility of the Design-Build Team. Therefore, it

is important to note that additional mitigation will have to be approved by the environmental agencies and such approval shall require, at a minimum, the preparation and approval of a Mitigation Plan before permits are approved. To mitigate for these additional jurisdictional impacts, the Design-Build Team shall be responsible for all costs associated with acquiring suitable mitigation. Construction of any on-site mitigation shall be performed by a contractor that has successfully constructed similar on-site mitigation. In the absence of suitable on-site mitigation, the Design-Build Team shall be responsible for acquiring all additional mitigation from the NC Division of Mitigation Services or an approved compensatory mitigation banking source.

The Design-Build Team shall analyze all new areas to be impacted that have not been analyzed during the NEPA Process, including but not limited to borrow sites, waste sites, haul roads and staging areas that are located outside the project right of way. This analysis shall include performing all environmental assessments. These assessments shall require the Design-Build Team to engage the services of a NCDOT prequalified environmental consultant to conduct a full environmental investigation to include, but not be limited to, Federally Listed Threatened and Endangered Species, wetlands, streams, avoidance and minimization in jurisdictional areas, compensatory mitigation, FEMA compliance, and historical, archaeological, and cultural resource surveys in these areas. The environmental consultant shall obtain concurrence, through EAU, from the U. S. Fish and Wildlife Service, to document compliance with Section 7 of the *Endangered Species Act* for those species requiring such concurrence. In addition, the Design-Build Team shall identify additional mitigation required and fulfill all other requirements that the environmental agencies impose to obtain the permit. Any contract time extensions resulting from additional environmental assessments required by the Design-Build Team's design and / or construction methods impacting areas outside those previously analyzed through the NEPA Process shall be solely at the Department's discretion.

Commitments

The NCDOT is committed to incorporating all reasonable and practicable design features to avoid and minimize wetland and stream impacts; and to provide full compensatory mitigation of all remaining wetland and stream impacts. Avoidance measures were taken during the planning and NEPA Process and minimization measures were incorporated as part of the preliminary design provided by the Department. The Design-Build Team shall incorporate these avoidance and minimization features, plus any minimization identified during the Concurrence Point 4B Meeting and the Concurrence Point 4C Meeting, into the design and / or construction methods at no additional cost or contract time extension.

All work by the Design-Build Team must be accomplished in strict compliance with the plans submitted with the permit application and in compliance with all conditions of the permits and certifications issued by the environmental agencies. The Design-Build Team shall provide each of its contractors and / or agents associated with the construction or maintenance of this project with a copy of the permits and certifications.

Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall strictly adhere to these commitments, as well as others, including but not limited to, those included in the I-3306A

Categorical Exclusion, the W-5707C Categorical Exclusion, all permits, all interagency meetings, and all site visits.

Cultural Resources

If the Design-Build Team discovers any undocumented historic or archaeological resources while conducting the authorized work, they shall immediately suspend activities in that area and notify, in writing, the Design-Build Unit, the NCDOT Historic Architecture Team Leader, the NCDOT Archaeology Team Leader and the NCDOT Project Development Engineer listed below. Upon receipt of notification, the Department will perform an initial assessment and initiate any required State / Federal coordination. Should the initial resource assessment and agency coordination completed by NCDOT determine that additional NRHP evaluation and / or Section 106 mitigation is necessary, the Design Build Team shall engage the services of a NCDOT prequalified historic architecture and / or archaeology consultant to conduct further historic architecture and / or archaeology evaluation and / or mitigation.

The inadvertent or accidental discovery of human remains shall be handled in accordance with North Carolina General Statutes 65 and 70. All questions regarding these discoveries shall be addressed to Mary Pope Furr, NCDOT Historic Architecture Team Leader at (919) 707-6068, Matthew Wilkerson, NCDOT Archaeology Team Leader at (919) 707-6089, or Gene Tarascio, NCDOT Project Manager at (919) 707-6046.

EROSION AND SEDIMENTATION CONTROL SCOPE OF WORK (3-14-21)

The NCDOT Roadside Environmental Unit will review and accept all Erosion and Sedimentation Control Plans. Clearing & Grubbing and Final Grade Release for Construction (RFC) Erosion Control Plans shall be submitted, accepted and distributed to all NCDOT personnel listed in the Design-Build Submittal Guidelines before **any** land disturbing activities, including clearing and grubbing, can commence. If the Design-Build Team chooses to perform the work in discrete sections, then a complete set of Clearing & Grubbing and Final Grade RFC Erosion Control Plans shall be submitted, accepted, and distributed, as noted above, prior to land disturbing activities, including clearing and grubbing, commencing in that section. No land disturbing activities, including clearing and grubbing, shall occur in any location that does not have accepted Clearing & Grubbing and Final Grade RFC Erosion Control Plans. Refer to the most recent version of the NCDOT *Erosion and Sediment Control Design and Construction Manual* and the NCDEQ - *Erosion and Sediment Control Planning and Design Manual* for erosion control design guidelines not addressed in this Scope of Work.

To ensure adherence with the April 1, 2019 NCG-010000 General Construction Permit, issued by the North Carolina Department of Environmental Quality, Division of Water Resources, the Design-Build Team shall formally submit a project-wide Vegetation Management Procedure for the Department's review and acceptance prior to any land disturbing activities. After this initial review, the Design-Build Team shall concurrently provide the Resident Engineer and Roadside Environmental Field Operations Engineer updated versions of the Vegetation Management Procedure on a monthly basis. These updated versions will not require formal submittal to the Design-Build Unit, but will be subject to review comments by the aforementioned field personnel. All versions of the Vegetation Management Procedure shall include, but not be limited to, 1) provisions for the early establishment of grasses / vegetation, 2) provisions for obtaining the required 80% permanent vegetation stand, as defined in the April 1, 2019 NCG-010000 General Construction Permit and in accordance with the *Permanent Vegetation Establishment* Project Special Provision found elsewhere in this RFP, by the project final completion date, and 3) procedure and schedule details for fertilizer topdressing, supplemental seeding, mowing and repair seeding. The Vegetation Management Procedure shall be closely coordinated with the grading and hauling operations. The Design-Build Team shall provide a narrative overview of the Vegetation Management Procedure in the Technical Proposal.

From the beginning through the end of construction, the Design-Build Team shall maintain comprehensive "red-line" As-Constructed Drawings that detail when and where permanent / temporary / repair seeding and fertilizer topdressing have been performed.

Erosion and Sedimentation Control Plans shall at a minimum address the following:

I. Complete Set of Plans

A. Clearing and Grubbing Phase

1. Use correct NCDOT symbology.

2. Protect existing drainage structure inlets with Rock Inlet Sediment Trap Type 'A' (RIST-A), Rock Inlet Sediment Trap Type 'C' (RIST-C), Rock Pipe Inlet Sediment Trap Type 'A' (PIST-A), etc.
3. Utilize adequate perimeter controls (temporary silt ditches (TSD)), temporary silt fence (TSF), etc.).
4. Clean Water Diversions (CWD) shall not be used to divert offsite runoff through the project construction limits.
5. All jurisdictional streams within the project limits shall be identified as 'Environmentally Sensitive Areas" (ESA) on Clearing and Grubbing Plans.
6. On Clearing & Grubbing Plans, identify areas within the project limits that are within the Rocky Run, Sevenmile Creek, and Eno River High Quality Water (HQW) areas (within one mile and draining to the identified HQW resource). ESA and HQW restrictions shall apply for all delineated areas.
7. Utilize skimmer basins and rock measures with sediment control stone (Temporary Rock Sediment Dam Type 'B' (TRSD-B), Temporary Rock Silt Check Type 'A' (TRSC-A), etc.) at drainage outlets.
8. Take into account topography and show existing contour lines on Clearing & Grubbing Plans only.
9. Utilize Temporary Rock Silt Checks Type 'B' (TRSC-B) or wattles to reduce velocity in existing ditches with spacing of 250 feet divided by percentage of ditch grade. Also utilize TRSC-Bs in proposed TSDs and temporary diversions (TD).
10. Protect existing streams; do not place erosion control devices in live streams unless permitted by the Division of Water Resources 401 Certification and the Army Corps of Engineers 404 Permit.
11. Sediment basins shall be sized to provide adequate silt storage for 3,600 cubic feet per disturbed acre with surface area equal to 435 square feet per cubic foot per second (cfs) of the peak inflow rate, Q25, using 25-year peak rainfall data (NCDEQ - *Erosion and Sediment Control Planning and Design Manual* or NOAA's National Weather Service website **https://hdsc.nws.noaa.gov/hdsc/pfds/** for partial duration (ARI) time series type). A Sediment Basin Designer Spreadsheet will be provided by the NCDOT Roadside Environmental Unit upon request.
12. Skimmer Basins shall be sized to provide adequate silt storage for 1,800 cubic feet per disturbed acre with surface area equal to 325 square feet per cubic foot per second (cfs) of the peak inflow rate, Q25, using the 25-year peak rainfall data (NCDEQ - *Erosion and Sediment Control Planning and Design Manual* or NOAA's National Weather Service website **https://hdsc.nws.noaa.gov/hdsc/pfds/** for partial duration (ARI) time series type). Skimmer Basins shall be designed to dewater in two to three days. A Skimmer Basin Designer Spreadsheet will be provided by the NCDOT Roadside Environmental Unit upon request.
13. Design Riser Basins to the following standards:
    a. Surface Area shall be determined by Equation A (sq. feet) = Q25 (cfs) * 435.
    b. Volume requirement shall be 1,800 cubic feet per disturbed acre draining to the riser basin.
    c. Riser Pipe shall have a cross-sectional area 1.5 times that of the barrel pipe.
    d. The riser pipe shall be non-perforated with a skimmer attached to the bottom of the pipe, one foot from the bottom of the basin.

e. See NCDEQ - *Erosion and Sediment Control Planning and Design Manual* for additional design criteria.

14. The minimum and maximum length to width ratio of all Sediment Basins shall be 2:1 and 6:1, respectively.
15. Coir Fiber Baffles shall be installed in all silt basins and sediment dams at drainage outlets. For silt basins with a 20-foot or longer length, three Coir Fiber Baffles shall be installed with a spacing of 1/4 the basin length. For silt basins with a length less than 20 feet, a minimum of two Coir Fiber Baffles shall be installed, with a spacing of 1/3 the basin length. The Design-Build Team will not be required to show the individual baffles on the Erosion Control Plans, but shall be required to incorporate the Coir Fiber Baffle Detail on the Erosion Control Plans.
16. Include any culvert and / or pipe construction sequence plan sheets in the Clearing & Grubbing Plans; all pipes 48 inches or larger, or any combination of pipes that total 48 inches or more, in jurisdictional streams, shall require a construction sequence. Prior to installation of pipes smaller than 48 inches in jurisdictional streams, the Design-Build Team shall submit a phasing plan for managing the watercourse to the Resident Engineer for review and acceptance. The phasing plan shall be in accordance with the *Best Management Practices for Construction and Maintenance Activities*.
17. During construction, provide temporary sediment basins that dewater from the surface at all permanent stormwater devices.
18. Utilize Excelsior / Coir Fiber Wattles with Polyacrylamide (PAM) and / or TRSC-As with Matting and PAM in temporary and permanent, existing and proposed ditches per NCDOT *Erosion and Sediment Control Design and Construction Manual* in areas where sediment basins are not feasible at drainage outlets and in areas where sediment basins at drainage outlets with sediment traps (i.e. PIST-A, RIST-A, etc.), cannot be properly sized to surface area and / or sediment storage requirements due to safety concerns, right of way restrictions, utility conflicts, or other construction limitations approved by the NCDOT Roadside Environmental Unit.
19. Place devices utilizing PAM at all sediment basin inlets.
20. At a maximum spacing of 200 feet, at all sag points and as directed, utilize Special Sediment Control Fence or Coir Fiber Wattles as drainage breaks in silt fence.
21. Do not place erosion control devices that require excavation (i.e. sediment basins, silt ditches, etc.) in wetlands unless permitted by the Division of Water Resources 401 Certification and the Army Corps of Engineers 404 Permit.
22. Within the entire project limits, provide disturbed and undisturbed drainage area delineations in MicroStation Format.
23. For all drainage outlets where the runoff cannot be treated with a sediment basin and / or the sediment basin cannot be constructed to the required sediment storage or surface area requirements, provide a written explanation.
24. Excluding Sediment Basins that will function only during Clearing and Grubbing operations, all perimeter Sediment Basins shall be placed outside of fill slopes.

B. Final Grade Phase

1. Use correct NCDOT symbology.

2. Protect existing and proposed drainage structure inlets with RIST-A, RIST-C, PIST-A, etc.
3. Utilize adequate perimeter controls (TSD, TSF, etc.).
4. Clean Water Diversions (CWD) shall not be used to divert offsite runoff through the project construction limits.
5. Utilize TRSC-Bs or wattles to reduce velocity in existing and proposed ditches with spacing of 250 feet divided by percentage of ditch grade. Also utilize TRSC-Bs in proposed TSDs and TDs.
6. Utilize temporary slope drains and earth berms at top of fill slopes eight feet or higher and a fill slope steeper than 4:1, or where there are superelevations above 0.04 and fills are greater than five feet. Maximum slope drain spacing shall be 200 feet.
7. Utilize a rock energy dissipater at the outlet of all slope drains.
8. Devices at all drainage turnouts shall utilize skimmer or sediment control stone (TRSD-B, TRSC-A, etc.) and a spillway with an adequately designed base length to distribute outflow.
9. Sediment basins shall be sized to provide adequate silt storage for 3,600 cubic feet per disturbed acre with surface area equal to 435 square feet per cubic foot per second (cfs) of the peak inflow rate, Q25, using 25-year peak rainfall data (NCDEQ - *Erosion and Sediment Control Planning and Design Manual* or NOAA's National Weather Service website **https://hdsc.nws.noaa.gov/hdsc/pfds/** for partial duration (ARI) time series type). A Sediment Basin Designer Spreadsheet will be provided by NCDOT Roadside Environmental Unit upon request.
10. Skimmer Basins shall be sized to provide adequate silt storage for 1,800 cubic feet per disturbed acre with surface area equal to 325 square feet per cubic foot per second (cfs) of the peak inflow rate, Q25, using the 25-year peak rainfall data (NCDEQ - *Erosion and Sediment Control Planning and Design Manual* or NOAA's National Weather Service website **https://hdsc.nws.noaa.gov/hdsc/pfds/** for partial duration (ARI) time series type). Skimmer Basins shall be designed to dewater in two to three days. A Skimmer Basin Designer Spreadsheet will be provided by the NCDOT Roadside Environmental Unit upon request.
11. Design Riser Basins to the following standards:
    a. Surface Area shall be determined by Equation A (sq. feet) = Q25 (cfs) * 435.
    b. Volume requirement shall be 1,800 cubic feet per disturbed acre draining to the riser basin.
    c. Riser Pipe shall have a cross-sectional area 1.5 times that of the barrel pipe.
    d. The riser pipe shall be non-perforated with a skimmer attached to the bottom of the pipe, one foot from the bottom of the basin.
    e. See NCDEQ - *Erosion and Sediment Control Planning and Design Manual* for additional design criteria.
12. In accordance with the requirements below, install erosion control in all ditch lines, including but not limited to temporary ditch lines (TDs) utilized to divert offsite runoff around construction areas:

    - Install straw matting in all ditch lines where the velocity is greater than 2.0 feet / sec, and the shear stress is 1.25 psf or less.

- Install excelsior matting in all ditch lines with a shear stress above 1.25 psf, but not greater than 2.55 psf.
- Excluding locations where Rip Rap is not allowed (e.g. clear recovery zone, etc.), install Permanent Soil Reinforcement Mat or Rip Rap in all ditch lines with a sheer stress greater than 2.55 psf.
- At locations where Rip Rap is not allowed, install Permanent Soil Reinforcement Mat in all ditch lines with a sheer stress greater than 2.55 psf.

13. Unless otherwise approved by the Roadside Environmental Field Operations Engineer, provide matting for erosion control on all slopes (cut and fill) that are steeper than 4:1 and a height of eight feet or greater.
14. Install matting for erosion control on all disturbed slopes adjacent to jurisdictional areas regardless of height or slope. Rolled erosion control products used within wetlands or riparian areas shall be non-poly mesh nettings.
15. Along all slopes (cut and fill) that are 30 feet or higher, place parallel rows of minimum nine-inch Excelsior Wattles at a spacing height of 20 feet.
16. The minimum and maximum length to width ratio of all Sediment Basins shall be 2:1 and 6:1, respectively.
17. Coir Fiber Baffles shall be installed in all silt basins and sediment dams at drainage outlets. For silt basins with a 20-foot or longer length, three Coir Fiber Baffles shall be installed with a spacing of 1/4 the basin length. For silt basins with a length less than 20 feet, a minimum of two Coir Fiber Baffles shall be installed, with a spacing of 1/3 the basin length. The Design-Build Team will not be required to show the individual baffles on the Erosion Control Plans, but shall be required to incorporate the Coir Fiber Baffle Detail on the Erosion Control Plans.
18. During construction, provide temporary sediment basins that dewater from the surface at all permanent stormwater devices.
19. Utilize Excelsior / Coir Fiber Wattles with Polyacrylamide (PAM) and / or TRSC-As with matting and PAM in temporary and permanent, existing and proposed ditches per NCDOT *Erosion and Sediment Control Design and Construction Manual* in areas where sediment basins are not feasible at drainage outlets, and in areas where sediment basins at drainage outlets with sediment traps (i.e. PIST-A, RIST-A, etc.) cannot be properly sized to surface area and / or sediment storage requirements due to safety concerns, right of way restrictions, utility conflicts, or other construction limitations approved by the NCDOT Roadside Environmental Unit.
20. Place devices utilizing PAM at all sediment basin inlets.
21. At a maximum spacing of 200 feet, at all sag points and as directed, utilize Special Sediment Control Fence or Coir Fiber Wattles as drainage breaks in silt fence
22. Do not place erosion control devices that require excavation (i.e. sediment basins, silt ditches, etc.) in wetlands unless permitted by the Division of Water Resources 401 Certification and the Army Corps of Engineers 404 Permit.
23. Within the entire project limits, provide disturbed and undisturbed drainage area delineations in MicroStation Format.
24. For all drainage outlets where the runoff cannot be treated with a sediment basin and / or the sediment basin cannot be constructed to the required sediment storage or surface area requirements, provide a written explanation.

25. All perimeter Sediment Basins shall be placed outside of fill slopes.

C. Intermediate Phase

Intermediate Erosion Control Plans shall be required if design modifications and / or site conditions require additional erosion control design or design revisions to the RFC Clearing and Grubbing and / or RFC Final Grade Erosion Control Plans, including all detours where construction stormwater is not captured in the Erosion Control Plans. Intermediate Erosion Control Plans shall be submitted for review and shall be accepted prior to construction of any aspect impacted by the revised erosion control design. For any intermediate phase, comply with Section B, "Final Grade Phase" above.

II. Detail Sheets and Notes

A. Provide project specific special notes and details, including but not limited to, skimmer basin, coir fiber wattle with Polyacrylamide (PAM), etc.
B. Provide matting summary sheet(s): matting for erosion control (straw and excelsior), permanent soil reinforcement mat, and coir fiber mat.
C. Provide reforestation sheet(s): regular, wetland, streambank and / or buffer showing appropriate species.

III. Title Sheet

A. Show correct notes: NCG-01, HQW, ESA, clearing and grubbing, etc.
B. Show correct standards for project
C. List of standard NCDOT symbology
D. Show name and certification number of Level III certified individual responsible for designing and / or reviewing Erosion and Sedimentation Control Plans
E. Show name of primary NCDOT Roadside Environmental Unit Erosion and Sedimentation Control Plan reviewer

IV. Special Provisions

A. Erosion Control Special Provisions are available at the following website:

https://connect.ncdot.gov/resources/roadside/Pages/Soil-Water.aspx

B. References in Erosion Control Special Provisions from the aforementioned website to Method of Measurement, Basis of Payment, or any other statement regarding direct payment for Erosion & Sediment Control measures shall be disregarded.

C. *Erosion & Sediment Control / Stormwater Certification* Project Special Provision found elsewhere in this RFP.

V. Miscellaneous

A. Plan submittals shall include all pertinent design information required for review, such as design calculations, drainage areas, etc.
B. The NCDOT Roadside Environmental Unit will provide a sample set of Erosion and Sedimentation Control Plans (including any special details or special provisions used by the NCDOT Roadside Environmental Unit) and MicroStation Erosion Control Workspace to the Design-Build Team for reference upon request.
C. The Erosion and Sedimentation Control Plans shall address any environmental issues raised during the permitting process.
D. The Design-Build Team shall allow sufficient time in the proposed schedule to address any comments to the Erosion and Sedimentation Control Plans, as deemed necessary by the NCDOT Roadside Environmental Unit.
E. Temporary access and haul roads, other than public roads, constructed or used in connection with the project shall be considered a part of the project and addressed in the Erosion and Sedimentation Control Plans. Temporary access and haul roads located within the footprint and / or the right of way / easement corridor of the project shall be part of the highway Erosion and Sedimentation Control Plans. Temporary access and haul roads associated with borrow pits and staging areas shall be included in the Reclamation Plan.
F. At a minimum, the Design-Build Team shall install Floating Turbidity Curtains at ponds, lakes, and other standing water bodies, both jurisdictional and non-jurisdictional, where 1) construction activities create surface fill impacts or 2) sufficient erosion and sediment control devices cannot be installed to contain sediment and / or turbidity impacts.
G. To contain concrete waste water and associated concrete mix from washing out ready-mix trucks, drums, pumps, or other equipment, provide Concrete Washout Structures at egress points. Concrete Washout Structures must collect and retain all concrete waste water and solids so that this material does not migrate to surface waters or into the ground water. The Concrete Washout Structures are not intended for concrete waste not associated with washout operations. The Concrete Washout Structures may include devices above or below ground and / or commercially available devices designed specifically to capture concrete waste water. Concrete Washout Structure options may be found in the special provision, available at the website noted in Section IV above. For construction details of an above grade and below grade Concrete Washout Structure, reference the website noted below:

https://connect.ncdot.gov/resources/roadside/SoilWaterDocuments/ ConcreteWashoutStructuredetail.pdf

H. Borrow or waste areas that are part of the project shall require a separate Reclamation Plan, unless the borrow or waste activity is regulated under the *Mining Act of 1971*, or is a landfill regulated by the NCDEQ - Division of Waste Management (DWM). For newly created borrow pit(s) that require dewatering, Borrow Pit(s) Dewatering Basins shall be required and shall be in accordance with the applicable special provisions available at the website noted in Section IV above. The Design-Build Team shall submit the location and permit number for waste / borrow sites covered by the aforementioned Mining Act or regulated by the NCDEQ - DWM concurrently to the Design-Build Unit and the Resident Engineer. For Reclamation Procedures, see:

https://connect.ncdot.gov/resources/roadside/FieldOperationsDocuments/ ContractedReclamationProcedures.pdf

I. Whenever the Engineer determines that significant erosion and sedimentation continues despite the installation of approved protective practices, the Design-Build Team shall be required to, and shall, take additional protective action to maintain environmental compliance. In accordance with Division One found elsewhere in this RFP, all additional efforts to maintain environmental compliance shall be considered maintenance of the project and shall not be considered additional work.

J. An accepted Erosion and Sedimentation Control Plan shall not exempt the Design-Build Team from making every effort to contain sediment onsite. As directed by the Engineer, sediment losses shall be recovered and associated damages repaired. In accordance with Division One found elsewhere in this RFP, the work necessary to recover and repair areas affected by sediment losses shall be considered maintenance of the project and shall not be considered additional work.

K. Any Erosion Control Design revisions made during the construction of the project shall be submitted to the NCDOT Roadside Environmental Unit via the Design Build Unit for review and acceptance. At anytime requested by the Engineer or the NCDOT Roadside Environmental Unit, the Design-Build Team shall provide an updated version of the Erosion and Sedimentation Control Plans for distribution to all parties involved in the construction process.

L. The Design-Build Team shall comply with the North Carolina Administrative Code *Title 15A Environmental Quality* Chapter 4, Sedimentation Control.

M. A pre-submittal meeting shall take place between the NCDOT Roadside Environmental Unit Soil & Water Engineering Section, the Design-Build Team, and any other pertinent NCDOT personnel before any Erosion and Sedimentation Control Designs are submitted to the NCDOT Roadside Environmental Unit. Erosion and Sedimentation Control Plan submittals shall only be reviewed and accepted by the NCDOT Roadside Environmental Unit after the Erosion and Sedimentation Control Pre-Submittal Meeting. The Design-Build Team shall be required to submit a tentative Erosion and Sedimentation Control Plan submittal schedule at the pre-submittal meeting.

N. At a minimum, the Design-Build Team shall bring one erosion control plan sheet with a clearing & grubbing erosion control design to the Erosion and Sedimentation Control Pre-Submittal Meeting.

O. All RFC Erosion and Sedimentation Control Plans, including any red line revisions, shall be kept on site at all times throughout the duration of the project.

P. Immediately after the clearing and grubbing erosion control measures have been installed for the entire project, or for individual sections if the Design-Build Team has divided the project into construction segments, the Design-Build Team's erosion and sedimentation control designer shall field verify constructed dimensions and installation of all erosion control devices. After this initial inspection(s), the aforementioned designer shall review the project conditions a minimum of every 30 days during the heavy grading operations, and as directed by the Engineer, to verify the field conditions of disturbed areas draining to erosion control devices and to ensure that the erosion control devices provide the current field condition requirements for sediment storage and surface area. During construction, the NCDOT may conduct separate field inspections of the project conditions and the

erosion control devices. The erosion and sedimentation control designer shall make appropriate design revisions to the Clearing and Grubbing, Intermediate Erosion Control Plans and / or Final Grade Erosion Control Plans resulting from / required by the Design-Build Team and / or the Departmental field inspections for the Department's review and acceptance, in accordance with the Design-Build Submittal Guidelines. The Design-Build Team shall concurrently provide written documentation of all field verifications / inspections performed by the Design-Build Team to the NCDOT Roadside Environmental Unit, Soil and Water Engineering and Field Operations Section, and the Resident Engineer. At a minimum, this documentation shall detail what was observed during the field verification / inspection and all resulting required actions with a timeframe for implementation. The Department will determine when the project conditions no longer warrant inspections by the erosion and sedimentation control designer.

Q. The Design-Build Team's erosion and sedimentation control designer shall submit design calculations, for the Department's review and acceptance, for all modifications to the Erosion and Sedimentation Control Plans that result in dimension modifications and / or relocations, other than minor shifts to accurately place, to the devices noted below:

- Riser Basin
- Skimmer Basin and all devices with Skimmers
- Temporary Rock Sediment Dam Type A
- Temporary Rock Sediment Dam Type B
- Temporary Rock Silt Check Type A
- Culvert Construction Sequences
- Temporary and Permanent Stream Channel Relocations

R. Erosion & Sediment Control / Stormwater Certification shall be required according to the Project Special Provision found elsewhere in this RFP.

S. Prior to installation of any erosion control devices, the Design-Build Team shall verify boundaries of jurisdictional and ESA areas in the field and delineate with Safety Fence or flagging. For guidance on Safety Fence and flagging in jurisdictional areas, see:

https://connect.ncdot.gov/resources/roadside/Pages/Field-Operations-Documents.aspx

T. Once RFC Erosion and Sedimentation Control Plans are issued, any major design change or addition, any change that involves calculations, and any addition, deletion, or relocation of a sediment basin shall be submitted to the NCDOT Roadside Environmental Unit, via the Design-Build Unit, for review and acceptance. Minor changes such as moving silt fence, adding or moving temporary ditches (unless adding new runoff flow to a sediment basin), and adding or moving slope drains shall be reviewed by the Engineer in the field.

U. All erosion control measures with stone extending beyond the construction limits shall be considered temporary fill. If impacted wetland areas are permitted as Hand Clearing, then the aforementioned temporary fill shall be permitted as Temporary Fill in Hand Cleared Areas for Erosion Control. (Reference the Environmental Permits Scope of Work found elsewhere in this RFP)

V. Sediment basins that drain directly into jurisdictional water or have a total drainage area of one acre or more shall be designed and constructed with outlet structures that only withdraw water from the surface. For sediment basins that do not drain directly into jurisdictional water or have less than one acre of total drainage area, surface dewatering outlets or stone outlets may be provided.

W. In accordance with the requirements noted herein, the Design-Build Team shall be responsible for erosion control design, erosion control plans, erosion control plan implementation and maintenance of erosion control measures for all utility installation and relocation work performed by the Design-Build Team. To ensure that the Design-Build Team's erosion control designs, erosion control plan implementation and / or maintenance of erosion control measures do not conflict with the erosion control design, erosion control plan implementation and / or maintenance of erosion control measures for utility installation and / or relocation work performed by others, the Design-Build Team shall coordinate with the utility companies performing Utilities by Others (UBO) work.

X. Structural controls installed to manage construction materials stored or used on site shall be shown on the Erosion and Sedimentation Control Plans in compliance with Section F, Materials Management of the NCG010000 permit. The Design-Build Team shall conduct monthly litter pick-up and disposal of construction and non-construction waste within the project limits and as directed by the Engineer. Disposal of these waste materials shall be in accordance with solid waste management rules governing the disposal of solid waste (15ANCAC 13B).

Y. Prior to performing fertilizer application on the project within the limits of the Jordan Lake Watershed, the person(s) responsible for applying fertilizer and person(s) conducting the application of fertilizer shall complete the web-based training found at the website below and provide a certificate of completion to the Engineer.

http://www.jordanlake.org/web/jordanlake/fertilizer-management

Z. Ground Cover Stabilization Requirements - NCG010000 (7 - 14 Days)

Ground cover stabilization shall comply with the timeframe guidelines specified by the North Carolina Department of Environmental Quality, Division of Water Resources NCG-010000 General Construction Permit that became effective on April 1, 2019. Excluding the slopes noted below, temporary and permanent ground cover stabilization shall be provided within seven calendar days from the last land-disturbing activity. The Design-Build Team shall label all slopes subject to the seven-day ground cover stabilization requirements on all Erosion and Sedimentation Control Plans submitted to the Department for review and acceptance.

For the slopes noted below, temporary and / or permanent ground cover stabilization shall be provided within 14 calendar days from the last land-disturbing activity:

Slopes between 2:1 and 3:1, with a slope length of ten feet or less
Slopes 3:1 or flatter, with a slope length of 50 feet or less
Slopes 4:1 or flatter

Temporary and / or permanent ground cover stabilization shall be provided in accordance with the provisions in this RFP, the Vegetation Management Procedure developed by the Design-Build Team and the April 1, 2019 NCG-010000 General Construction Permit.

AA. Additional Ground Cover Stabilization Requirements

Once the Design-Build Team identifies the area for stabilization due to inactivity, the Design-Build Team shall obtain concurrence from the Engineer and adhere to the following options based on the estimated amount of time the area will remain inactive. If the area stabilized exceeds the estimated timeframe, the Design-Build Team shall implement the next level of stabilization as directed by the Engineer.

All application rates noted below are in pounds per acre.

Short Term Stabilization - For areas that will remain inactive for up to 21 days

Erodible areas shall be stabilized utilizing non-vegetative cover. Non-vegetative cover options include straw mulch, hydraulic applied erosion control products or rolled erosion control products. If straw mulch is used, it shall provide 100% groundcover and be tacked sufficiently to hold the mulch in place for the duration of the inactive period. All other methods shall be installed according to the manufacturer's directions.

Mid-Term Stabilization -For areas that will remain inactive for up to 90 days

Erodible areas shall be stabilized utilizing the following stabilization protocol:

March 1 - August 31	**September 1 - February 28**
50# German or Browntop Millet	50# Rye Grain or Wheat
500# Fertilizer	500# Fertilizer
4000# Limestone	4000# Limestone

At the Engineer's sole discretion, the use of limestone may be eliminated for Mid-Term (temporary) seeding. The Design-Build Team shall consult with, and obtain written approval from, the NCDOT Roadside Environmental Unit prior to eliminating limestone.

Upon obtaining written approval from the Engineer, the Design-Build Team may use wood mulch and / or ground clearing and grubbing debris as an option for Mid-Term Stabilization. If approved, the aforementioned mulch and / or debris shall be installed at a thickness that prevents erosion.

Long Term Stabilization - For areas that will remain inactive for more than 91 days

Erodible areas shall be stabilized utilizing the following stabilization protocol:

All Roadway Areas

March 1 – August 31	**September 1 – February 28**
10# Centipede *	10# Centipede *
50# Tall Fescue Cultivars **	50# Tall Fescue Cultivars **
25# Bermudagrass (hulled)	35# Bermudagrass (unhulled)
500# Fertilizer	500# Fertilizer
4000# Limestone	4000# Limestone

* On cut and fill slopes 2:1 or steeper, the Design-Build Team shall apply centipede at a rate of five pounds per acre.

Riparian and Wetland Locations

March 1 - August 31	**September 1 - February 28**
18# Creeping Red Fescue Cultivars ***	18# Creeping Red Fescue Cultivars ***
6# Indiangrass	6# Indiangrass
8# Big Bluestem	8# Big Bluestem
4# Switchgrass	4# Switchgrass
25# German or Browntop Millet	35# Rye Grain
500# Fertilizer	500# Fertilizer
4000# Limestone	4000# Limestone

Waste and Borrow Areas

March 1 – August 31	**September 1 – February 28**
75# Tall Fescue Cultivars **	75# Tall Fescue Cultivars **
25# Bermudagrass (hulled)	35# Bermudagrass (unhulled)
500# Fertilizer	500# Fertilizer
4000# Limestone	4000# Limestone

**** Approved Tall Fescue Cultivars**

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

***** Approved Creeping Red Fescue Cultivars**

Aberdeen
Boreal
Epic
Cindy Lou

From January 1 - December 31, the Design-Build Team shall apply an additional 20# of Sericea Lespedeza on cut and fill slopes 2:1 or steeper.

Fertilizer shall be 10-20-20 analysis or a different analysis that provides a 1-2-2 ratio applied at a rate that provides the same amount of plant food as a 10-20-20 analysis and as directed.

Soil Analysis

If vegetation establishment indicates a deficiency in soil nutrients or an incurred pH level is present, the Design-Build Team shall take soil samples and apply additional soil amendments to the affected area and as directed by the Engineer.

Fertilizer Topdressing

In accordance with the requirements noted below, the Design-Build Team shall apply a minimum of one Fertilizer Topdressing application to all permanently seeded areas immediately prior to completion of the project, twice during every growing season from April 1st through September 30th, and at other times as directed by the Engineer.

Fertilizer used for topdressing shall be 10-20-20 analysis applied at a rate of 500 pounds per acre; or a different analysis that provides a 1-2-2 ratio applied at a rate that provides the same amount of plant food as a 10-20-20 analysis and as directed by the Engineer.

Fertilizer used for waste and borrow areas shall be 16-8-8 grade applied at a rate of 500 pounds per acre; or a different analysis that provides a 2-1-1 ratio applied at a rate that provides the same amount of plant food as a 16-8-8 analysis and as directed by the Engineer.

Supplemental Seeding

For all supplemental seeding, the kinds of seed and proportions shall be the same as specified above for *Long Term Stabilization*, with the exception that centipede seed shall not be allowed in the seed mix. The rate of application for supplemental seeding shall be between 25# to 75# per acre. Prior to topdressing, the Design-Build Team shall determine the actual rate per acre for supplemental seeding and submit the supplemental seeding rate and areas to the Department for review and acceptance.

To prevent disturbance of existing vegetation, minimum tillage equipment, consisting of a sod seeder, shall be used to incorporate seed into the soil where degree of slope allows. Where degree of slope prevents the use of a sod seeder, a clodbuster (ball and chain) may be used.

Mowing

At a minimum, the Design-Build Team shall mow areas not under active construction within the project limits within 14 calendar days prior to the Memorial Day, Independence Day, Labor Day, and Veterans Day holidays, and as directed by the Engineer. Monthly litter management cleanups shall be timed to occur just prior to planned mowing activities. With prior written approval, mowing dates may be modified to occur with Division mowing cycles with prior approval. The Design-Build Team shall conduct an additional project mowing prior to final acceptance as directed by the Engineer. The minimum mowing height shall be four inches.

EROSION CONTROL COORDINATION MEETINGS

Preliminary Construction Meeting

Prior to any land disturbing activity, the Engineer will schedule a meeting with Division construction personnel, Design-Build Team senior management, Design-Build Team project staff, NCDOT project staff, consultant engineering / inspection staff, NCDOT Construction Unit, NCDOT Roadside Environmental Unit, Land Quality, Department of Water Resources and any other party associated with activities that impact the overall effectiveness of the project's erosion control.

During this meeting, the attendees shall review the Design-Build Team's Traffic Control Plans and identify potential erosion control issues. All attendees will provide comments, recommendations and supportive information to help facilitate resolution to the aforementioned potential erosion control issues.

Construction Meetings

Once construction begins, the Engineer will schedule monthly meetings to review the erosion control status. All parties listed above for the Preliminary Construction Meeting shall participate in these monthly construction meetings.

During the construction meetings, the erosion control efforts / issues to date will be reviewed and discussed. Additionally, the upcoming construction phases will be reviewed to identify potential erosion control issues. After the construction meeting, a project review may occur to identify site specific issues and identify solutions. The Design-Build Team shall be responsible for all actions, corrections and / or resolutions resulting from the construction meetings and / or subsequent site visits.

The NCDOT senior management will discuss issues that are repeatedly identified on inspection reports and / or discussed during the construction meetings with the Design-Build Team's senior management.

If project activities do not change the erosion control status / conditions, the Engineer may elect to change the construction meeting frequency or cancel a meeting.

EROSION CONTROL DAMAGES

The Design-Build Team shall observe and comply with Federal and State Laws, Local Laws, Ordinances, and Regulations; as well as Orders and Decrees of Bodies having any jurisdiction or authority in accordance with Section 107 of the 2018 NCDOT *Standard Specifications for Roads and Structures*.

The Design-Build Team shall take all reasonable precautions to comply with all regulations of all authorities having jurisdiction over public and private land governing the protection of erosion and sedimentation. Any fines, remediation required or charges levied against the Department for failing to comply with all rules and regulations concerning erosion and sediment control, due to the Design-Build Team's negligence, carelessness, or failure to implement the Erosion and Sedimentation Control Plans and Specifications; or failure to maintain an approved Storm Water Pollution Prevention Plan (SWPPP), regardless of absence of neglect, shall be deducted from monies due the Design-Build Team. In addition to said fines, remediation required, or charges levied, any associated engineering costs or actions taken by the Department in order for the Department to comply with rules and regulations, as a result of the Design-Build Team's negligence, carelessness, or failure to implement the Erosion and Sedimentation Control Plans and Specifications; and / or the SWPPP, regardless of absence of neglect, shall be deducted from the monies due to the Design-Build Team.

GEOTECHNICAL ENGINEERING SCOPE OF WORK (5-25-21)

I. GENERAL

All geotechnical data, tests, computations and supporting subsurface investigations and documentation submitted by the Design-Build Team shall be provided in English Units.

Obtain the services of a firm prequalified for geotechnical work by the NCDOT Geotechnical Engineering Unit. A list of prequalified firms and the Discipline Code requirements can be found at the websites noted below:

https://www.ebs.nc.gov/VendorDirectory/search.html?s=pc&a=new

https://connect.ncdot.gov/resources/Geological/Pages/default.aspx

The prequalified geotechnical firm shall use the personnel and office location(s) that were submitted to the Department for their latest prequalification approval.

The prequalified geotechnical firm shall prepare foundation design recommendation reports for use in designing structure foundations, roadway foundations, retaining walls, sound barrier foundations, overhead sign structure foundations, and temporary structures.

The Engineer of Record who prepares the foundation design recommendation reports shall be a Professional Engineer registered in the State of North Carolina who has completed a minimum of three geotechnical design projects of scope and complexity similar to that anticipated for this project using the load and resistance factor design (LRFD) method and in accordance with the latest edition of the AASHTO *LRFD Bridge Design Specification*.

The prequalified geotechnical firm shall also determine if additional subsurface information, other than that required and noted elsewhere in this RFP, is required based upon the subsurface information provided by the NCDOT and the final roadway and structure designs. If a determination is made additional subsurface information is required; the Design-Build Team shall use a prequalified geotechnical firm to perform all additional subsurface investigation and laboratory testing in accordance with the current NCDOT Geotechnical Engineering Unit *Guidelines and Procedures Manual for Subsurface Investigations*. Submit additional information collected by the Design-Build Team to the Geotechnical Engineering Unit, via the Design-Build Unit, for review and acceptance. The Design-Build Team shall provide the final Subsurface Investigation report in electronic and hardcopy format to the NCDOT for its records.

Unless noted otherwise herein, the Design-Build Team shall design foundations (except for sign foundations), embankments, slopes, retaining walls, and sound barrier walls in accordance with the current edition of the AASHTO *LRFD Bridge Design Specifications*, NCDOT *LRFD Driven Pile Foundation Design Policy*, all applicable NCDOT Geotechnical Engineering Unit Standard Provisions, NCDOT *Structures Management Unit Manual* and NCDOT *Roadway Design Manual*. The NCDOT *LRFD Driven Pile Foundation Design Policy* is located on the NCDOT Geotechnical Engineering Unit's website at:

https://connect.ncdot.gov/resources/Geological/Pages/default.aspx

For *Geotechnical Guidelines for Design-Build Projects*, the Design-Build Team shall adhere to the guidelines located at the following website:

https://connect.ncdot.gov/letting/Pages/Design-Build-Resources.aspx

A minimum of two standard penetration test (SPT) / rock core borings shall be required per bent for all bent lengths of 50 feet or less. Additional SPT / rock core borings shall be required across the roadway typical section for each bent more than 50 feet long and the borings shall be spaced no greater than 50 feet apart. All borings for pile-supported bents shall be located within 25 feet of the centerline of each bent location to be counted for these minimum requirements. All borings for bents with spread footing or drilled pier foundations shall be performed at opposite ends of each bent, but not greater than 50-feet apart along the bent line as required by bent length noted above, to be counted for these minimum requirements. For structure sites with multiple bridges, borings may be performed between bridges along the bent projection provided the distance between any two borings does not exceed 50 feet. The Design-Build Team shall extend all borings to a depth of 15 feet or four foundation element diameters, whichever is greater, below the foundation element to show a complete subsurface profile. The Design-Build Team shall be responsible for obtaining the borings noted above for all bents where subsurface information is not sufficient or is warranted by variability in the geology unless the prequalified geotechnical firm submits documented justification that the subsurface investigation provided by the NCDOT is adequate for design purposes and the justification is acceptable to the Department. Any deviations to the requirements noted above shall require acceptance from the NCDOT Geotechnical Engineering Unit prior to the foundation design submittal.

The maximum spacing between borings for retaining walls and sound barrier walls shall be 100 feet, with a minimum of two borings; one at each end of the wall. Drill borings for retaining walls a minimum depth below the bottom of the wall equal to twice the maximum wall height. Boring depths for sound barrier walls shall be to a minimum depth below the bottom of the wall equal to the maximum wall height or to SPT refusal.

II. ADDITIONAL DESIGN REQUIREMENTS

A. Structure Foundations

Spread footings shall not be allowed on residual Triassic soils. Placing spread footings on the Triassic rock (weathered and non-crystalline) requires checking the field conditions for the required bearing capacity and placing concrete within 24 hours after the excavation is completed. If concrete cannot be placed within 24 hours, a lean concrete mud slab shall be placed to help protect the bearing material. Water shall not be allowed to pool within the excavation.

- Permanent steel casings shall be required for drilled piers that are constructed in six inches or more of water. Permanent steel casings shall also be required for drilled piers constructed on stream banks and within ten feet of the top of stream banks.

- When the weathered rock or rock elevation is below the 100-year hydraulic scour elevation, the 100-year and 500-year design scour elevations are equal to the 100-year and 500-year hydraulic scour elevations from the structure survey report developed by the Design-Build Team and accepted by the NCDOT Hydraulics Unit. When the weathered rock or rock elevation is above the 100-year hydraulic scour elevation, the 100-year design scour elevation may be considered equal to the top of the weathered rock or rock elevation, whichever is higher, and the 500-year design scour elevation may be set two feet below the 100-year design scour elevation.

- End bent fill slopes up to 35 feet in height (defined as the difference between grade point elevation and finished grade at toe of slope) shall be 1.5:1 (H:V) or flatter. End bent fill slopes with heights greater than 35 feet shall be 2:1 (H:V) or flatter. All end bent cut slopes located in Triassic soil shall be 3:1 (H:V) or flatter. All other end bent cut slopes shall be 2:1 (H:V) or flatter. All end bent slope protection shall be in accordance with the Structures Management Unit Standard Drawings SP1or SP2.

- Analyze drilled pier and pile bent foundations using either LPile or FB-Pier. Design drilled piers and vertical piles in pile bents with a sufficient embedment in soil and / or rock to achieve “fixity”.

- For box culverts, the Design-Build Team shall submit details for undercut of unsuitable material or recommendations for use of more than one foot of conditioning material to the NCDOT Geotechnical Engineering Unit, via the Design-Build Unit, for review and acceptance.

- Excluding retaining walls that eliminate impacts to the existing Duke Energy Transmission Tower in Quadrant B of the I-40 / NC 86 (Martin Luther King, Jr. Boulevard) interchange, and raising the headwall of the Rocky Run culvert a maximum of 3’-0”, retaining walls or taller headwalls / end walls shall not be used to reduce the length of proposed culverts and or the length of culvert extensions.

- Installation of concrete cylinder piles for bridge foundations shall adhere to the following requirements:

    - Excluding the last five feet to be driven, if hammer blows exceed 120 blows per foot, the Design-Build Team shall stop driving the pile and 1) remove the soil plug in the pile to an elevation three feet above the pile toe / tip and / or 2) perform spudding inside the concrete cylinder pile with a closed ended steel pipe pile having a minimum wall thickness of one inch. After

the plug has been removed and / or spudding has been performed, the Design-Build Team may continue driving the pile.

- The last five feet of the cylinder pile shall be driven with no disturbance to the soil plug.

- The material removed from inside the cylinder pile shall be contained and disposed of in accordance with the applicable permits.

- Add steel pile points and cutting shoes to all driven steel H-piles and all driven open-ended pipe piles driven into weathered rock and / or rock, respectively.

B. Roadway Foundations

- This project is located in the vicinity of the Triassic basin consisting of irregularly bedded sandstone, siltstone, and mudstone; partly micaceous and feldspathic in composition formed in the Triassic Age. These Triassic soils have high slaking potential and degrade when exposed to air and / or water. Borrow material or unclassified excavation containing Triassic soils or Triassic rock (weathered and non-crystalline) shall not be used on the project for any purpose and shall not be wasted within the NCDOT right of way and / or property. Existing Triassic material within the projects limits that will not be excavated may remain in place.

- Unless noted otherwise herein, all unreinforced proposed fill slopes and cut slopes, except bridge end bent slopes (Reference Section A - Structure Foundations), shall be 2:1 (H:V) or flatter.

- Excluding cuts within Triassic rock (weathered and non-crystalline), all proposed cut slopes located within the Triassic Basin shall be 3:1 (H:V) or flatter.

- Cuts within non-Triassic Rock (≥ 60 blows / 0.1') shall be 1:1 (H:V) or flatter, unless otherwise approved by the Department, in writing. Rock cuts steeper than 1:1 (H:V) shall only be used if detailed design calculations and a slope stability analysis are submitted to the NCDOT Geotechnical Engineering Unit, via the Design-Build Unit, for review and acceptance prior to construction.

- Cuts within Triassic rock (weathered and non-crystalline) shall adhere to the following requirements:

  - 3:1 (H:V) or flatter - no additional treatment required.

  - 2:1 (H:V) up to, but not including, 3:1 (H:V) - use rock plating per Roadway Standard Drawing No. 275.01

- 1:1 (H:V) up to, but not including, 2:1 (H:V)
    - Use either 1) an anchored cast-in place concrete facing on the rock face that includes a drainage medium between the concrete facing and the rock face with 100 percent coverage, or 2) use a vertical or near vertical wall in front of the rock cut using coarse and / or fine aggregate between the wall and the rock face.
    - **** NOTE **** Deleted subbullet on design strength parameter requirements for the selected aggregate.
    - The wall design shall handle drainage of perched water and ground water found within fissures / seams in the rock.

- Reinforced soil slopes shall only be used to minimize impacts to existing structures, and / or cultural, historical or otherwise protected landmark or topographic features. All reinforced soil slopes shall meet the requirements of Geotechnical Standard Details 1803.1 and / or 1803.2 unless detailed design calculations and a slope stability analysis are submitted for review and accepted by the Department prior to construction.

- In accordance with the project specifications, Roadway Standard Drawings, and the Erosion and Sedimentation Control Scope of Work found elsewhere in this RFP, provide drainage recommendations including but not limited to the need for lateral ditches, underdrains, etc. for the new I-40 through lanes, existing mainline through lanes, and all -Y- Lines, ramps, loops and service roads designed and constructed on new location, excluding the transitions required to tie to existing to meet the following conditions:
    - Maintain a minimum three-foot vertical separation between the groundwater table and the bottom of the pavement structure (asphalt base course / ABC) or Type 1 Aggregate Subgrade Stabilization, where required (Reference the Pavement Management Scope of Work found elsewhere in this RFP)
    - Coarse aggregate (No. 57 stone) shall be used for subsurface / pipe underdrains and shoulders.

- Calculate and report estimated settlement and rate of settlement at bridge approach embankments within 250 feet of end bents. Add wait periods, settlement monitoring, and soil improvement techniques that keep long term settlements equal to or less than one inch prior to performing fine grading of the subgrade.

- A minimum of two embankment settlement gages shall be required at each end bent when a waiting period of more than one month is recommended in the foundation design recommendation reports developed by the Design-Build Team. Install

settlement plates at least one foot below original grade and begin monitoring prior to placing the first lift of the embankment.

- Calculate and report estimated settlement and rate of settlement for roadway embankments. Add wait periods, settlement monitoring, and soil improvement techniques that keep long term settlements equal to or less than four inches prior to performing fine grading of the subgrade.

- Where computed settlement is greater than four inches in roadway embankments, monitor settlement across the width of the embankment at a maximum spacing interval of 250 feet using settlement gages or other approved methods.

- Soil improvement techniques that mitigate long term settlement problems or transfer the embankment load to a deeper bearing stratum are acceptable means to accelerate construction. All soil improvement techniques shall follow the current industry standard practices and the guidelines of *Ground Improvement Methods FHWA publication NHI-04-001* or *Geosynthetic Design and Construction Guidelines FHWA-HI-95-038.*

- Mitigate all unsuitable soils to the extent required to improve the stability of the proposed embankment or subgrade. Use any suitable material to backfill undercut areas except when employing shallow undercut in accordance with Section 505 of the NCDOT 2018 *Standard Specifications for Roads and Structures* which requires the use of Select Material, Class IV. For undercut backfilling in water, use Select Material, Class III.

- Conduct proofrolling in accordance with Section 260 of the 2018 *Standard Specifications for Roads and Structures*. A minimum load capacity of 35 tons shall be required. In areas where proofrolling fails or is not practical, the Engineer will conduct DCP testing in accordance with the following:

    - Where Type 1 aggregate subgrade is required, the Engineer will conduct DCP testing on the soils beneath the Type 1 aggregate subgrade at a spacing of 100 feet when the Design-Build Team has notified the Department that the aggregate subgrade location has been prepared for geotextile for pavement stabilization placement (Reference the Pavement Management Scope of Work, the *Aggregate Subgrade* Standard Special Provision, and the *Geotextile For Pavement Stabilization* Project Special Provision found elsewhere in this RFP). If the DCP tests indicate poor soils beneath the required eight-inch Type 1 aggregate subgrade, the Engineer will provide direction to increase the thickness of the Class IV subgrade stabilization prior to placing the geotextile for pavement stabilization. Payment of the additional Type 1 aggregate subgrade (below the eight inches required) will be paid for as extra work in accordance with Subarticle 104-8(A) of the 2018 *Standard Specifications for Roads and Structures* at the unit price of $50.00 per cubic yard (in place volume). This payment will be considered

full compensation for the additional subgrade undercut, removal and proper disposal of the undercut material, and the placement and compaction of the additional Class IV subgrade stabilization below eight inches.

- Where Type 1 aggregate subgrade is not required, the Engineer will conduct DCP testing on the soils beneath the pavement base at a spacing of 100 feet when the Design-Build Team has notified the Department a location has been prepared (Reference the Pavement Management Scope of Work found elsewhere in this RFP). If the DCP tests indicate poor soils beneath the pavement base, the Engineer will provide direction to undercut and place Class IV subgrade stabilization. Payment of the Class IV subgrade stabilization for these undercut areas deeper than eight inches will be paid for as extra work in accordance with Subarticle 104-8(A) of the 2018 *Standard Specifications for Roads and Structures* at the unit price of $50.00 per cubic yard (in place volume). This payment will be considered full compensation for the subgrade undercut below eight inches, removal and proper disposal of the undercut material, and the placement and compaction of the Class IV subgrade stabilization below eight inches.

- The Design-Build Team is cautioned that some of the existing embankments on the project contain rock fill. It is anticipated that the size of the material ranges from gravel to boulders, with the parent material consisting of crystalline and non-crystalline rock that can have unconfined compressive strengths exceeding 10,000 psi. The Design-Build Team shall consider the existence of this material when performing jack and bore activities and develop construction methods that minimize risk of roadway settlement. The Design-Build Team shall be responsible for all activities, as deemed necessary by the Department, to repair any roadway settlement caused by jack and bore operations. The Department will not honor any requests for additional contract time or compensation for completion of the aforementioned repairs, including but not limited to repairs resulting from rock fill in the existing embankments. At a minimum, the Design-Build Team shall perform the following activities at all jack and bore locations:

  - Along the outside and median edges of travel, set elevation points at ten-foot on center for a distance equal to twice the maximum fill height or 30 feet, whichever is greater, on each side of the centerline of the proposed pipe to be installed by jack and bore operations.
  - Obtain pavement elevations at the aforementioned points no more than seven days prior to beginning jack and bore operations, and continue daily while jack and bore operations are ongoing.

  If the total settlement at any point exceeds two inches, the Design-Build Team shall immediately suspend jack and bore activities at that site and notify the Engineer and the Design-Build Unit, in writing. The Design-Build Team shall submit a Remediation Plan to the Geotechnical Unit, via the Design-Build Unit, that details 1) revisions to the Design-Build Team's current jack and bore operations, 2) how

the revisions will address settlement, and 3) how the settlement will be repaired. Prior to resuming jack and bore operations at the site, the Remediation Plan shall be reviewed and accepted by the Department, all settlement repairs shall be completed, and all required revisions to the Design-Build Team's jack and bore operations shall be implemented. The Department will not honor any requests for additional contract time or compensation for settlement repairs or required revisions to the Design-Build Team's jack and bore operations.

C. Permanent Retaining Wall Structures

- Retaining walls or abutment walls will not be allowed at any location where more than five feet of scour is calculated at the base of the wall.

- For design and construction of mechanically stabilized earth (MSE) retaining walls, refer to the NCDOT *Policy for Mechanically Stabilized Earth Retaining Walls* which can be found at the NCDOT Geotechnical Engineering Unit's website at:

  https://connect.ncdot.gov/resources/Geological/Pages/Products.aspx

- With the exception of walls covered by a Geotechnical Engineering Unit Standard Detail, design and construct permanent retaining walls in accordance with the applicable NCDOT Geotechnical Engineering Unit Project Special Provisions, which can be provided upon request by the Design-Build Team. Geotechnical Provisions and Notes can be found at the NCDOT Geotechnical Engineering Unit's website at:

  https://connect.ncdot.gov/resources/Geological/Pages/Geotech_Provisions_Notes.aspx

- Submit a wall layout and design for each retaining wall. The wall layout submittal shall include at least the following.

  - Wall envelope with top of wall, bottom of wall, existing ground, and finished grade elevations at incremental stations
  - Wall alignment with stations and offsets
  - Typical sections showing top and bottom of wall, drainage, embedment, slopes, barriers, fences, etc.
  - Roadway plan sheets showing the wall (half size)
  - Roadway cross sections sheets showing the wall (half size)
  - Traffic Control Plans showing the wall (half size)

- For project retaining walls requiring a design not covered by a Geotechnical Engineering Unit Standard Drawing, the wall layout submittal shall also include the following:

    - Calculations for sliding, overturning, bearing capacity, global stability, and settlement.
    - Details of conflicts with utilities and drainage structures

- Locate retaining walls at toes of slopes unless restricted by right of way limits. The Design-Build Team shall submit global stability calculations for slopes at retaining walls and obtain acceptance from the NCDOT prior to construction. All slopes behind walls shall be as required elsewhere in this Scope of Work.

- Cut wall (e.g., soil nail walls, soldier pile walls) anchors (where necessary) shall be located within the project right-of-way.

- Due to Triassic soils, special consideration for anchor design bond strength shall be required. Low values should be anticipated. If needed to provide anchors within acceptable lengths, the Design-Build Team shall use special methods that increase the bond strength.

- Drainage over the top of retaining walls and sags in the top of walls shall not be allowed. Direct runoff above and below walls away from walls, if possible, or collect runoff at the walls and transmit it away. Curb and gutter or cast-in-place single faced barrier with paving up to the wall shall be required when runoff cannot be directed away from the back or front of the wall. In accordance with the NCDOT Roadway Design Manual - Section 6-7A, Figure 3, the Design-Build Team shall design and construct a paved concrete ditch, with a minimum 12-inch depth, at the top of all retaining walls with slopes draining towards the wall, and a four-foot bench between the wall and fill / cut slopes steeper than 6:1 (H:V).

- Precast or cast-in-place coping shall be required for walls without a cast-in-place face with the exception of when a barrier is integrated into the top of the wall. Extend coping or cast-in-place face a minimum of 12 inches above where the finished or existing grade intersects the back of the wall.

- Excluding abutment retaining walls, provide a six-foot chain-link fence or handrail, as directed by the Engineer, on top of the facing, coping or barrier, or immediately behind, all proposed walls and existing walls to remain in place that are a minimum of 30.0” tall.

- When using abutment retaining walls with deep foundations, the end bent deep foundation shall be designed and constructed with one of the following.

    - A single row of plumb piles with brace piles battered toward the wall
    - A single row of plumb piles with MSE reinforcement connected to the back of the cap
    - An integral abutment with a single row of plumb piles and no reinforcement connected to the back of the cap in accordance with FHWA GEC 11 pages 6-8 through 6-10
    - Drilled piers

- All deep foundations for end bents with abutment retaining walls shall extend a minimum of ten feet below the retaining wall foundation or leveling pad. For drilled-in piles behind such retaining walls, the penetration can be reduced to five feet below the bottom of the wall provided the Design-Build Team analyzes and determines that the vertical piles are "fixed" in natural ground such that the decrease in pile embedment shall not significantly increase the top deflection under lateral loading. The calculations and supporting documentation for this analysis shall be reviewed and approved by the NCDOT prior to construction.

D. Temporary Structures

- Design temporary retaining structures, which include earth retaining structures and cofferdams, in accordance with current allowable stress design AASHTO *Guide Design Specifications for Bridge Temporary Works*, the *Temporary Shoring* Standard Special Provision found elsewhere in this RFP and the applicable NCDOT Project Special Provisions available upon request by the Design-Build Team. The only submittal required to use the standard sheeting design is the "Standard Shoring Selection Form".

- Traffic control barrier on top of walls shall be in accordance with the NCDOT Work Zone Traffic Control Unit details available upon request by the Design-Build Team. If anchored barrier is required, then anchor the barrier in accordance with NCDOT 2018 Roadway Standard Drawing No. 1170.01.

III. ADDITIONAL CONSTRUCTION REQUIREMENTS

- Prior to incorporating recommended remedial measures into the project, the Design-Build Team shall investigate, propose, and submit proposed remedial measures for any construction problems related to the following to the NCDOT Geotechnical Engineering Unit for review and be accepted prior to construction.

    - Foundations
    - Retaining walls
    - Sound barrier walls
    - Subgrades

  - Settlement
  - Slopes
  - Construction vibrations

- The prequalified geotechnical firm which prepares the foundation designs shall review and approve all pile driving hammers and drilled pier construction sequences. After the prequalified geotechnical firm has approved these submittals, the Design-Build Team shall submit them to the NCDOT for review and be accepted prior to beginning construction. Hammer approvals shall be submitted prior to performing any pile driving and shall be performed using GRLWEAP Version 2010 or later.

- The prequalified geotechnical firm which prepares the original foundation designs shall be responsible for any necessary changes to the foundation designs revising analysis, recommendations, and reports as needed. All changes shall be based upon additional information, subsurface investigation and / or testing. Send copies of revised designs, including additional subsurface information, calculations and any other supporting documentation to the NCDOT for review and acceptance.

- The prequalified geotechnical firm which prepares the embankment design for a bridge or roadway fill shall review any necessary settlement monitoring data (at least weekly during fill placement and a minimum of biweekly once full height is achieved) and provide monthly updates to the NCDOT Geotechnical Engineering Unit, via the Design-Build Unit. This same firm will issue a release letter ending the wait period for an embankment fill once the settlement criteria listed elsewhere in this RFP is met. Settlement monitoring data and recommendations shall be submitted to the NCDOT Geotechnical Engineering Unit, via the Design-Build Unit, for review and acceptance prior to issuing a release letter.

- The Design-Build Team shall be responsible for any damage and / or claim caused by construction, including but not limited to damage caused by vibration (see Article 107-14 of the NCDOT 2018 *Standard Specifications for Roads and Structures*). The Design-Build Team shall be responsible for deciding if any pre- and post-construction monitoring and inventories need to be conducted. Any monitoring and inventory work shall be performed by a prequalified consulting firm.

- Prequalification of contractors is not required for pile excavation or drilled-in pile holes that are 30 inches in diameter or less. Class A concrete or grout shall be required to backfill holes for drilled-in piles.

- Use Pile Driving Analyzer (PDA) testing on a minimum of two production piles for each pile size and type for each bridge with driven piles using the approved hammer driving system for the pile. The two test piles shall not be located at the same bent to meet this requirement. Each PDA tested pile shall be driven to the maximum RDR for the end bent / bent(s) the PDA tested pile covers. The spacing

between PDA tested piles shall not exceed 200 feet and at least one PDA tested pile shall be located at an end bent. Additional PDA testing shall be performed at other end bent / interior bents as needed to stay within the maximum spacing requirement. Changes in hammer driving systems and / or additional similar hammer driving systems shall require additional PDA testing. Additional PDA testing may be warranted based on AASHTO LFRD Bridge Design Specifications and shall be recommended as needed by the geotechnical foundation design engineer and submitted to the NCDOT for review and acceptance. Dual bridges shall not be considered as a single bridge when determining the amount and location of PDA testing.

- A prequalified PDA consultant shall perform the required PDA testing, provide PDA reports, and develop pile driving criteria. All PDA consultants shall be prequalified a minimum of 30 days prior to performing any pile driving on the project. Geotechnical Contractor Prequalification requirements can be found at the NCDOT Geotechnical Engineering Unit's website at:

  https://connect.ncdot.gov/resources/Geological/Documents/ 19-05-01_Contractor%20Prequalification%20Requirements.pdf

- PDA reports shall conform to the current NCDOT requirements and format and be signed and sealed by a Professional Engineer registered in the State of North Carolina who meets the experience requirements for the PDA Engineer in responsible charge of the PDA report. In addition, the recommendations within the PDA report shall address the cause of any Integrity Factor (BTA) values less than 100 and clarify the condition of the pile. PDA reports with driving criteria recommendations shall be reviewed and accepted by NCDOT prior to driving any production piles at the end bents / bents the PDA tested pile covers. PDA reports for miscellaneous piles tested to confirm ultimate resistance or acceptable pile integrity shall be reviewed and accepted by NCDOT prior to incorporating the pile into an end bent, bent or footing.

- For drilled piers the following shall apply:

  - Use current NCDOT inspection forms for drilled piers available on the NCDOT Geotechnical Engineering Unit's webpage. Construct and inspect drilled piers in accordance with Section 411 of the 2018 NCDOT *Standard Specifications for Roads and Structures* and the *Drilled Piers* Project Special Provision located on the NCDOT Geotechnical Engineering Unit's website.

  - The Department will inspect drilled piers using the Shaft Inspection Device (SID) for any pours using the wet method of concrete placement and for any drilled pier excavations that cannot be visually inspected or have remained open longer than 24 hours that cannot be dewatered due to unstable soil or rock.

- The Design-Build Team shall notify Matt Hilderbran, PE by e-mail (mrhilderbran@ncdot.gov) a minimum of five days prior to required SID testing, followed by a confirmation two days prior to required SID testing. The Design-Build Team shall notify Matt Hilderbran of all SID testing cancellations as soon as possible at the e-mail address noted above and at (919) 329-4015.

- Install Crosshole Sonic Logging (CSL) tubes in all drilled piers. CSL test a minimum of 25% of drilled piers at each bridge or one per bent, whichever is greater. If a CSL test identifies any defect in the drilled pier, the Department has the right to request additional CSL testing and / or tomography as needed. The Department will determine which piers will be CSL tested. Submit CSL and tomography test information and results to the Geotechnical Engineering Unit, via the Design-Build Unit, for review and acceptance.

- Drilled pier tip elevations shall not be changed during construction unless the prequalified geotechnical firm which prepares the bridge foundation design redesigns the drilled pier from either an SPT / rock core boring, performed in accordance with ASTM standards at the subject pier location, or observations of the drilled pier excavation. If a drilled pier is designed based on a boring, do not drill a boring inside an open drilled pier excavation. Locate the boring within three pier diameters of the center of the subject pier and drill to a depth of two pier diameters below the revised tip elevation. If a drilled pier is redesigned based upon observations of the drilled pier excavation, the geotechnical engineer of record shall be present during the excavation to determine the actual subsurface conditions.

- The geotechnical grade point shall be defined as the location where the proposed subgrade and natural ground intersect. At all geotechnical grade points, the Design-Build Team shall undercut the existing soils within two feet of the bottom of the proposed subgrade in accordance with the requirements below:

  - The undercut shall extend along the profile to a point where the elevation difference from the bottom of the proposed subgrade to natural ground is greater than two feet, or to 25 feet on each side of the geotechnical grade point, whichever is less.

  - The lateral extent of the undercut shall extend to a point where the elevation difference from the bottom of the proposed subgrade to natural ground is greater than two feet or to one foot outside of the paved shoulder / face of curb of the proposed roadway typical section, whichever is less.

  - The base of the undercut shall parallel the proposed subgrade.

- Send copies of any inspection forms related to foundations, settlement, sound barrier walls, or retaining wall to the NCDOT for review and acceptance.

HYDRAULICS SCOPE OF WORK (7-12-21)

Project Details

- The Design-Build Team shall employ a private engineering firm(s) to perform hydraulic design for all work required under this contract. The private engineering firm must be prequalified for Tier II hydraulic design work under the Department's normal prequalification procedures prior to the Technical Proposal submittal date.

- The Design-Build Team shall hold a pre-design meeting with the Design-Build Unit and Hydraulics Review Engineer after acceptance of the Preliminary Roadway Plans developed by the Design-Build Team.

Storm Drainage System Design

- The Design-Build Team shall design all storm drainage systems using Geopak Drainage, including but not limited to incorporating discharges from allowable routing programs.

- Raised median island cuts will not be allowed.

- Slotted concrete median barrier will not be allowed for permanent installations.

- Excluding I-85 southbound / I-40 westbound west of SR 1134 (Dimmocks Mill Road), the Design-Build Team shall remove all existing 6" x 8" concrete curb and flumes and associated drainage structures, including but not limited to existing slope drains, and replace with shoulder berm gutter and appropriate drainage structures throughout the project construction limits.

- Within the I-40 and I-40 / I-85 existing and proposed right of way, including ramp and loop right of way, the Design-Build Team shall repair all damaged concrete aprons at existing drop inlets that are not being replaced.

- All drainage system improvements shall be contained within the right of way. When tying directly to existing downstream systems located outside the right of way that are hydraulically deficient during the design storm, the Design-Build Team shall provide an Open Throat Catch Basin (OTCB) or 2GI within the right of way limits.

- The Design-Build Team shall use a minimum ditch grade of 0.3% and avoid constructing ditches in wetlands.

- At a minimum, the Design-Build Team shall install traffic bearing grated drop inlets with steel frames and flat steel grates at the following locations:

  - Within a temporary travel lane
  - Within four feet of a temporary and / or permanent travel lane

- Existing and proposed longitudinal pipe (trunkline) shall not be located beneath the proposed roadway travel lanes or beneath proposed barrier rails.

- At all pipe outlets with a ten-year partial flow velocity greater than 15 fps, the Design-Build Team shall provide additional outlet protection that mitigates erosive velocities to receiving downstream channels.

Hydraulic Spread

- The hydraulic spread shall not encroach into any operational lane beyond the limits noted below:

  - For roadways with shoulders, including those with expressway gutter and shoulder berm gutter, the hydraulic spread shall not encroach into a permanent travel lane and shall not encroach more than two feet into an operational temporary travel lane.

  - For all other roadways, the hydraulic spread shall not exceed the values specified in Table 10-1 of the current *North Carolina Division of Highways Guidelines for Drainage Studies and Hydraulics Design*.

  - For bridges on alignments with design speeds greater than 45 mph, the hydraulic spread shall not encroach into an operational permanent or temporary through lane on a bridge.

  - For bridges on alignments with design speeds less than or equal to 45 mph, the hydraulic spread shall not encroach more than four (4) feet into an operational permanent or temporary through lane.

  - For all bridges, the hydraulic spread shall not encroach more than four (4) feet into an operational permanent or temporary exclusive turn lane.

  - For existing bridges with no alteration to the travel lanes or shoulders (location and / or widths), hydraulic spread will be allowed to encroach into an operational travel lane to an extent equal to that present in the existing (pre-project) conditions.

- The Design-Build Team shall analyze spread for all bridges within the project limits and, as necessary, provide mitigation that adheres to the hydraulic spread requirements noted above. If required, the Design-Build Team shall adhere to the bridge drainage system requirements noted below:

  - The Design-Build Team shall design bridge drainage without the use of bridge scuppers (open grated inlets) or closed / suspended drainage systems. If deck drains are used on the bridge, they shall be vertical pipes at the flow line through the deck with no elbow and shall be consistent with that shown in the current NCDOT Stormwater Best Management Practices Toolbox. The Design-Build Team shall use 4” deck drains adjacent to pedestrian facilities.

- The Design-Build Team shall provide bridge drainage features that prevent direct discharge into waterways or onto any existing / future greenway, railway right of way, travel lane or paved shoulder.

- The maximum allowable deck drain spacing shall be 12-foot on center.

Hydroplaning Analysis

- Excluding areas that the Design-Build Team will be uniformly overlaying the existing pavement structure, the Design-Build Team shall perform a hydroplaning risk assessment and, as necessary, provide mitigation that minimizes hydroplaning risk for all new and existing roadways within the construction limits. (Reference the Roadway and Pavement Management Scopes of Work found elsewhere in this RFP) The Design-Build Team shall include a brief summary of the mainline hydroplaning risk assessment in the Technical Proposal.

- The Design-Build Team shall utilize the following methods to perform the hydroplaning risk assessment:

  - *NCDOT Hydroplaning Risk Assessment Guidance*

  - *FDOT Hydroplaning Risk Analysis Design Guidance,* HP Program, 2014

- The Design-Build Team shall use a 70 mph speed for the mainline hydroplaning analysis, regardless of the design speed or any future posted speeds.

- **** NOTE **** Deleted bullet on hydroplaning analysis requirement for the future conversion of the proposed I-40 outside paved shoulders to through lanes.

- The Design-Build Team shall give particular attention to areas with zero superelevation in a crest and / or sag vertical curve, and superelevation reversal points.

- The Design-Build Team shall develop a Final Design Hydroplaning Risk Assessment Report that shall be included with the Preliminary Roadway Plans submittal for the Department's review and acceptance.

- In addition to Final Design Hydroplaning Risk Assessment Report, the Design-Build Team shall develop a Construction Hydroplaning Risk Assessment and Mitigation Plan Report that shall be included with the Traffic Control Plans submittal for the Department's review and acceptance. The aforementioned Report shall identify a process that evaluates and avoids concentrated flow across travel lanes where speeds are in excess of 45 mph during construction phasing. (Reference the Transportation Management Scope of Work found elsewhere in this RFP)

- **Stormwater Management**

- In accordance with the NCDOT Post-Construction Stormwater Program, NCDOT's Stormwater Best Management Practices Toolbox, and NCDOT's Guidelines for Drainage Studies and Hydraulics Design, the Design-Build Team shall develop a Stormwater Management Plan that, at a minimum, demonstrates the following:

  - Compliance with the requirements described in the NCDOT Post-Construction Stormwater Program dated April 2014.

  - To the maximum extent practicable, stormwater runoff shall be diverted away from surface waters.

  - To the maximum extent practicable, on-site stormwater control measures shall be employed to minimize water quality impacts.

  - Underground detention will not be allowed.

  - No additional right of way will be acquired solely for stormwater management.

- In accordance with the *Guidelines for Drainage Studies and Hydraulics Design*, including all addenda, memos and revisions, the Design-Build Team shall prepare Outlet Analyses for the increases in discharge due to the proposed project and take appropriate action to ensure that any increases are appropriately mitigated, including but not limited to improvements to drainage structures outside the project limits. If improvements to drainage structures outside the project limits are required solely to mitigate for increases in discharge due to the proposed project, the Design-Build Team will only be required to incorporate improvements that mitigate the project impacts. The Design-Build Team shall make every effort to mitigate for increases in discharge due to the proposed project within the existing / proposed right of way. The Design-Build Team shall include all mitigation improvements for increases in discharge due to the proposed project within the existing / proposed right of way in the lump sum price bid for the entire project. If, in the Department's sole discretion, improvements to drainage structures outside of the existing / proposed right of way are required to mitigate for increases in discharge due to the proposed project, the required improvements outside the existing / proposed right of way will be paid for as extra work in accordance with Subarticle 104-8(A) of the 2018 *NCDOT Standard Specifications for Roads and Structures*. Velocity mitigation shall be implemented in compliance with NC Administrative Code 15A NCAC 04B .0109 and associated *NCDOT Compliance Documentation Workflow for Rule 15A NCAC 04B .0109*. Such mitigation measures shall first consider long-term maintenance of the proposed mitigation. Except as otherwise noted, improvements to receiving channels shall be implemented before implementing any detention basin structures.

- Direct connections from impervious surfaces to the receiving waters shall be minimized to the maximum extent practicable.

Drainage Structures

Throughout this RFP, the term *drainage structures* shall include box culverts, cross pipes, drainage boxes and storm drainage systems.

- Excluding the locations noted below, the Design-Build Team shall replace **all** existing metal pipes within the existing / proposed right of way of the 1) I-40 / I-85 interchange and 2) construction limits of the mainline, I-40 / I-85, all -Y-Lines, service roads, ramps, loops and interchange quadrants, with the appropriate pipe type required in the *Drainage Pipe* Project Special Provision found elsewhere in this RFP.

  The Design-Build Team will not be required to analyze or replace existing metal pipes located 1) on I-85 southbound / I-40 westbound west of SR 1134 (Dimmocks Mill Road), 2) outside the construction limits on the I-40 westbound to I-85 northbound ramp, and 3) solely within the W-5707C construction limits.

- The Design-Build Team shall remove or fill with flowable fill all existing pipes not retained for drainage.

- Unless required otherwise elsewhere in this RFP, the Design-Build Team will not be required to analyze, supplement or replace 1) the box culvert under I-40 / I-85 at Rocky Run, 2) drainage structures within construction limits that consist solely of pavement marking obliterations and / or revisions, 3) drainage structures within construction limits that consist solely of guardrail replacement or 4) drainage structures solely within the W-5707C construction limits.

- The Design-Build Team shall not install permanent elliptical pipe. Elliptical pipe will only be allowed in temporary conditions and all elliptical pipe shall be removed prior to final project acceptance.

- The Design-Build Team shall develop discharges for all drainage structures based upon the future build-out land use projections. At a minimum, the Design-Build Team shall use a level of future urbanization with a percent impervious area of no less than 20% throughout the project. The Design-Build Team shall not include the effects of storage when computing discharges for hydraulic design and analysis for areas less than 50% impervious. For drainage areas where impervious surfaces are greater than 50%, routing will be allowed. EPA SWMM, USACE HMS, Win TR-20, HydroCAD or equivalent are acceptable programs for routing. A storm drainage duration of 24 hours shall be used in developing the hydrograph. For drainage structures in the I-40 median, the discharges shall also include the addition of one future 12-foot outside through lane in each direction of I-40.

- Revise the *Guidelines for Drainage Studies and Hydraulic Design as follows:*
  - Table 7-1, Design Frequency
    - Along I-40 / I-85 and I-40, replace the 50-year frequency for Bridges, Culverts, and Cross Pipes with a 100-year frequency
    - Along I-40 / I-85 and I-40, replace the 50-year frequency for Storm Drain Systems at Sags (without relief) with a 100-year frequency
  - Table 7-1, Peak Discharge Design Frequency
    - Design frequency for Temporary / Detours, Storm Drain System on Grade shall be ten years.
    - Design frequency for Temporary / Detours, Storm Drain Systems at Sags (without relief) shall be 25 years.
  - Table 7-2, Peak Discharge Method Selection
    - Rational Method is acceptable up to the lower limit of the applicable USGS methods.
    - Delete the NCDOT Hwy. Hydrologic Charts column
  - Delete Appendix C - NCDOT Hydrologic Charts
  - Delete Appendix J - NCDOT Ditch Stability Charts
  - Section 15.6 Temporary Encroachment in Regulatory Floodway
    - Section 15.6 is not applicable on this project. The Design-Build Team shall assume all liability for any flood damages resulting from the temporary encroachment.
- For all existing and proposed box culverts and pipes (including all extensions), a minimum 1.5-foot freeboard shall be required below the shoulder point during the design storm, unless allowed otherwise elsewhere in this RFP. The Design-Build Team shall not steepen slopes, reduce easements and / or reduce right of way solely to obtain the aforementioned freeboard requirement.
- A maximum HW/D = 1.2 shall not be exceeded for all existing and proposed box culverts and pipes during the design storm, unless allowed otherwise elsewhere in this RFP.
- Unless allowed otherwise elsewhere in this RFP, at existing box culverts to be retained, the Design-Build Team will not be required to adhere to the maximum HW/D = 1.2 requirement provided all the following requirements are met:

- The supplemental pipe(s) diameter shall be equal to the box culvert's barrel clear height opening (inside dimension height minus any burial) plus any upsizing required due to burial below the streambed.

OR

If, in the Department's sole discretion, it is not feasible to place the supplemental pipe(s) in the stream bed due to the existing topography, the supplemental pipe(s) may be constructed on a floodplain bench. The floodplain bench elevation shall be set a maximum of six inches above the normal water surface elevation (vegetation line) or one foot above the streambed, whichever is higher. For supplemental pipes constructed on a floodplain bench, the supplemental pipe(s) diameter may be reduced by the floodplain bench height (measured from the streambed to the top of the floodplain bench) or two feet, whichever is less.

- A minimum 3.0-foot freeboard is provided below the shoulder point during the design storm.

- For a single supplemental pipe, a maximum HW/D = 1.6 shall not be exceeded during the design storm.

OR

For dual supplemental pipes, a maximum HW/D = 2.2 shall not be exceeded during the design storm.

- At the existing four (4) barrel box culvert at New Hope Creek, the Design-Build Team will not be required to supplement the box culvert provided the project does not increase the drainage area to the culvert and the proposed HW/D does not exceed 1.3. If the project increases the drainage area to the culvert and / or the HW/D exceeds 1.3, the Design-Build Team shall provide the appropriate hydraulic mitigation required herein.

- Revise the NCDOT *Pipe Material Selection Guide* as follows:

  - Delete Note No. 5 and replace with the following:

    - Unless noted otherwise elsewhere in this RFP, all new cross-pipes on I-40 / I-85 and I-40, including all ramps, loops and interchange quadrants, shall be upsized by a minimum of six inches in diameter above that which would be hydraulically and / or jurisdictionally required. Upsizing shall be in addition to any upsizing required due to burial below the streambed. The aforementioned upsizing requirements shall not apply to pipes installed to supplement existing box culverts to be retained.

    - Excluding I-40 / I-85, all new cross-pipes on -Y- Lines and service roads that are beneath a fill height that is equal to or greater than fifteen (15) feet, as measured from

the top of the pipe to the corresponding road surface above the pipe, shall be upsized by a minimum of six inches in diameter above that which would be hydraulically and / or jurisdictionally required. Upsizing shall be in addition to any upsizing required due to burial below the streambed.

- All storm drainage systems shall maintain a hydraulic grade line that is a minimum of 0.5 feet below the inlet rim elevation or top of junction box; and shall adhere to all other requirements as identified in Chapter 10 of the *Guidelines for Drainage Studies and Hydraulic Design*.

- In the Technical Proposal, Volume II, the Design-Build Team shall provide a *Box Culverts and Cross Pipes Hydraulic Assessment Table* that contains the attributes noted below for all new box culverts and cross pipes 18 inches in diameter or greater:

  - Station
  - Proposed drainage structure details
  - Drainage Area
  - Percent Impervious or "C" value used
  - Discharge method used
  - Built-Out Discharges (Design Year and 100 Year)
  - FEMA Crossing (Yes / No)
  - Water Surface Elevation Natural Condition
  - Water Surface Elevation with Drainage Structure
  - HW/D for Build-out Discharges
  - Hydraulic Freeboard for Build-out Discharges
  - Comments

- Excluding welded steel pipes installed using trenchless construction methods, the maximum pipe diameter shall be 72 inches. The minimum reinforced concrete box culvert barrel height (inside dimension) shall be six (6) feet, with a minimum six-foot clear opening height above the streambed. The minimum reinforced concrete box culvert barrel width (inside dimension) shall be six (6) feet.

- Except as allowed otherwise elsewhere in this RFP, cross drainage shall be conveyed with a single drainage structure (pipe or box culvert). Excluding existing box culverts that are supplemented and remain in place, and the four (4) barrel box culvert at New Hope Creek, more than one line of pipe and / or three (3) box culvert barrels serving the same watershed shall not be allowed.

- All proposed drainage boxes, including but not limited to catch basins, drop inlets and junction boxes, shall have a grate or manhole access.

- Throughout the project limits, the Design-Build Team shall analyze all drainage structures for hydraulic and structural deficiencies that are located within the existing / proposed right of way, unless allowed otherwise elsewhere in this RFP. The Design-Build Team will be allowed to supplement existing reinforced concrete box culverts with two lines of pipe to mitigate hydraulic deficiencies. Within -Y- Line construction limits, the Design-Build Team will not

be required to analyze existing cross pipes that will not be lengthened if no additional discharge from the project is being generated. Using the hydraulic discharges required in this Scope of Work, drainage structures that do not adhere to the requirements in Sections 9.5.1.3 and 9.5.2.3 of the *Guidelines for Drainage Studies and Hydraulic Design*, including all addenda, memos and revisions, and / or the freeboard and HW/D requirements noted above, shall be deemed hydraulically deficient. Based on these analyses, the following shall be adhered to:

- The Design-Build Team shall provide the appropriate hydraulic mitigation for 1) all hydraulically deficient drainage structures and 2) all hydraulically and structurally deficient drainage structures, including but not limited to replacement. Inlet improvements outside the right of way shall not be allowed to mitigate for hydraulically deficient box culverts and / or pipes. Based on build-out discharges, the Design-Build Team shall identify all hydraulically deficient drainage structures and note their proposed mitigation in the Technical Proposal. At a minimum, in the Technical Proposal, Volume II, the Design-Build Team shall 1) identify all hydraulically deficient storm drainage systems and the proposed mitigation on the plans, and 2) provide *a Box Culverts and Cross Pipes Hydraulic Deficiency Assessment and Proposed Mitigation Table* that contains the box culvert and cross pipe attributes noted below:

    - Station
    - Existing Box Culvert / Cross Pipe Details
    - Drainage Area
    - Percent impervious or “C” value used
    - Discharge method used
    - Build-out Discharges (Design Year and 100 year)
    - Hydraulically Deficient (Yes / No) for Build-out Discharges\
    - Proposed Mitigation Structures(s) Details
    - HW/D for Build-out Discharges at Existing Structure without Mitigation
    - HW/D for Build-out Discharges at Existing Structure with Mitigation
    - Hydraulic Freeboard at Sag for Build-out Discharges at Mitigation Structure(s)
    - Comments

- To ensure that all pipes and box culverts retained for drainage purposes are structurally sound, the Design-Build Team shall provide appropriate documentation, in the Department’s sole discretion, for the Department’s review and approval prior to any hydraulic design submittal. At a minimum, the aforementioned documentation shall include a video inspection of each pipe and box culvert retained for drainage purposes, and a corresponding inspection report. The video inspection shall be performed with a Closed Circuit Television Video (CCTV) steerable pipe crawler / rover that is tethered to a cable reel and capable of capturing 360° views from within the pipe or box culvert. The inspection report shall identify the elements noted below for each pipe and box culvert retained for drainage purposes:

    - Structural integrity of each joint, in its entirety, including but not limited to joint failure, joint separation and joint offsets

- Longitudinal, transverse circumferential and multi-direction cracking
- Spalling
- Seepage and infiltration into the pipe
- Pipe failures, including but not limited to deferential settlement, material deformation and puncture holes

The Design-Build Team shall also provide the location of each item noted above, as measured from the outlet end of the pipe. If, for any reason, the video inspection or report is incomplete or inconclusive, the Design-Build Team shall perform another inspection and develop another report at no additional cost to the Department. Prior to performing any storm drain clean-out required for the aforementioned video inspections, the Design-Build Team shall obtain approval from the Engineer. In accordance with Subartical 104-8(A) of the 2018 *Standard Specifications for Roads and Structures*, required storm drain clean-out will be paid for as extra work.

As directed by the Engineer, the Design-Build Team shall provide the appropriate structural mitigation for all structurally deficient box culverts and / or pipes. Structural mitigation, for structural deficiencies in box culverts and / or pipes, including but not limited to all design and repair costs, will be paid for as extra work in accordance with Subarticle 104-8(A) of the 2018 *Standard Specifications for Roads and Structures*.

Permit Coordination

- The Design-Build Team shall conduct a Concurrence Point 4B Meeting and a Concurrence Point 4C Meeting prior to the final submittal of the environmental permit applications. (Reference the Environmental Permits Scope of Work found elsewhere in this RFP) All work resulting from the Concurrence Point 4B Meeting and Concurrence Point 4C Meeting shall be the Design-Build Team's responsibility. A minimum of five weeks prior to the appropriate Concurrence Point Meeting, the Design-Build Team shall provide 1) hydraulic plans, 2) permit drawings, calculations, and impact sheets for the USACE 404 Permit and the NCDWR Section 401 Certification and 3) information required to obtain a Neuse Riparian Buffer authorization to the Design-Build Unit. The Design-Build Team shall take minutes of the Concurrence Point 4B Meeting and the Concurrence Point 4C Meeting and provide them to the Department within three business days of the aforementioned meetings.

FEMA Regulated Streams

- For all FEMA regulated streams impacted by the Design-Build Team's design and / or construction, the Design-Build Team shall adhere to the current *Guidelines for Drainage Studies* and *Hydraulics Design*, including all addenda, memos and revisions, and the following requirements:

- The Design-Build Team shall prepare a CLOMR or MOA package for the Department's submittal to the North Carolina Floodplain Mapping Program (NCFMP). The Design-Build Team shall obtain NCFMP approval prior to performing any construction activity in a FEMA regulated floodplain.

- Where a CLOMR is required, the structure shall be designed such that no more than 0.5 feet of rise occurs between the Corrected Effective and the Revised Conditions for the 100-year water surface elevation.

- The Design-Build Team shall notify the Design-Build Unit, in writing, of all structures that may require purchase due to an increase in the 100-year water surface elevation. The Department will be responsible for all surveys to ascertain insurable structures within the impacted area of the floodplain(s). The Design-Build Team shall discuss the extent and limits of the rise in water elevation in the floodplain(s), identify potentially impacted insurable structures, specify areas anticipated to require additional surveys and estimate the anticipated additional right of way impacts outside the project construction limits in the Technical Proposal. (Reference the Right of Way Scope of Work found elsewhere in this RFP.)

- The Department will be responsible for all fees associated with the CLOMR(s) and / or MOA(s).

- The Design-Build Team shall ensure that construction and / or removal of all structures in FEMA regulated floodplains adheres to the approved CLOMR(s) and / or MOA(s). Within three months of completion of work in a FEMA-regulated floodplain, the Design-Build Team shall provide As-Built Plans of the site, and a completed As-Built Certification Review Form that verifies construction and / or removal adheres to the approved CLOMR(s) and / or MOA(s).

- The Design-Build Team shall prepare a new FEMA model and / or package and be responsible for all associated costs resulting from any construction variation from the approved CLOMR(s) and / or MOA(s).

- The Department will allow no direct contact between the Design-Build Team and the NCFMP representatives. No contact between the Design-Build Team, the NCFMP and / or personnel under contract with NCFMP shall be allowed by phone, e-mail, or in person, without Department representatives present. A representative from the Design-Build Unit shall be included on all correspondence.

- Temporary impacts due to construction and / or on-site detour traffic that 1) last longer than one year and / or 2) encroach into the floodway, shall be reviewed by the Design-Build Team for changes in the water surface elevations that could impact structures or have adverse impacts to the surrounding property. The results of the review shall be submitted to the Hydraulics Unit in a report format for the Department's coordination with NCFMP.

General

- The Design-Build Team's design shall be in accordance with the information on the following website, the version of the following references effective on the Technical Proposal submittal date, and the contract requirements contained herein:

  - The North Carolina Division of Highways Hydraulics Unit website:

    https://connect.ncdot.gov/resources/hydro/pages/default.aspx

  - The North Carolina Division of Highways *Guidelines for Drainage Studies and Hydraulics Design*, including all addenda, memos and revisions, excepted as may be amended herein

  - The NCDOT *Best Management Practices for Construction and Maintenance Activities*

  - The NCDOT *Stormwater Best Management Practices Toolbox*

  - The NCDOT *Post-Construction Stormwater Program*

  - The NCDOT *Design-Build Submittal Guidelines*

- In case of conflicting design parameters, and / or ranges, in the various resources, the proposed design shall adhere to the *Guidelines for Drainage Studies and Hydraulics Design*, including all addenda, memos and revisions, unless noted otherwise elsewhere in this RFP.

ITS SCOPE OF WORK (7-12-21)

GENERAL

A pre-design meeting shall take place between the NCDOT Transportation Systems Management & Operations Unit (TSMOU), the Work Zone Traffic Control Group, the Design-Build Team, the Design-Build Unit, the Division Traffic Engineer, the Regional Traffic Engineer, Statewide Operations Center (STOC), the Triad Regional Traffic Management Center (TRTMC), local municipalities (if applicable) and any other pertinent NCDOT personnel. The Department shall not review ITS Plan submittals prior to the pre-design meeting.

The Design-Build Team shall coordinate with the Division Traffic Engineer, the Regional Traffic Engineer, the STOC and the TRTMC throughout the project duration.

The Design-Build Team shall design, furnish, and install new ITS devices from the I-40 / I-85 interchange to the I-40 / US 15-501 interchange. Integrate the new DMS and CCTV cameras into the existing computer and network hardware and software at the TRTMC at 201 South Chimney Rock Road, Greensboro, NC 27409 and the STOC at 1636 Gold Star Drive, Raleigh, NC 27607. Major items of work include, but are not limited to, the following:

- Install thirteen (13) new Closed-Circuit Television (CCTV) cameras
- Install three (3) new Dynamic Message Signs (DMS) on pedestal structures
- Install three (3) ITS hub cabinets
- Fiber optic cable
- Junction boxes (electrical and communications)
- Metal poles
- Electrical service equipment
- Portable Changeable Message Signs (PCMS) and portable CCTV camera assemblies as identified herein.

The Design- Build Team shall furnish and install guardrail and / or concrete barrier to protect permanent ITS devices and temporary guardrail or concrete traffic barrier to protect temporary ITS devices, as required.

Determine the new location of each ITS device, obtain the Engineer's approval of the location, install the devices and implement test procedures, then integrate the devices into the existing computer and network hardware and software at the TRTMC and the STOC.

Prior to any underground work, locate existing utilities, communications cable, power cable, and adjust work activities to protect these facilities. Immediately cease work and notify the Engineer and the affected owners if damage to existing utilities occurs. Repair damages to existing utilities, communications cable, and / or power cable at no cost to the Department.

Perform all work in accordance with the ITS Project Special Provisions found elsewhere in this RFP, the 2018 NCDOT *Standard Specifications for Roads and Structures*, the 2018 NCDOT

Roadway Standard Drawings, and the ITS & Signals Generic Project Special Provisions effective on the Technical Proposal submittal date, found at the following website:

https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

PROJECT OPERATION REQUIREMENTS

It is the Department's desire to provide uninterrupted traffic incident management and traveler information operations throughout the life of the project. Thus, the Design-Build Team shall identify the approximate location of the new ITS devices and when they will be installed and operational in their permanent location in the Technical Proposal.

Except as allowed otherwise below, the Design-Build Team shall provide a portable CCTV camera that is integrated with the TRTMC and the STOC at each of the permanent CCTV camera locations until a permanent CCTV camera is installed and integrated with the TRTMC and the STOC. An existing CCTV camera that is located at a permanent CCTV camera location, and remains operational and integrated with the TRTMC and the STOC, may be used in lieu of providing a portable CCTV camera at that location. The Design-Build Team shall provide a PCMS at each of the proposed DMS locations until the permanent DMS is installed and integrated with the TRTMC and the STOC. The portable CCTV cameras and PCMS shall be installed and integrated with the TRTMC and the STOC prior to beginning any activity that will impede the traffic on I-40. All portable ITS devices shall communicate with the TRTMC and the STOC by means of a Department supplied cell modem.

For unplanned disconnections to permanent or temporary ITS devices, where communications cannot be restored within 24 hours, a replacement portable device capable of communicating with the TRTMC and the STOC shall be provided at no additional cost to the Department. PCMSs and CCTV cameras used at proposed DMS locations and to replace existing CCTV cameras shall be in addition to the PCMSs and portable CCTV cameras required for work zone traffic control and incident management during construction. (Reference the Transportation Management Scope of Work found elsewhere in this RFP)

The Design-Build Team shall remove and deliver all existing CCTV camera equipment and all wireless radio equipment and cell modems used for portable ITS devices to the TRTMC. Contact Dominique McCullough at (336) 915-7080 two weeks in advance to coordinate the delivery of the aforementioned equipment.

Intermediate Contract Time #21 for Failure to Restore Communication

The Design-Build Team shall maintain communications with all permanent and temporary ITS devices integrated with the TRTMC, and the STOC. If communication is lost, the Design-Build Team shall restore communication within 24 hours or provide a replacement device at no cost to the Department. If a replacement device is provided, it shall be integrated and communicating with the TRTMC and the STOC within 24 hours.

Liquidated Damages for Intermediate Contract Time #21 for failure to restore communication or provide a replacement device within 24 hours are $500.00 per hour or any portion thereof.

DESIGN REQUIREMENTS

The Design-Build Team shall furnish and install all new field equipment from the I-40 / I-85 interchange to the I-40 / US 15-501 interchange and shall furnish all new equipment to be installed at the TRTMC and the STOC to integrate the new devices. The Department and the North Carolina Department of Information Technology (DIT) will install and test all new equipment required at the TRTMC and / or STOC. The Design-Build Team shall notify the Engineer and the Design-Build Unit, in writing, when the new equipment to be installed at the TRTMC and / or STOC is available for installation.

Communications

Design the field-to-center communication network using fiber optic cable for the permanent ITS devices. The Design-Build Team shall design, furnish and install a 144-fiber trunk line with 12-fiber drop cables for ITS device drops along I-40 from the I-40 / I-85 interchange to the I-40 / US 15-501 interchange. Terminate the 144-fiber trunk line in the new hub cabinet to be installed at the I-40 / US 15-501 interchange. **Terminate ALL fibers of each cable in an interconnect center in each ITS hub cabinet and ITS device cabinet.**

The Design-Build Team shall furnish and install Ethernet edge switches for the ITS devices in accordance with *Ethernet Edge Switch* Project Special Provision found elsewhere in this RFP.

The Design-Build Team shall design, furnish and install three (3) ITS hub cabinets, with associated fiber cables, at the locations listed below. The ITS hub cabinets shall comply with the *HUB Cabinet* Project Special Provision found elsewhere in this RFP.

- I-40 at I-85 - New ITS hub cabinet
    - Existing 144-fiber cable located along the I-40 / I-85 corridor
    - New aforementioned 144-fiber cable to be installed on the project
    - New 12-fiber drop cable from nearby CCTV camera
    - New 48 port hub switch to be provided by the Department
- I-40 at Old NC 86 - Replace existing ITS hub cabinet
    - New aforementioned 144-fiber cable to be installed on the project
    - Existing 24-fiber located along Old NC 86
    - Relocate the existing 48 port hub switch within the existing ITS hub cabinet to the new ITS hub cabinet

- I-40 at US 15-501 - New ITS hub cabinet (Replace existing CCTV cabinet)
    - New aforementioned 144-fiber cable to be installed on the project
    - Existing 60-fiber located along I-40
    - New 48 port hub switch to be provided by the Department
    - New 12-fiber drop cable from nearby CCTV camera

The Design-Build Team shall request the hub switches from the Engineer at least 90-days prior to the scheduled installation.

The Department will furnish all cellular modems to be used on the project. The Design-Build Team shall request the modems through the Engineer at least eight (8) weeks prior to scheduled installation.

CCTV Cameras

The Design-Build Team shall strategically locate and install thirteen (13) new CCTV cameras on new 50-foot metal poles at locations that provide optimum viewing. All CCTV camera installations, including equipment cabinets, shall comply with the requirements of the *Digital CCTV Camera Assembly* and *CCTV Field Equipment Cabinet* Project Special Provisions found elsewhere in this RFP; and the *Metal Pole Supports* Project Special Provision found on the ITS and Signals website noted in the General Section above. At locations 1) where new cameras are being installed and 2) where an existing camera is being replaced, all CCTV camera equipment installed shall be new, including but not limited to cabinets, poles, and pole grounding systems.

Install one CCTV camera on a metal pole at each of the following locations:

- I-40 at I-85 - Replace Existing
- I-40 at MM 259 - Replace Existing
- I-40 between MM 260 and Exit 261 (in curve) - New Installation
- I-40 at Old NC 86 - Replace Existing
- I-40 between Exit 261 and MM 262 (in curve) - New Installation
- I-40 at Exit 263 - Replace Existing
- I-40 between Exit 263 ant MM 264 (in curve) - New Installation
- I-40 at MM 264 - Replace Existing
- I-40 at Exit 266 - Replace Existing
- I-40 between Exit 266 and MM 267 (in curve) - New Installation
- I-40 at MM 267 - Replace Existing
- I-40 at SR 1734 (Erwin Road) - Replace Existing
- I-40 at US 15-501 - Replace Existing

Determine the exact location of each CCTV camera, obtain the Engineer's written approval of the locations, and install the cameras. Furnish site surveys, including but not limited to bucket truck or drone surveys, to ensure camera coverage areas are acceptable.

Install new electrical service equipment at all new CCTV camera locations unless power service is not available. Install solar power assembly equipment at any CCTV camera location where power service is not available. Obtain approval from the Engineer for any solar power location. Comply with the National Electrical Code (NEC), the National Electrical Safety Code (NESC), the 2018 NCDOT *Standard Specification for Roads and Structures*, the Project Special Provisions, and all local ordinances. All work involving electrical service shall be coordinated with the appropriate utility company and the Engineer.

Dynamic Message Signs (DMS)

The Design-Build Team shall strategically locate, design, and install three (3) new Type 2C pedestal mount DMSs. DMSs shall not be located behind sound barrier walls or in the median. Furnish and install new DMS and associated equipment as defined in the *Dynamic Message Sign (DMS)* Project Special Provision found elsewhere in this RFP.

Install one DMS at each of the following locations:

- I-40 westbound near MM 262
- I-40 westbound near MM 268
- I-40 eastbound near MM 268

The DMSs installed under this project shall be full color DMS selected from the most current version of the NCDOT ITS & Signals Qualified Products List.

Determine the exact location of the DMSs by coordinating with the Engineer. Obtain the Engineer's written approval of the locations and install the DMSs.

Install new electrical service equipment at all new DMS locations. Comply with the National Electrical Code (NEC), the National Electrical Safety Code (NESC), the 2018 NCDOT *Standard Specifications for Roads and Structures*, the Project Special Provisions, and all local ordinances. All work involving electrical service shall be coordinated with the appropriate utility company and the Engineer.

MATERIALS & CONSTRUCTION

Furnish and install new materials and hardware unless stated otherwise elsewhere in this RFP. Adhere to the requirements of the 2018 NCDOT *Standard Specifications for Roads and Structures* and the 2018 NCDOT *Roadway Standard Drawings and* the ITS & Signals Generic Project Special Provisions effective on the Technical Proposal submittal date.

CCTV Cameras

Install each stand-alone CCTV camera on a 50-foot metal pole. Install CCTV equipment in a 336S equipment cabinet mounted on the pole.

**** NOTE **** Deleted minimum equipment in CCTV equipment cabinet requirements. Requirements are defined in applicable ITS Project Special Provisions found elsewhere in this RFP.

Perform all work in accordance with the applicable ITS Project Special Provision found elsewhere in this RFP, and other standards listed elsewhere in this RFP.

Dynamic Message Signs (DMS)

Install DMSs on a single metal pedestal type structure with ladders, ladder safety cages, platforms, and walkways leading to the DMS maintenance access door. The bottom of each DMS shall be 25 feet higher than the highest point of the roadway. Install DMS equipment in an approved equipment cabinet mounted on the structure. Install a department furnish cellular modem in each DMS cabinet for redundant communications.

**** NOTE **** Deleted additional minimum equipment in DMS equipment cabinet requirements. Requirements are defined in applicable ITS Project Special Provisions found elsewhere in this RFP.

Perform all work in accordance with the applicable Project Special Provisions found elsewhere in this RFP, and other standards listed elsewhere in this RFP.

Conduit

Except as required otherwise in the Structures Scope of Work found elsewhere in this RFP, furnish and install two 2-inch conduits (for fiber) and one 2-inch conduit (for power) and all necessary hardware by trenching or directional drilling in accordance with Section 1715 of the 2018 NCDOT *Standard Specifications for Roads and Structures*. Conduit shall not be placed in the median or under the roadway, except for lateral traverse crossings.

The four-inch conduit duct system attached to the proposed bridges shall be terminated in a communications junction box beyond the approach slab at each end of the bridge. Ensure the junction boxes for bridge conduit termination are installed in an area of flat ground and that they are easily accessible for conduit installations. (Reference the Structures Scope of Work found elsewhere in this RFP)

Junction Boxes

Electrical

Furnish and install junction boxes (pull boxes) for electrical services with all necessary hardware in accordance with Sections 1098-5 and 1716 of the 2018 NCDOT *Standard Specifications for Roads and Structures*. Provide standard junction boxes with minimum inside dimensions of 16”(l) x 10”(w) x 10”(d) for electrical service, with a concrete collar / skirt of six-inch to eight-inch depth, 12 inches wide all around, and flush with the top surface. Install electrical junction boxes at maximum intervals of three hundred (300) feet or at locations where underground splicing is necessary.

Provide junction box covers with standard “Electric” logo, pull slots and stainless-steel pins.

Communications

Furnish and install junction boxes (pull boxes) with all necessary hardware in accordance with Sections 1098-5 and 1716 of the 2018 NCDOT *Standard Specifications for Roads and Structures*. Provide Tier 22 load rated junction boxes with minimum inside dimensions of 36”(l) x 24”(w) x 24”(d), with a concrete collar / skirt of six-inch to eight-inch depth, 12 inches wide all around, and flush with the top surface.

On interstates and US routes only, the maximum distance between junction boxes for fiber optic cable shall be 1500 feet.

Provide Tier 22 junction box covers with standard “NCDOT Fiber Optic” logo, pull slots and stainless-steel pins.

Wood Poles

In accordance with Section 1720 of the 2018 NCDOT *Standard Specifications for Roads and Structures,* furnish and install wood poles, with all necessary grounding systems and hardware necessary. Provide wood poles sized as necessary for the intended application.

** **NOTE** ** Deleted bullet on the use of 60-foot CCTV Class 3 wood poles.

- Use 40-foot Class 4 wood poles for approved applications.
- Use 6” x 6” x 8’ treated wood posts for underground electrical service structures.

Furnish and install related items of work including but not limited to risers with weatherhead or heat shrink tubing and all necessary hardware in accordance with Section 1720 of the 2018 NCDOT *Standard Specifications for Roads and Structures*.

Electrical Service

Furnish and install new electrical services rated 100 Amps for overhead service or 200 Amps for underground service, 240/120 VAC service drops for the each new ITS device. Furnish and install related items of work, including, but not limited to service entrance equipment, service conductors, feeder conductors, disconnects, junction boxes, risers, guy assemblies, and wood poles with all necessary hardware in accordance with Section 1700 of the 2018 NCDOT *Standard Specifications for Roads and Structures*. (Reference the Utilities Coordination Scope of Work found elsewhere in the RFP for additional coordination / approval requirements and payment responsibilities)

OTHER CODES AND STANDARDS

All ITS materials shall conform to the latest version of the applicable standards of the National Electrical Code (NEC), National Electric Manufacturer's Association (NEMA), the Underwriters' Laboratories, Inc. (UL), the Electronic Industries Association (EIA), the International Municipal Signal Association (IMSA), and the National Electrical Safety Code (NESC). All materials and workmanship must conform to the requirements of the NESC, standards of the American Society for Testing and Materials (ASTM); American National Standards Institute (ANSI). Comply with all federal laws, state laws, and city codes in accordance with the 2018 NCDOT *Standard Specifications for Roads and Structures*.

QUALIFIED PRODUCTS LIST

Submit a listing of items on the NCDOT 2018 Qualified Products List (QPL) to receive approval for use on the project. Catalog cuts will not be required for items on the QPL. The QPL website is:

https://connect.ncdot.gov/resources/safety/Pages/default.aspx

For any equipment not on the QPL, the Design-Build Team shall provide product specifications and special provisions, as necessary, for the Department’s review and acceptance prior to incorporation.

ADDITIONAL REQUIREMENTS

For all ITS devices and components located from the western project limits to the I-40 / US 15-501 interchange, the Design-Build Team shall comply with the following requirements:

Maintenance and Repair

The Design-Build Team shall maintain and repair all ITS components within the project scope, including but not limited to, ITS devices, ITS conduit system, and all related ITS components, from the beginning of construction until the final acceptance of the project by the NCDOT. After acceptance of the project, the Design-Build Team shall be responsible for repairing the system due to faulty materials or workmanship in accordance with the *Twelve Month*

Guarantee Project Special Provision found elsewhere in this RFP, or longer if the Design-Build Team extends the aforementioned warranty period.

Plan of Record Documentation

Prepare and submit to the Department Plan of Record (POR) documentation that depicts the conduit and ITS device locations. Submit final POR documentation in electronic and hard copy format for Department approval. Provide electronic plans in MicroStation (latest release in use by the Department). Submit hard copy documentation on 22-inch x 34-inch plan sheets. POR documentation shall include the final location and depth of conduits, wiring external to the cabinets, locations of splice enclosures, junction box locations, and Single Mode Fiber Optics (SMFO) cable terminations. Include in the POR documentation real world coordinates for all ITS devices, splice enclosures, junction boxes, and equipment cabinets installed or utilized under this project. Provide the coordinates in feet units using the North Carolina State Plane coordinate system (1983 North American Datum also known as NAD '83). Furnish coordinates that do not deviate more than 1.7 feet in the horizontal plane and 3.3 feet in the vertical plane. Global positioning system (GPS) equipment able to obtain the coordinate data within these tolerances may be used. All POR documentation described above shall be provided to the Engineer and the NCDOT ITS & Signals Management Section.

Integration

Upon completion of the ITS device installations, integrate the new devices with the TRTMC, and the STOC. Ensure all existing and new ITS devices along the project corridor remain integrated with the TRTMC and the STOC.

Modify, as necessary, the existing central hardware and software modules including but not limited to databases, to provide operators access to new devices through the operators' Graphical User Interface. Coordinate with and obtain the Engineer's approval prior to starting any work in the TRTMC or the STOC or modifying any existing hardware or software.

Testing

Develop unit and system test plans and procedures for each ITS device and all associated components and submit to the Engineer for review and approval.

Upon completion of the ITS device installations, conduct unit and system tests according to the approved test plan and procedures. Provide all necessary test equipment.

In case of failures and substandard performance, the Design-Build Team shall identify the cause, repair or replace the faulty parts and components and repeat the test. If the problem persists, the entire unit causing the problem shall be replaced prior to retest, at no additional cost.

After successful completion of all unit and system tests, submit the test reports along with the record of repairs and part replacements to the Engineer.

SUBMITTALS

Submit a set of 60% preliminary plans, 90% unsealed set of project plans, including specifications for materials, catalog cuts, and installation and testing requirements for review. Upon acceptance by the Department, provide a 100% set of sealed plans and specifications to the Department. No construction of the ITS devices shall begin until the Department has accepted the 100% sealed plans and specifications.

LIGHTING SCOPE OF WORK (3-9-21)

The Design-Build Team shall provide and install roadway lighting equipment and materials, in accordance with the Final Lighting Plans provided by the Department, Division 14 of the 2018 NCDOT *Standard Specifications for Roads and Structures*, and the *Roadway Standard Drawings*, except as amended below. Prior to the Technical Proposal submittal date, the NCDOT will provide the Preliminary Lighting Plans. The Department will finalize the lighting design based upon the Design-Build Team's Release for Construction (RFC) Roadway Plans.

The Design-Build Team shall include all costs required to construct the roadway lighting shown in the aforementioned Preliminary Lighting Plans provided by the Department in their lump sum price bid for the entire project. The Department shall only compensate the Design-Build Team for additional lighting construction costs that result from design revisions 1) required elsewhere in this RFP, 2) incorporated at the Department's discretion and / or 3) that result from errors or omissions in the Department's Preliminary Lighting Plans. The Design-Build Team shall be solely responsible for all additional lighting construction costs that result from design revisions incorporated at the Design-Build Team's discretion.

If any design revision, including but not limited to those incorporated at the Department's discretion, those incorporated at the Design-Build Team's discretion and / or those incorporated due to errors or omissions in the Department's Preliminary Lighting Plans, results in the removal and / or reduction of lighting equipment from the Preliminary Lighting Plans provided by the Department, all construction costs associated with the removal and / or reduction of lighting equipment shall be deducted from monies due the Design-Build Team.

After the RFC Roadway Plans have been accepted by the Department, the Design-Build Team shall submit MicroStation files of the RFC Roadway Plans for the Department to complete the lighting design. The Design-Build Team shall allow the Department fifteen business days after this submittal to update and finalize the lighting design.

The Design-Build Team shall allow ten days for Department review of each submittal for all materials including poles and foundation designs. An additional ten days shall be required for pole submittals from vendors that do not commonly do business with the Department.

Reference the Transportation Management Scope of Work found elsewhere in this RFP for time restrictions and lane closure requirements.

Reference the *Lighting* Project Special Provision found elsewhere in this RFP for additional requirements.

MAINTENANCE

Throughout construction, the Design-Build Team shall assume responsibility for routine maintenance of the newly installed lighting system(s) and any relocated lighting components in accordance with Division 14 of the 2018 NCDOT *Standard Specifications for Roads and Structures*, except as amended below.

- NCDOT will assume maintenance responsibility for the completed lighting systems after the project is accepted and there is no chance of construction-related damage.

- The Design-Build Team shall replace any newly installed non-functional lighting system components within the project limits. All luminaires must be operational at project acceptance.

PAVEMENT MANAGEMENT SCOPE OF WORK (7-13-21)

I-40 CONCRETE WIDENING

For the I-40 concrete widening sections, the pavement design for the I-40 travel lanes, the I-40 median paved shoulders and the I-40 outside paved shoulders shall consist of the following:

I-40 Median Travel Lane Concrete Widening Pavement Design

11.0” doweled jointed concrete
1.5” S9.5B
3.5” B25.0C
8” Type 1 Aggregate Subgrade (*Aggregate Subgrade* Standard Special Provision found elsewhere in this RFP)

The transverse joints shall match the adjacent travel lane joint spacing and location.

In accordance with the *Diamond Grinding Concrete Pavement* Project Special Provision found elsewhere in this RFP, the Design-Build Team shall diamond grind the new median travel lane concrete widening.

From the western project limits to the limits of the existing ultra-thin bonded wearing course near US 15-501, the Design-Build Team will not be required to resurface or overlay the I-40 concrete pavement (new or existing to remain in place).

I-40 Full-Depth Median Concrete Shoulder Pavement Design

11.0” jointed concrete (without dowels)
1.5” S9.5B
3.5” B25.0C
8” Type 1 Aggregate Subgrade (*Aggregate Subgrade* Standard Special Provision found elsewhere in this RFP)

The transverse joints shall match the adjacent travel lane joint spacing and location.

I-40 Full-Depth Outside Concrete Shoulder Pavement Design

11.0” jointed concrete (without dowels)
1.5” S9.5B
3.5” B25.0C
8” Type 1 Aggregate Subgrade (*Aggregate Subgrade* Standard Special Provision found elsewhere in this RFP)

The transverse joints shall match the adjacent travel lane joint spacing and location.

I-40 CONCRETE RECONSTRUCTION

For all I-40 concrete reconstruction sections, the pavement design for the I-40 travel lanes, the I-40 median paved shoulders and the I-40 outside paved shoulders shall consist of the following:

I-40 Travel Lane Concrete Pavement Design

12.5" doweled jointed concrete
1.5" S9.5B
3.5" B25.0C
8" Type 1 Aggregate Subgrade (*Aggregate Subgrade* Standard Special Provision found elsewhere in this RFP)

The transverse joints shall be uniformly spaced 15 feet apart.

In accordance with the *Diamond Grinding Concrete Pavement* Project Special Provision found elsewhere in this RFP, the Design-Build Team shall diamond grind the reconstructed concrete travel lane pavement. The Design-Build Team will not be required to overlay or resurface the reconstructed concrete travel lane.

I-40 Full-Depth Median / Inside Concrete Shoulder Pavement Design

12.5" jointed concrete (without dowels)
1.5" S9.5B
3.5" B25.0C
8" Type 1 Aggregate Subgrade (*Aggregate Subgrade* Standard Special Provision found elsewhere in this RFP)

Median shoulder joints shall match the adjacent travel lane joint spacing and location.

I-40 Full-Depth Outside Concrete Shoulder Pavement Design

12.5" jointed concrete (without dowels)
1.5" S9.5B
3.5" B25.0C
8" Type 1 Aggregate Subgrade (*Aggregate Subgrade* Standard Special Provision found elsewhere in this RFP)

Outside shoulder joints shall match the adjacent travel lane joint spacing and location.

I-40 / I-85 ASPHALT WIDENING

Along I-40 / I-85, the existing pavement joint between the asphalt pavement and concrete pavement is located at approximately Station 44+50 -YRPD-. The asphalt pavement design for the I-40 / I-85 widening sections shall **only** be used from the western project limit to the aforementioned asphalt pavement and concrete pavement joint.

For the I-40 / I-85 asphalt widening sections, the pavement design for the I-40 / I-85 travel lanes, the I-40 / I-85 median paved shoulders and the I-40 / I-85 outside paved shoulders shall consist of the following:

I-40 / I-85 Travel Lane, Median Shoulder and Outside Shoulder Asphalt Pavement Design

3.0" S9.5D
4.0" I19.0C
10.0" B25.0C

8" Type 1 Aggregate Subgrade (*Aggregate Subgrade* Standard Special Provision found elsewhere in this RFP)

I-40 / I-85 AND I-40 TRAVEL LANE AND SHOULDER RECONSTRUCTION

At a minimum, the Design-Build Team shall remove and dispose of / recycle the pavement structures within the limits noted below:

- The I-40 / I-85 outside paved shoulder within the construction limits, excluding areas that consist solely of pavement marking obliterations / revisions.

- The I-40 eastbound median and outside paved shoulders within the construction limits, excluding areas that consist solely of pavement marking obliterations / revisions and areas that consist solely of W-5707C construction activities.

- The I-40 westbound median and outside paved shoulders from the eastern limits of the bridge on I-40 westbound over I-85 to the eastern construction limits, excluding areas that consist solely of pavement marking obliterations / revisions and areas that consist solely of W-5707C construction activities.

- The I-40 westbound inside paved shoulder throughout the guardrail replacement limits, including any necessary paved shoulder tapers, from the I-85 southbound / I-40 westbound gore to the western limits of the bridge on I-40 westbound over I-85. (Reference the Roadway Scope of Work found elsewhere in this RFP)

- The I-40 asphalt median travel lane located at the existing I-40 transition from four lanes to six lanes west of the I-40 / US 15-501 interchange. (The Design-Build Team will only be required to remove the asphalt median lane east of the existing I-40 concrete median barrier.)

Within the aforementioned limits, the Design-Build Team shall remove and dispose of / recycle the pavement structure, in its entirety, to the top of the soil subgrade, including but not limited to the removal and disposal of existing aggregate base course, and replace with the appropriate pavement design defined above.

OTHER I-40 / I-85 and I-40 REQUIRMENTS

The existing I-40 travel lane concrete pavement shall be retained and will not require an overlay or resurfacing grade (excluding the areas that have been overlaid with an ultra-thin bonded wearing course). For all sections of the existing I-40 travel lanes, the Design-Build Team shall reseal the existing joints.

As directed by the Engineer, the Design-Build Team shall repair the existing I-40 concrete pavement. In accordance with the *Sealing Existing Pavement Cracks - Polymer Patch* Standard Special Provision found elsewhere in this RFP and the 2018 *Standard Specifications for Roads and Structures*, these repairs shall consist of 1) sealing existing pavement cracks greater than ¼-inch wide and cracks that have associated spalling, and 2) patching concrete pavement spalls at joints greater than two inches wide. In accordance with Subarticle 104-8(A) of the 2018 *Standard Specifications for Roads and Structures*, all repairs to the existing I-40 concrete pavement will be paid for as extra work at the unit prices noted below:

- All sealing of concrete pavement cracks will be paid for at the unit price of $3.50 per pound. All work tasks required to seal the concrete pavement cracks, including but not limited to traffic control and portable lighting, shall be incidental to the unit price noted above.

- All patching of concrete pavement spalls will be paid for at the unit price of $100.00 per square foot. All work tasks required to patch concrete pavement spalls, including but not limited to traffic control and portable lighting, shall be incidental to the unit price noted above.

As directed by the Engineer, the Design-Build Team shall perform full depth concrete slab removal and replacement for any shattered concrete slabs broken into three or more pieces. The full depth concrete removal and replacement shall be performed in accordance with Section 723 of the NCDOT *Standard Specifications for Roads and Structures,* except subgrade repair shall be considered incidental to the full depth concrete removal and replacement. Place 18" of Type 1 Aggregate Subgrade under the slabs prior to replacement. (Reference the *Aggregate Subgrade* Standard Special Provision found elsewhere in this RFP). In accordance with the *Diamond Grinding Concrete Pavement* Project Special Provision found elsewhere in this RFP, the Design-Build Team shall diamond grind all replacement concrete slabs. Full depth concrete removal and replacement will be paid for as extra work in accordance with Subarticle 104-8(A) of the 2018 NCDOT *Standard Specifications for Roads and Structures* at the unit price of $400.00 per square yard. All work tasks required to replace shattered slabs requested by the Engineer, including but not limited to subgrade repair, diamond grinding, traffic control and portable lighting, shall be incidental to the unit price noted above.

In areas of existing concrete pavement within the construction limits that have been overlaid with an ultra-thin bonded wearing course, including areas that consist solely of pavement marking obliterations / revisions, but excluding areas that require removal and replacement, the Design-Build Team shall:

- Mill the existing ultra-thin bonded wearing course, to the top of the existing jointed concrete pavement on the inside median lane (approximately 5/8") and to a depth of 2-1/8" into the existing asphalt layer on the outside two lanes. Mill the existing asphalt median and outside shoulders to a depth of 1.5 inches.
- As directed by the Engineer, perform crack sealing, spall patching, and broken slab repairs to the underlying concrete pavement in accordance with the requirements above. The underlying concrete pavement repairs will be paid as extra work in accordance with Subarticle 104-8(A) of the 2018 NCDOT *Standard Specifications for Roads and Structures* at the unit prices noted above.
- Overlay the milled asphalt (outside two travel lanes, median shoulder and outside shoulder) with 1.5" of S9.5D.
- Overlay all travel lanes with an ultra-thin bonded wearing course.

As required by the Transportation Management Scope of Work found elsewhere in this RFP to conceal pavement markings, the Design-Build Team shall uniformly overlay asphalt areas of I-40 / I-85 and I-40, including all ramps and loops, with 1.5" S9.5C. Prior to placing any subsequent layer of the final pavement design, the Design-Build Team shall mill the aforementioned uniform overlay. (Reference the Transportation Management Scope of Work found elsewhere in this RFP). The Design-Build Team is cautioned that the milling required to remove the temporary surface course layers installed to conceal pavement markings shall be in addition to all other milling requirements found elsewhere in this RFP.

OTHER REQUIREMENTS

Unless noted otherwise elsewhere in this RFP, all longitudinal joints shall be located on a lane line or lane midpoint. Solely to shift a longitudinal joint to one of the aforementioned locations, the following transitions will be allowed:

- A maximum 840-foot transition at the I-40 western concrete pavement construction limits to tie to the existing eastbound and westbound travel lanes.

- A maximum 1,260-foot transition approaching / departing the dual bridges on I-40 over Norfolk Southern Railway (NSR) and SR 1725 (Millhouse Road).

The Design-Build Team shall indicate in the Technical Proposal how longitudinal joints will be located on a lane line or lane midpoint.

Concrete from the existing pavement removal can be crushed and reused on the project provided it meets the appropriate requirements of the 2018 *Standard Specifications for Roads and Structures* for the intended use.

The Design-Build Team shall design and construct mainline ramps / loops and -Y- Lines, including all required widening, utilizing the pavement designs listed in **Table 1** below:

Table 1

Line	Surface	Intermediate	Base	ABC	Stab *
-YRPAREV-, -Y2RPA-, -Y2RPB-, -Y2RPC-, -Y2RPD-, -Y3RPA-, -Y3RPB-, -Y3RPC-, and -Y3RPD-	3.0” S9.5D	2.5” I19.0C	3.0” B25.0C	----	Yes
SR 1009 (Old NC 86, -Y2-), and NC 86 (-Y9-)	3.0” S9.5C	4.0” I19.0C	4.0” B25.0C	----	No
SR 1723 (New Hope Road, -Y3-)	3.0” S9.5C	----	5.0” B25.0C	----	No
SR 1725 (Millhouse Rd, -Y4-)	3.0” S9.5C	----	4.0” B25.0C	----	No
-Y9LPB-, -Y9RPB-, -Y9RPC-, -Y9SPURC-, and -Y9RPD-	3.0” S9.5D	4.0” I19.0C	3.0” B25.0C	----	Yes
SR 1730 (Whitfield Road, -Y10-)	3.0” S9.5C	----	5.0” B25.0C	----	No
-YFLYB- Inside and Outside Shoulders	8.0” jointed concrete (without dowels)	----	5.0” B25.0C	----	No

* The subgrade stabilization shall consist of 8” Type 1 Aggregate Subgrade (Reference the *Aggregate Subgrade* Standard Special Provision found elsewhere in this RFP)

For the -Y- Line, ramp and loop pavement designs noted in **Table 1** above, the Design-Build Team may substitute an ABC layer for the asphalt base course layer. If such an alternative is proposed, the thickness of the ABC layer, used as a substitute for the asphalt base course layer, shall be equal to twice the proposed asphalt base course thickness specified for the roadway. If an asphalt surface course is placed directly on an ABC layer, the Design-Build Team shall apply prime coat over the ABC layer.

The Design-Build Team shall maintain the same pavement design throughout the construction limits of each -Y- Line, ramp and loop. In the Technical Proposal, the Design-Build Team shall specify the base option chosen (ABC or asphalt) for all -Y- Lines, ramps, and loops.

Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall resurface the existing pavement (travel lanes and shoulders) of all -Y- Lines, ramps and loops with a minimum depth that equals the full thickness of surface course as provided in **Table 1** above. (Reference the Roadway Scope of Work found elsewhere in this RFP)

Throughout the NC 86 (-Y9-) construction limits, the Design-Build Team shall uniformly mill the existing pavement (travel lanes and shoulders) to a depth of 1.5” and resurface with a minimum 1.5” S9.5C. (Reference the Roadway Scope of Work found elsewhere in this RFP)

On all ramps and loops, the adjacent through lane pavement design shall extend to the back of the gore (12-foot width).

Within the concrete pavement limits of the I-85 southbound to I-40 eastbound flyover (-YFLYB-) that require guardrail replacement, the Design-Build Team shall remove and dispose of / recycle the inside and outside paved shoulder pavement structures, including any necessary paved shoulder tapers, in their entirety (to the top of the soil subgrade), and construct new concrete shoulders. (Reference the Roadway Scope of Work found elsewhere in this RFP)

For the widening of existing concrete ramps at -Y2RPD-, -Y3RPA-, -Y3RPC-, -Y9RPC-, and -Y9RPD-, the Design-Build Team shall 1) remove and dispose of / recycle the ramp shoulder pavement structure, in its entirety, to the top of the soil subgrade, including but not limited to the removal and disposal of existing aggregate base course, 2) widen the ramp with the pavement design noted in **Table 1** above, and 3) resurface the existing concrete pavement with a minimum 1.5" S9.5D from the back of the gore (12-foot width) to the -Y- Line.

In areas along ramps where the existing outside turf shoulder has been stabilized with aggregate, the Design-Build Team shall maintain, replace and / or install new aggregate such that the limits of the existing stabilized turf shoulders remain at the project completion. The stabilization shall consist of a minimum of six inches of ABC.

Throughout the -Y- Line, ramp and loop construction limits that consist solely of pavement marking obliterations and / or revisions, the Design-Build Team shall uniformly overlay the existing pavement (travel lanes and shoulders) with a minimum pavement depth that equals half the full thickness of the surface course as provided in **Table 1** above.

Unless noted otherwise elsewhere in this RFP, the minimum narrow widened width shall be eight feet. The minimum narrow widened width may be reduced to four feet only if the Design-Build Team demonstrates, in the Department's sole discretion, that their equipment properly compacts narrow widening and obtains prior Department written approval. Tapers that tie proposed pavement to existing pavement are excluded from the narrow widening requirements noted above.

In the I-85 / I-40 gore area and areas where the existing -Y- Line, service road or ramp paved shoulders are proposed to be incorporated into a permanent travel lane, the Design-Build Team shall be responsible for evaluating the existing paved shoulder regarding its suitability for carrying the projected traffic volumes. In the event that the existing paved shoulder is found to be inadequate, the Design-Build Team shall be responsible for upgrading the existing paved shoulder to an acceptable level or replacing the existing paved shoulder. The Design-Build Team shall submit their evaluation and proposed use of existing paved shoulders to the Design-Build Unit for review and acceptance or rejection.

Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall pave from 1) the edge of all paved shoulders to the face of all single face barrier / guardrail, 2) from the edge of all paved shoulders to the edge of all expressway / shoulder berm gutter and 3) from the edge of all paved shoulders to the face of proposed retaining walls and sound barrier walls located on the

outside shoulder with 6" of ABC (or 4" B25.0C), a split seal and at least two lifts of surface course. If a split seal is not used, the ABC pavement design shall require prime coat at the normal application rate. In these areas, the Design-Build Team's installation of ABC or black base shall be consistent with the pavement type for the specific roadway. As an alternative to the pavement designs above for paving the shoulders to the face of the aforementioned features, the Design-Build Team may use the adjacent travel lane pavement design. Along I-40, the Design-Build Team shall use the adjacent I-40 concrete paved shoulder pavement design for paving the shoulders to the face of the aforementioned features. Along -YFLYB-, the Design-Build Team shall use the -YFLYB- concrete shoulder pavement design for paving the shoulders to the face of the aforementioned features. Along ramps, the Design-Build Team shall provide a continuous paved shoulder width between segments of single face concrete barrier and / or guardrail when the segments are less than 800 feet apart.

The Design-Build Team shall place a minimum of 6" of ABC or 4" B25.0C under all single face barrier, expressway / shoulder berm gutter, curb and gutter, and concrete truck aprons.

All driveways, up to the radius point, shall be constructed with the full-depth pavement design of the intersecting roadway. The entire impacted length of all non-concrete driveways with a 10% grade shall be constructed with 1.5" S9.5B (or S9.5C) and 8" ABC with prime coat. Unless otherwise noted above, the Design-Build Team shall adhere to the following for all driveway construction:

- For existing gravel and soil driveways, use 8" ABC
- For existing asphalt driveways, use 1.5" S9.5B (or S9.5C) and 8" ABC with prime coat, or 2.0" S9.5B (or S9.5C) and 6" ABC with prime coat.
- For existing concrete driveways, use 6" jointed concrete reinforced with woven wire mesh

The Design-Build Team shall be responsible for the design of all temporary pavements and for the evaluation of existing shoulders and roadways regarding their suitability for carrying traffic during construction, if necessary. In the event that the existing shoulders and / or roadways are found to be inadequate for the proposed temporary traffic volumes and durations, the Design-Build Team shall be responsible for upgrading the pavement to an acceptable level. All temporary pavements shall be designed in accordance with the NCDOT *Pavement Design Procedure* - AASHTO 1993 Method dated January 4, 2019, including all revisions. Temporary pavement designs and associated calculations shall be submitted for review and acceptance using the Design-Build submittal process prior to incorporation. The expected duration for traffic on temporary pavement must be included as part of the submittal.

The rate of application and the maximum and minimum thickness per application and layer shall be in accordance with the NCDOT Roadway Design Manual and 2020 Asphalt QMS manual.

Excluding the high side of superelevated sections, the Design-Build Team shall design and construct new continuous median and outside shoulder drains and outlets for the I-40 concrete pavement. The Design-Build Team shall tie the existing drainage structures to proposed drainage structures, as required, to ensure drainage of the entire pavement structure. Where installed on

the outside shoulder, outlets shall be provided approximately every 300 feet. Where installed on the median shoulder, outlet locations shall not exceed 500 feet, and all outlets shall be located at drainage structures. The shoulder drain design and outlet locations shall be submitted to the Design-Build Unit for review and acceptance.

When a uniform overlay or resurfacing grade ties to an existing curb, bridge and / or pavement, the Design-Build Team shall perform incidental milling, such that the new pavement ties flush with the existing feature(s). In superelevated sections of facilities with existing curb on both sides of the typical section, the Design-Build Team shall uniformly mill the entire pavement width to a depth that equals the required surface layer pavement thickness noted above. When tying to the aforementioned feature(s), the Design-Build Team shall not reduce the minimum required surface layer pavement thickness noted above. At existing pavement ties at bridges and the beginning / end of construction, the Design-Build Team shall perform incidental milling for 25 feet per surface course. To tie into existing curb and gutter, The Design-Build Team shall perform incidental milling for a minimum of six feet. The Design-Build Team shall not perform incidental milling more than 72 hours prior to placement of the asphalt surface layer.

ALTERNATIVE TECHNICAL CONCEPTS

Alternative Technical Concepts proposing alternate pavement designs are not permitted and shall not be evaluated or considered.

PAVEMENT MARKINGS SCOPE OF WORK (3-17-20)

General

The Design-Build Team shall prepare Pavement Marking Plans in accordance with the information on the following websites, the version of the following references effective on the Technical Proposal submittal date, and the contract requirements contained herein:

- The Signing and Delineation Unit website

  https://connect.ncdot.gov/resources/safety/Pages/Signing-and-Delineation.aspx

- Signing and Delineation Unit Procedures Manual

  https://connect.ncdot.gov/resources/safety/Pages/Signing-and-Delineation.aspx

- Traffic Engineering Practices, Policies, and Legal Authority (TEPPL)

  https://connect.ncdot.gov/resources/safety/Teppl/Pages/Teppl-Select-Topics.aspx

- *Manual on Uniform Traffic Control Devices* (MUTCD)

  http://mutcd.fhwa.dot.gov/kno_2009r1r2.htm

- *Guidelines for Preparation of Signing and Final Pavement Marking Plans for Design-Build Projects*

  https://connect.ncdot.gov/letting/Pages/Design-Build-Resources.aspx

- *Design-Build Submittal Guidelines*

  https://connect.ncdot.gov/letting/Pages/Design-Build-Resources.aspx

- NCDOT *Standard Specifications for Roads and Structures*

- NCDOT *Roadway Standard Drawings*

In case of conflicting design parameters, and / or ranges, in the various resources, the proposed design shall adhere to the most conservative values, unless noted otherwise elsewhere in this RFP.

Final Pavement Marking Plan Requirements

The Design-Build Team shall select a Private Engineering Firm (PEF) that has experience designing and sealing Pavement Marking Plans for NCDOT on comparable projects. The

Design-Build Team shall list projects in the Technical Proposal, including description and similarity to the subject project, for which the PEF developed Pavement Marking Plans.

The Design-Build Team shall develop Pavement Marking Plans that maintain all types of traffic (motorists, bicyclists, and pedestrians within the highway, including persons with disabilities, in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130) as defined by the *Manual for Uniform Traffic Control Devices* (MUTCD).

If sidewalk is constructed, the Design-Build Team shall show and station all curb ramps in the Pavement Marking Plans for signalized intersections, non-signalized intersections and points of pedestrian crossings. Curb ramps shall be constructed per current ADA standards and with guidance from the 2018 NCDOT Roadway Standard Drawings. If the roadway geometry does not allow for the use of standard details, contact the Contract Standards and Development Unit for alternate approved curb ramp designs.

Final Pavement Marking Project Limits

The Design-Build Team shall install all pavement markings and markers located within and outside the project limits, resulting from the project construction. The Final Pavement Marking Plans shall address all required modifications to existing pavement markings and markers located outside the project limits to ensure appropriate tie-ins. At a minimum, the Design-Build Team shall modify existing pavement markings and markers located outside the project limits to ensure that all lanes in each direction are open to traffic.

Pavement Markings, Markers and Delineation

The Design-Build Team shall submit a complete set of Final Pavement Marking Plans that includes the -L- Line, and all -Y- Lines, ramps / loops, and service roads for review and acceptance. The Design-Build Team shall not place any final pavement markings or markers until the aforementioned Final Pavement Marking Plans are reviewed and accepted by the Department.

The Design-Build Team shall coordinate with the Transportation Management Plans for necessary traffic control devices that will remain at the completion of the project.

The Design-Build Team shall use pavement marking and marker products that conform to all NCDOT requirements and are listed on the NCDOT's Approved Products List. The use of any devices that are not shown on the Approved Products List shall require written approval from the NCDOT Signing and Delineation Unit prior to incorporation.

The Design-Build Team shall install pavement markings and markers in accordance with the 2018 NCDOT *Standard Specifications for Roads and Structures*, and in accordance with the manufacturer's procedures and specifications.

In accordance with the NCDOT Roadway Standard Drawing No. 1205.08, Sheet 1 of 8, and guidance found on the Signing and Delineation Unit's webpage, the Design-Build Team shall install wrong-way ramp arrow pavement markings and markers on all exit ramps / loops.

The Design-Build Team shall install longitudinal pavement markings and pavement markers on the final surface as follows:

Road	Marking	Marker
Asphalt Surfaces	Thermoplastic with Standard Glass Beads	**Roadways** • Non-cast iron snowplowable markers on mainline, ramps and loops • Match existing on all other roadways **Bridge Decks** • Raised markers on mainline, ramp and loop bridge decks • Match existing on -Y- Line bridge decks
Concrete Surfaces	Polyurea with Standard Glass Beads	

In accordance with the Black - White Combination (10’ White Skip Lines / 10’ Black Skip Lines) Detail provided by the Department and the *Black Epoxy Pavement Marking Material* Project Special Provision found elsewhere in this RFP, the Design-Build Team shall place black epoxy contrast markings on concrete pavement.

On concrete surfaces, the Design-Build Team shall install Heated-in-Place Thermoplastic or Cold Applied Plastic (Type 2 or 3) markings for stop bars, symbols, characters, crosswalks, and diagonals.

On asphalt surfaces, the Design-Build Team shall install Heated-in-Place Thermoplastic or Extruded Thermoplastic markings for stop bars, symbols, characters, crosswalks, and diagonals.

Prior to placing pavement marking material on concrete surfaces that are diamond ground, the Design-Build Team shall use an acceptable method to grind ridges smooth where pavement markings will be installed.

On all Full Control of Access interstate facilities and US Routes the Design-Build Team shall install six-inch wide pavement markings, (i.e., lane line, edge line and skips) for the final pavement marking. The Design-Build Team shall install gore lines that are twice the edge line width.

Using approved methods, the Design-Build Team shall remove residue and surface laitance on concrete bridge decks prior to placing final pavement marking materials. In accordance with approved methods and the 2018 NCDOT *Standard Specifications for Road and Structures*, the Design-Build Team shall remove curing compound from all other concrete surfaces prior to placing final pavement marking materials.

The Design-Build Team shall only remove pavement markings from asphalt surfaces by grinding.

The Design-Build Team shall only remove pavement markings from concrete surfaces by hydroblasting.

The Design-Build Team shall tie proposed pavement marking lines to existing pavement marking lines.

The Design-Build Team shall replace any pavement markings that have been damaged by the end of each day's operation.

Pavement Markings for I-40 Westbound Lane Drop at US 15-501 (Exit 270)

The Design-Build Team shall remove / conceal, modify and / or install all pavement markings and markers necessary to temporarily remove the existing I-40 westbound left lane drop near US 15-501 (Exit 270); and convert the I-40 westbound outside through lane (third I-40 westbound through lane from the median) to an "Exit Only" lane onto the US 15-501 exit ramp. (Reference the Preliminary W-5707C Signing and Pavement Marking Plans provided by the Department; and *Intermediate Contract Time Number 1 and Liquidated Damages* Project Special Provision and Transportation Management Scope of Work found elsewhere in this RFP)

Prior to placing the I-40 traffic in the final traffic pattern, the Design-Build Team shall remove and install all the pavement markings and markers necessary for the final lane configuration that shall eliminate the aforementioned "Exit Only" condition.

PUBLIC INVOLVEMENT AND INFORMATION SCOPE OF WORK (3-9-21)

General

NCDOT will take the lead role on this project and be responsible for a portion of the public involvement and information efforts, through the Department's Public Involvement Group and Communications Office, respectively. At a minimum, the Design-Build Team shall designate a contact for public involvement and information inquiries / coordination.

The Design-Build Team shall hold an initial project coordination meeting with NCDOT at least six weeks prior to the start of construction to discuss project impacts to the public. This information will be used by the Department to create a Public Involvement and Information Plan.

The Design-Build Team shall prepare all required corridor and design public hearing maps in accordance with the Public Involvement Map Information Guide and the Corridor Public Hearing Map Checklist and / or Design Public Hearing Map Checklist located at the following website:

https://connect.ncdot.gov/projects/Roadway/Pages/Guidelines--Standards.aspx

The Department will develop, with assistance from the Design-Build Team, the specific list of target audiences for this project. The following groups are identified as typical target audiences to receive informational materials:

- Governmental agencies
- Municipalities directly affected by construction
- Transportation services
- Emergency services
- Neighborhood groups and private homes
- Industry and businesses
- Chamber of Commerce
- Individual schools affected by the project
- County / City school systems
- Any other organization as deemed necessary by the Department.

The Department will be responsible for establishing, creating, maintaining and updating a project website. However, throughout the project duration, the Design-Build Team shall coordinate public involvement activities with the NCDOT Public Involvement Officer assigned to the project; and provide weekly updates, photos and other needed announcements to the Communications Office to ensure the accuracy of the aforementioned project website.

In the Technical Proposal, the Design-Build Team shall discuss their approach to providing the public access to project personnel for inquiries on vehicular and pedestrian traffic impacts.

The Design-Build Team shall include in their lump sum bid for the project, all costs associated with their involvement in the Public Involvement and Information Scope of Work.

Public Involvement

Unless noted otherwise elsewhere in this RFP, the NCDOT Public Involvement Group will be responsible for the activities noted below:

- Organizing public meetings, including venue selection, reservation and fee
- Excluding corridor and design public hearing maps, developing and producing informational print materials for all meetings and workshops
- Soliciting and administering advertisements, as deemed necessary
- Mailings to the identified target audiences, including postage
- If necessary, developing and producing informational print materials for Limited English Proficiency (LEP) outreach
- Web page updates related to public involvement efforts

To ensure that project information can be distributed to the public using standard methods, including but not limited to newspaper notices, the Design-Build Team shall coordinate with the Public Involvement Officer assigned to the project.

The Design-Build Team shall also coordinate with the Public Involvement Officer to promote public awareness for this project. The amount of public involvement required for this project shall be directly based on the Design-Build Team's Transportation Management Plans and construction details. The Design-Build Team's responsibilities shall include, but are not limited to, the following:

- Providing information requested by the Department to develop and produce informational printed materials for all meetings and workshops
- Developing and providing corridor and design public hearing maps for presentation at all public meetings / workshops
- Providing details surrounding the impacts to the public
- Providing advance notice to the Department of upcoming project impacts
- Assisting the Department in the development of the target audience list
- At a minimum, the Design-Build Team shall attend and speak at individual stakeholder meetings. The Design-Build Team shall attend and speak at other public meetings / workshops as required herein or by the Department.
- Hand delivery of time sensitive informational materials

The minimum public involvement requirements solely associated with the Transportation Management Plans shall include, but are not limited to the following:

- Public Meetings - If Beginning of Construction meeting for area businesses and residents is held, attending and / or speaking at this event.

- Distribution of Informational Materials - For beginning of construction and for all road closures with detour routes, the Design-Build Team shall be responsible for providing time sensitive informational material, provided by the Department, directly to the target audiences. If the Design-Build Team informs the Department of the aforementioned

activities less than thirty (30) calendar days in advance, the Design-Build Team shall hand deliver the materials to the impacted target audiences.

Public Information

Unless noted otherwise elsewhere in this RFP, the NCDOT Communications Office will be responsible for the activities noted below:

- Providing media announcements, including social media
- Scheduling interviews, as needed
- Website updates related to project progress

To ensure that project information can be distributed to the public using standard methods, including but not limited to notifying media outlets and updating the project website, the Design-Build Team shall inform the Department at least thirty (30) calendar days in advance of any construction activity that will significantly impact the public. These activities shall include, but are not limited to, the start of construction, major traffic shifts, road closures, ramp closures, detours, night work and project completion.

Throughout construction, the aforementioned Design-Build contact shall provide weekly updates to the NCDOT Communications Office, including, but not limited to, traffic control phasing, graphic illustrations, project pictures, etc.

RAILROAD COORDINATION SCOPE OF WORK (5-20-21)

The Design-Build Team shall be responsible for coordinating with Norfolk Southern Railway (NSR) to secure the railroad agreements necessary for the widening of two highway bridges on I-40 over the track operated and maintained by NSR. The Design-Build Team shall be responsible for any modification to these agreements that may be necessary based on their design and / or construction methods. The Design-Build Team shall be responsible for coordination of all design and construction details on NSR right of way and shall secure any necessary agreements required by the NCDOT and / or NSR.

The Design-Build Team shall be responsible for all NSR costs associated with this project to include, but not be limited to, plan reviews, materials furnished by NSR, signals and communications work, track and related construction by NSR and / or their representative(s), any delays to train operations or maintenance crews, required insurances, railroad flagging, right of way acquisition, and construction engineering.

The Design-Build Team shall be responsible for all construction required. NSR will not incur any cost, and the Design Build Team shall not enter into or onto the NSR rail corridor until the Agreements are executed, insurance requirements are met, and NSR receives written authorization to proceed with the work provided in the Agreements.

Preparation for Construction within the Existing NSR Right of Way

I. The Design-Build Team shall comply with the following guidelines and any other guidelines as required by NSR, unless noted otherwise elsewhere in this RFP and / or a design exception is received from NSR and NCDOT, via the NCDOT Design-Build Unit:

A. *AREMA Manual for Railway Engineering,* latest edition

B. *Norfolk Southern Railway - Standard Specifications for Materials and Construction,* latest edition

C. *Norfolk Southern Railway - Public Projects Manual*, latest edition

D. *Federal Aid Policy Guide 23 CFR 140I*

E. *Federal Aid Policy Guide 23 CFR 646*

F. NCDOT *Construction Manual* Section 105-8.

G. NCDOT *Construction Manual* Section 107-9.

H. 2018 NCDOT *Standard Specifications for Roads and Structures,* Section 107-9 (Excluding Paragraph 2)

I. *North Carolina Administrative Code* Section T19A: 02B, 0150 through 0158

II. The Design-Build Team shall verify the number of trains per day and the maximum speed allowed at the proposed overhead bridge location with NSR. Railroad traffic shall be maintained at current levels at all times. The Design-Build Team shall have no claims whatsoever against either NSR or NCDOT for any delays and / or additional costs incurred based on changes to the following information:

Number of trains per day	1
Type of trains per day	Freight
Maximum train speed	10 mph

Railroad inspection and maintenance requirements, in addition to normal train operations, will occur that may impact construction activities.

III. This project has one site with two (2) existing structure crossings located on the NSR J-line Corridor between approximately NSR Milepost J4.44 (I-40 westbound bridge) and J4.46 (I-40 eastbound bridge). The rail corridor is considered oriented north / south with mileposts increasing from north to south. The corridor currently contains one track. The railroad right of way width for this area is 100 feet wide, centered 50 feet on each side of the existing track centerline.

Arrangements for Protection and Adjustments to Existing and Proposed Railroad Crossing Surface and Roadbeds

I. The Design-Build Team shall make the necessary arrangements with NSR for the installation of temporary grade crossing surfaces, including but not limited to associated temporary drainage, crash gates with a NSR issued lock, removal of temporary construction crossings after completion of project, shoring plans, railroad force account estimates and agreements. The temporary grade crossing surface shall conform to NSR standards. All crossing surfaces, including but not limited to all grade crossing signals, gates, and any related train control signals / communications systems, shall be procured, installed and removed by NSR, or their representative, at the Design-Build Team's expense.

The Design-Build Team shall not commence any work on NSR right of way / easement until all agreements have been executed, insurance acquired and approved in accordance with NSR policies and procedures, and all construction plans have been approved by NCDOT and NSR. The Design-Build Team shall make the necessary arrangements with NSR that are required to protect against property damage that may result in loss of service, expense, or loss of life. Removal of existing structures or portions of existing structures over NSR shall be performed in an approved manner so as not to damage or allow material / debris to fall on the track. The Design-Build Team shall be responsible for all damage to NSR property resulting from their operations and NSR may issue a stop order until all dangerous situations are remedied.

The Design-Build Team shall be responsible for providing Railroad Protective Liability Insurance for Bodily Injury Liability, Property Damage Liability, and Physical Damage to Property to NSR, identifying NSR as the insured party, during the duration of the time work is being performed on or over the railroad right of way / easement. The Design-Build Team shall be responsible for verifying and obtaining the appropriate insurance and coverage with NSR. Other insurance requirements, including those for all subcontractors, are detailed in the documents referenced herein. The Design-Build Team shall be responsible for any required Roadway Worker Protection training / certifications.

II. Prior to any utility installation, removal or relocation across NSR right of way / easement, including but not limited to pipelines and / or electrical and communication cable routings over or under railroad-owned facilities, the Design-Build Team shall coordinate with NSR and private utility owners to obtain the necessary permits and secure the appropriate Encroachment Agreements. At a minimum, the Design-Build Team shall assist the private utility owners in obtaining their respective Encroachment Agreements in the private utility owner's name. In accordance with the requirements noted herein and NSR's specifications, the private utility owner(s) will be responsible for all associated fees and provide the necessary insurance coverage.

All work associated with any utility installation across NSR's right of way / easement shall adhere to the requirements noted herein and NSR's specifications.

III. After negotiations among the Department, the Design-Build Team and NSR have been finalized, and approval obtained from the North Carolina Board of Transportation, the Design-Build Team shall submit executed agreements and plans to NCDOT's State Structures Engineer, via the NCDOT Design-Build Unit, for plan approval and final agreement execution by NCDOT, prior to authorizing railroad work. After approval by NCDOT, one copy of the executed agreement will be returned to the Design-Build Team and one copy forwarded to the NCDOT's Resident Engineer, prior to any construction work by the Design-Build Team or NSR. This section particularly applies if a modification to an agreement is necessary.

Coordination with NSR

The Design-Build Team shall coordinate with the primary owner of NSR through the NSR General Engineering Consultant (GEC), TGS Engineers. The Design-Build Team shall coordinate with Mr. Jeffrey Brittain at TGS Engineers, 107-A Mica Avenue, Morganton, NC 28655, (828) 437-4681 Ext. 216 to obtain coordination procedures for plan approval and, if needed, a partially executed legal agreement with NSR and the NCDOT as the parties in the agreement for proposed roadway work. The Department will review the agreement prior to submittal to the NSR. The Department will execute and distribute the Agreement within 14 calendar days of Board of Transportation approval. All agreements, and any modifications thereto, shall include necessary Force Account items, including but not limited to, preliminary engineering, construction engineering, flagging, temporary construction crossing surfaces, track materials, track construction, signal and communication lines, and other work performed by

NSR, as necessary. NSR has sole authority to determine the need for flagging required to protect its operations and property. (The Design-Build Team will not be responsible for the cost of flagmen required for NSR to perform routine maintenance programs.) The railroad agreements state that the Department will be responsible for payment of the NSR's Force Account work and NSR expenses; however, the Design-Build Team shall reimburse the Department for these costs including all Force Account estimate overruns. This reimbursement shall be incidental to the lump sum price bid for the project. Upon request, the Department will provide copies of the NSR invoices to the Design-Build Team for review. The Design-Build Team shall have ten (10) days to provide comments to the Department, after which the Department will pay the invoice. The Design-Build Team shall be responsible for maintaining records to verify the invoice items.

The preliminary plan and final plan submittals to NSR shall include 1) roadway plans, the Railroad's "Overhead Bridge Crossing Data," appropriate roadway plan sheets showing impacts to the NSR right of way / easement, 2) erosion control plans, 3) drainage calculations for any drainage on or across the NSR's right of way / easement and 4) bridge plans showing the vertical and horizontal alignments and preliminary general drawings. Electronic versions of the preliminary plans, final plans and data shall be submitted to TGS Engineers, via the Design-Build Unit. If plan re-submittals, RFC Plans and / or any additional information are required, the Design-Build Team shall submit electronic versions to TGS Engineers, via the Design-Build Unit. Working Drawings affecting NSR's operations and / or right of way / easement shall follow submittal process as outlined in the 2018 NCDOT *Standard Specifications for Roads and Structures* or Special Provisions. The Design-Build Team shall allow 30 days for review of all railroad submittals.

Coordination with NCDOT Rail Division

All plans submitted to NSR, as required above, shall be accompanied by a .pdf copy for submission to the NCDOT Rail Division, via the Design-Build Unit.

RIGHT OF WAY SCOPE OF WORK (3-12-21)

**** NOTE ** Prior to negotiating property acquisition with property owners, the Design-Build Team shall meet with the appropriate NCDOT Location and Surveys, Right of Way and Design-Build personnel.**

- The Design-Build Team shall employ qualified, competent personnel who are currently **approved by the NCDOT Right of Way Unit,** herein after referred to as the Department, to provide all services necessary to perform all appraisal (except appraisal reviews and updated appraisals required solely for condemned parcels), negotiation and relocation services required for all right of way, control of access and easements, including but not limited to utility easements, necessary for completion of the project in accordance with G.S. 136-28.1 of the General Statutes of North Carolina, as amended, and in accordance with the requirements set forth in the *Uniform Appraisal Standards and General Legal Principles for Highway Right of Way*, the *North Carolina Department of Transportation's Right of Way Manual*, the *North Carolina Department of Transportation's Rules and Regulations for the Use of Right of Way Consultants*, the *Code of Federal Regulations*, and Chapter 133 of the *General Statutes of North Carolina* from Section 133-5 through 133-18, hereby incorporated by reference, including the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended. The Design-Build Team shall field stake all right of way, control of access and easements, including but not limited to utility easements, in accordance with the requirements noted above. For a list of firms currently approved, the Design-Build Team should contact Mr. Terry Niles, in the NCDOT Right of Way Unit, at 919-707-4400. The Design-Build Team shall perform the services as set forth herein and furnish and deliver to the Department reports accompanied by all documents, including but not limited to all revisions and electronic design files, necessary for the settlement of claims and the recordation of deeds, or necessary for condemnation proceedings covering said properties. The Design-Build Team, acting as an agent on behalf of the State of North Carolina, shall provide right of way acquisition services for TIP I-3306A / W-5707C in Orange and Durham Counties.

  Acquisition services required outside of the project construction limits due solely to an allowable rise in the floodplain water elevation on insurable structures will be considered extra work and paid for in accordance with Article 104-7 of the 2018 NCDOT *Standard Specifications for Roads and Structures*.

The Design-Build Team shall carry out the responsibilities as follows:

- With respect to the payments, costs and fees associated with the acquisition of right of way, easements and / or control of access, the Department will be responsible for only direct payments to property owners for negotiated settlements, recording fees, any relocation benefits, and deposits and fees involved in the filing of condemnation claims. The Department will assume responsibility for all costs associated with the litigation of condemned claims, including testimony by the appraiser(s). The Design-Build Team shall be responsible for all other acquisition services related to payments, costs and fees, including but not limited to attorney fees required for all non-condemnation acquisitions.

- A Department representative will be available to provide technical guidance on right of way acquisition procedures and to make timely decisions on approving relocation benefits and approving administrative adjustment settlements on behalf of the Department over and above the authority granted to the Department Right of Way Consultant Project Managers.

- The Design-Build Team shall verify / determine the prior rights and / or compensable interest for an existing utility prior to acquiring any corresponding utility easement. (Reference the Utilities Coordination Scope of Work found elsewhere in this RFP)

- If applicable, the Department will provide a list indicating if existing billboards located within or adjacent to the project limits are conforming or non-conforming to the NCDOT *Regulations for The Control of Outdoor Advertising in North Carolina*, dated 2000. Prior to contacting any property owner(s) or billboard owner(s), the Design-Build Team shall meet with the appropriate Regional Outdoor Advertising Technician and the Division Right of Way Agent to determine the relocation eligibility and relocation benefits, and possible leasehold interest if the billboard is on leased property.

- The Design-Build Team shall submit a right of way project tracking report and right of way quality control plan to the Department. The Department standard forms and documents shall be used to the extent possible.

- The Design-Build Team shall provide a current title certificate for each parcel as of the date of closing or the date of filing of condemnation, unless required otherwise in the NCDOT December 21, 2018 *Right of Way Manual*.

- The Department will prepare all Condemnation Maps. The Design-Build Team shall prepare all Final Condemnation Reports and provide updated MicroStation CADD files, upon request, to the Department for preparation of the Condemnation Maps. Upon approval of the Final Condemnation Report, the Department will require a minimum of eight weeks to file the condemnation claim. For all plan revisions on condemned parcels that modify the area acquired, modify the control of access and / or impact the appraised value, the Design-Build Team shall be responsible for the following:

    - The Design-Build Team shall notify the Division Right of Way Agent, the Area Negotiator, Area Appraiser, Location and Surveys Unit, and the Attorney General, in writing, that revisions have been made that impact a condemned parcel, and provide updated plan sheets, revised MicroStation CADD files, and revised area takes.

    - The Design-Build Team shall consult with the Attorney General and the Area Appraiser to determine the status of the negotiations and appraisal(s).

    - If the Attorney General and / or Area Appraiser recommend an updated appraisal, the Design-Build Team shall provide an updated Summary Sheet to the Area Appraiser for the Department's use in obtaining an updated appraisal(s).

    - Upon receipt of the approved updated appraisal(s), the Design-Build Team shall develop a revised written offer. If settlement is not reached, the Design-Build Team

shall submit an updated Final Condemnation Report and revised MicroStation CADD files. If settlement is reached, the Design-Build Team shall notify the Attorney General and Area Appraiser, in writing, and submit an updated Final Condemnation Report with all necessary documentation, including but not limited to, revised MicroStation CADD files.

- The Department will be responsible for payment for the additional deposit to the Attorney General's Office and the Attorney General will prepare and file an Amendment to the Declaration of Taking.

- The following shall be required:

  - Unless otherwise approved by the NCDOT Assistant State Negotiator, in writing, the Design-Build Team shall provide right of way, control of access and easement descriptions in metes and bounds format (bearings and distances). The Design-Build Team shall provide exhibits, diagrams and / or other information required to verify the aforementioned descriptions.

  - In accordance with the NCDOT December 21, 2018 *Right of Way Manual*, the Design-Build Team may prepare red-line adjustments for parcels that are not condemned. The Department must approve a red-line adjustment, in writing, prior to the Design-Build Team making an offer based on the red-line adjustment.

  - The Design-Build Team shall prepare, execute and record documents conveying title to acquired properties to the Department with the Register of Deeds.

  - The Design-Build Team shall deliver all executed and recorded deeds and easements to the Department.

  - For all property purchased in conjunction with the project, title shall be acquired in fee simple or easement and shall be conveyed to "The North Carolina Department of Transportation", free and clear of all liens and encumbrances except permitted encumbrances.

- In accordance with the Location and Survey Unit's September 28, 2018 *Proc 2018-3 - Creating NCDOT Right of Way Plan Sheets for LET Projects* and *Proc 2018-5 - Elimination of Need to Request Control Sheets and Property Ties and RW Series Development Timeline* Memorandums (references to timelines in the aforementioned Memos shall be disregarded), the Design-Build Team shall develop the following right of way items:

  - Right of Way series of plan sheets ("R/W" series of plan sheets) that delineate the existing property information, property ties, proposed centerline data, existing and proposed right of way, existing and proposed easements, and existing and proposed control of access. The "R/W" series of plan sheets shall be signed and sealed by a Professional Land Surveyor registered in the State of North Carolina. The Professional Land Surveyor's signature and seal shall attest that the right of way monuments were placed under their responsible charge.

- A table of control points for the proposed centerline alignments ("D series of plan sheets).

- A table of proposed right of way and permanent easement control points ("E" series of plan sheets) that shall be signed and sealed by a Professional Land Surveyor registered in the State of North Carolina.

- It is understood and agreed by and between the parties hereto that all reports, surveys, studies, specifications, memoranda, estimates, etc., secured by and for the Design-Build Team shall become and remain the sole property of the Department upon termination or completion of the work, and the Department shall have the right to use same for any public purpose without compensation to the Design-Build Team.

- The Design-Build Team shall prepare appraisals in accordance with the Department's *Uniform Appraisal Standards and General Legal Principles for Highway Right of Way Acquisitions*. The Design-Build Team's appraiser shall be on the Department's approved state certified appraiser list. The Design-Build Team may request its state certified appraiser(s) be added to the approved state certified appraiser list, subject to approval by the Department's Area Appraiser and State Appraiser.

- The Department will develop or contract with a private firm to develop and provide a second appraisal for parcels as noted below:

  - All parcels with an initial appraisal, with just compensation, equal to or greater than one million dollars ($1,000,000.00).

  - All parcels where the initial appraisal indicates damages to the remaining property equal to or greater than two hundred fifty thousand dollars ($250,000.00), where damages to the remaining property are defined as a loss in value to the remaining land, and / or improvements and / or a cost to cure.

- The NCDOT, or its agent, will provide appraisal reviews complying with the Department's *Uniform Appraisal Standards and General Legal Principles for Highway Right of Way Acquisitions*. The reviewer will ensure that the appraisal meets the Department's guidelines and requirements, conforms to acceptable appraisal standards and techniques, does not include any non-compensable items or exclude any compensable items and that the value conclusions are reasonable and based on facts presented in the appraisal. The reviewer has the authority to approve, adjust, request additional data or corrections, or not to recommend and request another appraisal. Within ten business days from the date of receipt, all appraisals and / or appraisal corrections will be reviewed by NCDOT Review Appraisers or Review Appraisers under contract to the corresponding NCDOT Area Appraisal Office. The NCDOT will sign as approving any and all appraisals to be used in acquisitions.

- The NCDOT will provide relocation reviews and approvals for all Replacement Housing Payment calculations and all Rent Supplement Payment calculations prior to the Design-Build Team making any offers to the displacees. Within five business days of the

receipt of the Replacement Housing Payment or Rent Supplement Payment calculation documentation, which shall include all documentation required for an Evaluation Package, the Department will approve the calculation, and the signed FRM15-D will be returned to the Design-Build Team, or a request for an updated calculation or documentation will be presented to the Design-Build Team for further handling. At this time, the Relocation Coordinator in the NCDOT Right of Way Unit is the approving authority for the aforementioned calculations.

- The Design-Build Team shall coordinate with the Health Department to determine if septic systems can be relocated / modified to remain operational. To assist with the aforementioned determinations, the Design-Build Team may utilize a third-party consultant to perform the septic system inspections only if the Health Department approves the third-party consultant, in writing, prior to the inspections beginning. The Department will only be responsible for the Health Department fees and / or third-party fees associated with these determinations. The Design-Build Team shall determine the relocation / modification design and construction costs required for the septic systems to remain operational and include these costs in the property right of way appraisals. (Reference the Utilities Coordination Scope of Work found elsewhere in this RFP)

- All Claims for Payment involving relocation benefits must be submitted to the NCDOT Relocation Coordinator in the Right of Way Unit for approval and processing.

- At the conclusion of the right of way acquisition process, the Design-Build Team shall provide a right of way certification to the Division Right of Way Agent.

- The Design-Build Team shall prepare Right of Way Transmittal Summaries and / or Narrative Appraisals for all right of way, control of access and easement acquisitions. Claim Reports will not be allowed for any acquisition.

- Prior to acquiring right of way, control of access and / or easement from any parcel with contaminated soil, the Design-Build Team shall provide a written priority list of all properties with contaminated soil that require right of way, control of access and / or easement acquisition to the Division Right of Way Agent, the Area Negotiator, the Area Appraiser, and the Real Property Coordinator, Terry Niles. At a minimum, the aforementioned priority list shall contain the following information:

    - Project TIP Number, description and county

    - Parcel number(s) requiring acquisition of contaminated soil

    - Acquisition Appraisal(s)

    - GeoEnvironmental Impact Evaluation and Hazardous Materials Report provided by the Department

    - Description, with metes and bounds, of the area(s) to be acquired

SIGNING SCOPE OF WORK (7-12-21)

Project Description

The Design-Build Team shall prepare Signing Plans for the entire project limits, including but not limited to, advance and other necessary signing outside of the roadway construction limits.

Websites and References

The Design-Build Team shall prepare Signing Plans in accordance with the information on the following websites, the version of the following references effective on the Technical Proposal submittal date, and the contract requirements contained herein:

- The Signing and Delineation Unit website

  https://connect.ncdot.gov/resources/safety/Pages/Signing-and-Delineation.aspx

- Signing and Delineation Unit Procedures Manual

  https://connect.ncdot.gov/resources/safety/Pages/Signing-and-Delineation.aspx

- Traffic Engineering Practices, Policies, and Legal Authority (TEPPL)

  https://connect.ncdot.gov/resources/safety/Teppl/Pages/Teppl-Select-Topics.aspx

- *Manual on Uniform Traffic Control Devices* (MUTCD)

  http://mutcd.fhwa.dot.gov/kno_2009r1r2.htm

- *NC Supplement to the Manual on Uniform Traffic Control Devices*

  https://connect.ncdot.gov/resources/safety/TrafficSafetyResources/2009%20NC%20Supplement%20to%20MUTCD.pdf

- *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals* (AASHTO)

  https://bookstore.transportation.org/collection_detail.aspx?ID=126

- *Guidelines for Preparation of Signing and Final Pavement Marking Plans for Design-Build Projects*

  https://connect.ncdot.gov/letting/Pages/Design-Build-Resources.aspx

- *Design-Build Submittal Guidelines*

https://connect.ncdot.gov/letting/Pages/Design-Build-Resources.aspx

- NCDOT *Standard Specifications for Roads and Structures*

- NCDOT *Roadway Standard Drawings*

In case of conflicting design parameters, and / or ranges, in the various resources, the proposed design shall adhere to the most conservative values, unless noted otherwise elsewhere in this RFP.

Signing Requirements for Technical Proposal

The Design-Build Team shall select a Private Engineering Firm (PEF) that has experience in the preparation, design, and sealing of Signing Plans for NCDOT on comparable projects. The Technical Proposal shall list projects, where the Signing Plans were developed by the PEF, including description and similarity to the subject project.

The Design-Build Team shall include a Preliminary Signing Concept Map in the Technical Proposal. At a minimum, the aforementioned Concept Map shall include all anticipated DMS locations, all proposed overhead sign structure locations, all overhead signs, and all ground mounted Type A and B guide signs.

Signing Plans Submittal Requirements

The Design-Build Team shall submit an early work package for the signing modifications necessary to remove the existing I-40 westbound left lane drop near US 15-501 (Exit 270). At a minimum, the Design-Build Team shall submit a signing concept for review and approval prior to submitting the early work package RFC plans.

The Design-Build Team shall concurrently submit the 25% Preliminary Signing Plans to the recipients in the Design-Build Submittal Guidelines and the ITS Unit for review of the DMS locations.

Prior to submitting the 50% Preliminary Signing Plans, the Design-Build Team, the Division Traffic Engineer, the Regional Traffic Engineer, the Signing and Delineation Regional Engineer and the Design-Build Unit shall meet to discuss and review the Design-Build Team's 25% Preliminary Signing Plans.

The Design-Build Team shall provide 25% Pavement Markings Plans that have been reviewed and accepted by the Department and the latest Roadway Plans with the 50% Preliminary Signing Plans submittal.

Signs to be Furnished by Design-Build Team

The Design-Build Team shall furnish signs in accordance with the specifications provided by the NCDOT.

Signing Project Limits

Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall design, fabricate and install all Type A, B, D, E and F signs and supports (including overhead sign structures) required through the construction limits of the mainline, as well as all -Y- Lines, all service roads, all turn-arounds / cul-de-sacs, all roundabouts, all ramps and all loops. Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall design, fabricate and install all signs required beyond the roadway construction limits of the mainline, all -Y- Lines, all service roads, all turn-arounds / cul-de-sacs, all roundabouts, all ramps and all loops to ensure adequate advance signage and spacing is provided.

Signing for I-40 Westbound Lane Drop at US 15-501 (Exit 270)

The Design-Build Team shall remove, modify and / or install all signing necessary to temporarily remove the existing I-40 westbound left lane drop near US 15-501 (Exit 270); and convert the I-40 westbound outside through lane (third I-40 westbound through lane from the median) to an "Exit Only" lane onto the US 15-501 exit ramp. (Reference the Preliminary W-5707C Signing and Pavement Marking Plans provided by the Department and *Intermediate Contract Time Number 1 and Liquidated Damages* Project Special Provision found elsewhere in this RFP) The Department has fabricated the sign panels noted in the Preliminary W-5707C Signing and Pavement Marking Plans provided by the Department and stored the signs at the Orange County Maintenance Yard, 2122 Clarence Walters Road, Hillsborough, NC 27278. The Design-Build Team shall coordinate with the Division Traffic Engineer to schedule a time to pick-up the sign panels. The Design-Build Team and the Department shall concurrently inspect the signs for damage prior to the Design-Build Team taking possession of the signs. Any damage noted shall be documented and photographed by the Design-Build Team and a copy of the damage report and photographs shall be provided to the Engineer.

Prior to placing the I-40 traffic in the final traffic pattern, the Design-Build Team shall design, fabricate, and install all signing necessary, including overhead sign panels, for the final lane configuration that shall eliminate the aforementioned "Exit Only" condition.

Sign Designs

The Design-Build Team shall include all sign designs in the Signing Plans. All sign designs shall be prepared using the latest version of GuideSign software.

The Design-Build Team shall design, fabricate and install all signs required for the mainline, all -Y- Lines, all ramps, all loops, all service roads, all roundabouts, and all turnarounds / cul-de-sacs, including Type A and B overhead signs, Type A, B, and D ground mounted signs, and

exit gore signs. The Design-Build Team shall size and locate all Type E signs (warning and regulatory) and Type F signs (route marker assemblies).

The Design-Build Team shall design, fabricate and install new overhead sign panels for the I-40 eastbound exit directional sign onto the US 15-501 interchange.

The Design-Build Team shall design, fabricate and install mile markers for I-40 at **1-mile** intervals along both sides of the mainline. The Design-Build Team shall install each mile marker on one three-pound U-channel post. Mile markers shall be located at the outside shoulder point or a maximum of 15 feet from the edge of travel lane. The Design-Build Team shall install mile markers such that the bottom of the mile marker shall be four feet above the edge of travel lane (edgeline) elevation. Mile marker designs shall be in accordance with the Reference Location Signs (D10-2) referenced in the Standard Highway Signs (2004 Edition and the 2012 Supplement to the 2004 Edition).

The Design-Build Team shall design, fabricate and install mile markers and exit numbers in accordance with the mile numbers provided by the Department.

At all interchange exit loops and / or as required by the MUTCD Table 2C-5, the Design-Build Team shall fabricate and install advisory speed signing as shown in Figure 2C-3 of the MUTCD. In addition to signing shown in Table 2C-5 of the MUTCD, the advisory speed signing shall include W1-8, W13-6, W13-7, W1-13R, and E13-1P signs.

The Design-Build Team shall design, fabricate and install multi-lane crossroad signing, as shown in Figures 2D-11 and 2D-13 of the MUTCD, for the I-40 / Old NC 86 interchange and the I-40 / NC 86 interchange.

Prior to submittal of RFC Signing Plans, the Design-Build Team shall coordinate with the Signing and Delineation Unit and the Design-Build Unit on destination cities and / or street names on guide signs.

Logo Signs (Blue Service Signs with Specific Business Panels, including but not limited to, Specific Business Panels on U-channel posts)

The Design-Build Team will not be responsible for designing, locating or installing any additional Logo Signs not located within the project limits on the Technical Proposal submittal date.

Prior to project completion, the Design-Build Team shall relocate, reinstall and / or replace all existing Logo Signs located within the project limits on the Technical Proposal submittal date that are impacted by the Design-Build Team's design and / or construction methods.

If damage occurs to the Logo Signs and / or the business panels during construction, the Design-Build Team shall immediately notify the Division Logo Coordinator. The Design-Build Team shall replace all Logo Signs and / or business panels that are damaged during construction. If the Logo Signs are replaced, the Design-Build Team shall remove the business panels and deliver them to

the Division Logo Coordinator. During project construction, the Design-Build Team shall maintain the Logo Signs order of preference in accordance with the MUTCD Section 2J.01.

Sign Sheeting Requirements for Overhead Signs

The Design-Build Team shall design and fabricate all overhead signs with Grade A retro-reflective sheeting for sign legends (text), borders, and all Interstate, US and NC route shields and arrows. The Design-Build Team shall design and fabricate all overhead signs with Grade C retro-reflective sheeting for the background.

Black non-reflective sheeting shall be used for all black arrows, legends (text), and borders on overhead signs.

Speed Limit

The posted speed limit for the mainline (I-40) shall be 65 mph. (Reference the Roadway Scope of Work found elsewhere in this RFP)

Interstate, US and NC Route Designation

The Design-Build Team shall coordinate all interstate, US and NC highway routing with the Transportation Mobility and Safety Division of NCDOT. Prior to designing any signs that display new or revised Interstate, US or NC routes, the Design-Build Team shall confirm all highway routes with the Department. Concurrent with the Release for Construction (RFC) Signing Plans submittal, the Design-Build Team shall notify the State Signing and Delineation Engineer, in writing, of all new or revised Interstate, US or NC routes.

Sign Locations

The Design-Build Team shall determine the station location of all signs and sign structures.

The Design-Build Team shall provide a minimum of two advanced guide signs for all freeway / expressway interchange approaches.

To avoid placing a sign or sign structure in a location that might be in conflict with future roadway projects and / or limit its usefulness / lifespan, the Design-Build Team shall coordinate all proposed sign designs and locations with the Department.

Ground Mounted Sign Supports

The Design-Build Team shall design, fabricate and install ground mounted signs supports in accordance with the NCDOT Roadway Standard Drawings. The associated software for the design of Type A and B ground mounted sign supports, may be referenced on the website noted below:

https://connect.ncdot.gov/resources/safety/Pages/Signing-and-Delineation.aspx

Prior to installation, the Design-Build Team shall 1) field verify all Type A and B ground mounted sign supports, 2) recalculate the field verified S-Dimensions, using the latest edition of the design software on the website noted above, and 3) revise the beam sections, where applicable. The Design-Build Team shall use the most recent version of the ground mounted sign support selection workbook tool, in accordance with the submittal schedule outlined in the "Instructions" tab of the tool.

Unless otherwise approved by the Department, the vertical mounting height for ground mounted Type D, E and F signs shall be a minimum of seven feet and maximum of eight feet from the edge of the travel lane to the bottom of the sign.

On freeways and expressways, the minimum lateral offset for Type A and B ground mounted signs on breakaway supports shall be 30 feet, unless approved otherwise by the Department. The lateral offset shall be measured from the edge of the travel lane closest to the shoulder to the closest sign edge.

On freeways and expressways, all Type A and B ground mounted signs on simple (non-breakaway) supports shall be protected by guardrail, barrier or another form of approved positive protection. The minimum lateral distance between the face of guardrail and the closest sign edge shall be six feet.

Unless noted otherwise elsewhere in this RFP, all Type D, E and F signs shall be installed on U-channel posts in accordance with the NCDOT Roadway Standard Drawings. Type D signs shall not exceed eight feet in width and / or 24 square feet. Unless positively protected, all Type D signs shall be installed on a maximum of two U-channel posts.

Proposed Overhead Sign Structures

The Design-Build Team shall consider the proposed roadway geometry, number of lanes, and all advisory signing needs when selecting the type of overhead signing for a given location. At a minimum, the Design-Build Team shall provide overhead signing at the locations identified in the MUTCD, Section 2E.24 - Signing for Interchange Lane Drops, Section 2A.17 - Overhead Sign Installations, Items A - M, and the following locations, unless allowed otherwise elsewhere in this RFP:

- An option lane at a freeway / expressway multi-lane exit or freeway / ramp split (use Arrow Per Lane signs)
- A minimum of two (2) overhead sign structures for freeway lane ends (freeway lane drop)
- Three or more lanes on a freeway
- A series of Arrow-Per-Lane signs for the I-40 eastbound exit at the I-40 / I-85 interchange

The wind speed for the overhead sign structure and foundation designs for this project shall be 90 mph.

The Design-Build Team shall design, fabricate and install overhead sign supports and foundations in accordance with Section 906 of the NCDOT *Standard Specifications for Roads and Structures*,

the *Foundations and Anchor Rod Assemblies for Metal Poles*, and *Overhead and Dynamic Message Sign Foundations* Project Special Provisions found elsewhere in this RFP.

The vertical clearance beneath all proposed overhead sign assemblies shall be no less than 17 feet and no greater than 18 feet. For all proposed overhead sign assemblies, the Design-Build Team shall submit documentation that verifies the actual vertical clearance at all critical points.

For all overhead sign assemblies mounted on concrete median barrier, the Design-Build Team shall design, fabricate and install median barrier footing and median transitional barrier in accordance with the 2018 Roadway Standard Drawing No. 854.05.

The maximum span length for cantilever overhead sign structures shall be 52 feet.

Lighting and walkways will not be required on any overhead sign assembly.

Overhead signs shall not be attached to existing or proposed bridges.

Excluding Interchange Sequence Signs on median barrier, pedestal mounted overhead signs will not be allowed.

Overhead Sign Structure Inventory Numbers

The Design-Build Team shall submit an excel spreadsheet that includes all proposed overhead sign structure locations with the overhead sign structure line drawings. This spreadsheet shall also include the type of structure (cantilever, full span, pedestal) as well as geographic coordinate information shown in the example below:

Structure Number	Sign Structure	Type	Station	Latitude (Degrees)	Longitude (Degrees)
	A	Cantilever	Outside Project Limits on NB US 29	35.929633	-80.002204
	B	Full Span	-L- Sta. 12+50	35.932891	-79.995279
	C	Cantilever	-L- Sta. 35+50	35.936724	-79.988283
	D	Pedestal	Outside Project Limits on SB US 29	35.949003	-79.967006

Coordinates of the overhead sign structures shall be located within 50 feet of the center of the structure.

The Department will use the aforementioned spreadsheet, as well as the overhead sign structure line drawings, to determine Overhead Sign Structure Inventory Numbers for all overhead sign structures. Once the Overhead Sign Structure Inventory Numbers are assigned, the Department will provide the numbers to the Design-Build Team to be included on each structure line drawing in the RFC Signing Plans. The geographic coordinate information of the proposed overhead sign structure locations shall not be included in the structure line drawings in the RFC Plans. Reference the *Signing and Delineation Unit (SDU) Procedure Manual* for further guidance.

Proposed Overhead Wind Load Area

Overhead sign structures shall be designed for proposed and future signs. The Design-Build Team shall determine wind load areas and include the wind load areas on the overhead sign structure drawings. The wind load area for the sign structures shall be determined in accordance with the following:

- **Case A**, Identified Future Signs: For sign structures that have an identified need for larger future signs, the future signs shall be designed and shown on the overhead sign structure drawings. Future sign messages, sizes, and positions shall be shown on the elevation drawings. The largest potential wind load area shall be used for the design of the overhead structure.

- **Case B**, General Future Wind Load Area: For overhead signs without identified future signs, the structure shall be designed for a larger wind load area to accommodate future signs that are not identified at the time of the structure design. General future wind load area sizes and positions shall be shown on the elevation drawings. The general future wind load area shall be computed as follows:

  - The wind load area shall be rectangular for each primary sign including secondary and supplemental signs.

  - The wind load area width shall extend two feet outside the proposed primary sign on each side of the sign. In cases where the wind load areas of two signs intersect, the taller area shall take priority. For cantilever structures, the wind load area shall be flush with the edge of the primary sign at the cantilevered end, such that the future four-foot wind load area does not extend past the end of a cantilever sign structure.

  - The wind load area height shall extend two feet below the bottom of each sign and two feet above the top of each sign, including secondary and supplemental signs as well as the spacing between signs according to Roadway Standard Drawing No. 904.20, and excluding temporary “all traffic exit” signs. The minimum vertical clearance shall be measured from the bottom of the lowest wind load area.

- **Case C**, Exceptions from Case B: The following are exempted from Case B, general future wind load areas:

  - Arrow Per Lane Signs

  - Interchange Sequence Signs on median barrier

Existing Overhead Structures

Excluding the existing overhead sign assemblies noted in the Preliminary W-5707C Signing and Pavement Marking Plans provided by the Department, the Design-Build Team shall perform a structural analysis of the overhead sign structure prior to modifying the existing overhead sign assembly to accommodate proposed signs that exceed the original wind load area. The Design-

Build Team shall obtain Department acceptance of the structural analysis prior to construction. The Design-Build Team shall replace all existing overhead sign assemblies determined to be structurally inadequate for the proposed modifications, in the Department's sole discretion. The Design-Build Team may modify an existing overhead sign assembly to accommodate proposed signs that do not exceed the original wind load area without performing the aforementioned structural analysis.

When the aforementioned structural analysis determines that an existing overhead sign structure is structurally adequate to be retained or the proposed wind load area does not require a structural analysis, the Design-Build Team shall remove and dispose of all the existing overhead signs. The Design-Build Team shall install new signs on the retained existing overhead sign structure that adhere to the requirements herein. The Design-Build Team shall prepare Structure Line Drawings that depict 1) the existing signs to be removed, 2) the existing sign sizes, 3) the new sign designs, 4), the vertical clearance of all new signs, 5) the new signs positioning over travel lanes, 6) the lateral placement from supports, 7) the original wind load area, and 8) confirmation that the proposed wind load area does not exceed the original wind load area.

The Design-Build Team shall remove and dispose of lighting systems and walkways on all existing overhead sign structures that are retained.

If the Department cannot provide existing overhead structure line drawings or shop drawings of the existing overhead sign structure, the Design-Build Team shall design and install new overhead sign structures.

The minimum vertical clearance beneath all existing overhead sign assemblies that are retained shall be 17 feet. For all existing overhead sign assemblies retained, the Design-Build Team shall submit documentation that verifies the actual vertical clearance at all critical points.

Shop Drawings for Overhead Sign Structures

The Design-Build Team shall prepare a shop drawing for each proposed and modified overhead sign structure for the Department's review and acceptance. For shop drawing design and submittal requirements, see *Guidelines for Preparation of Signing and Final Pavement Marking Plans for Design-Build Projects* and the NCDOT *Standard Specifications for Roads and Structures.*

Guardrail or other Positive Protection for Overhead Sign Supports

Except as allowed otherwise below, overhead sign supports shall be located a minimum of 40 feet from the edge of the outside travel lane to the center of the sign supports. To minimize right of way, utility, drainage and / or jurisdictional impacts, or to allow a cantilever overhead sign assembly in lieu of a full-span overhead sign assembly, the minimum 40-foot offset may be reduced, at the Department's sole discretion. All overhead sign supports that are not located a minimum of 40 feet from the edge of the outside travel lane to the center of the sign support shall be protected by guardrail or other NCDOT approved positive protection. When an overhead sign

support is protected by guardrail, the face of the guardrail shall be located a minimum of eight feet from the center of the sign support.

The Design-Build Team shall review the protection for all existing overhead structure supports that are retained to determine if the existing positive protection meets current requirements. If the positive protection does not meet current requirements, the Design-Build Team shall design and construct new positive protection that adheres to the current requirements.

Cable-guide rail shall not be used as positive protection for overhead sign supports.

Verification of Theoretical Information shown on Structure Line Drawings

The Design-Build Team shall verify the information on the Structure Line Drawings prior to submittal of shop drawings for the Department's review and acceptance. At a minimum, the aforementioned verification shall include confirmation of the sign(s) positioning over lanes, span length, sign offsets, "s" drops, and the slopes at the center line of the support / upright. When theoretical dimensions or slopes are revised during construction, the Design-Build Team shall submit a revised Structure Line Drawing with the shop drawing.

Removal and Disposal of Existing Signs

The Design-Build Team shall determine which existing signs, sign supports, overhead signs, and / or overhead sign supports will not be needed or relevant when the project is completed. The Design-Build Team shall remove and dispose of these signs and sign supports.

Temporary Sign and Support Design

The Design-Build Team shall locate, design and install all temporary signs and sign supports. (Reference the Signing Requirements Section of the Transportation Management Scope of Work found elsewhere in this RFP for additional temporary signing requirements)

Sign Maintenance

During project construction, the Design-Build Team shall maintain all existing signs within the project limits (including all Logo Signs and temporary sign installations that may be required by the Transportation Management Plans) to ensure the signs are in good condition, perform as intended, and are visible to motorists. (Reference Articles 901-4 and 1092-2 of the NCDOT *Standard Specifications for Roads and Structures*) All signs and supports remaining / existing at the completion of this project shall be plumb, oriented correctly and adhere to AASHTO requirements.

Unless approved by the Division Logo Coordinator, in writing, all Logo and TOD signs shall be immediately relocated to a temporary or permanent location. If a temporary removal is granted, the Design-Build Team shall notify the Division Logo Coordinator in writing at least seven days prior to removal and deliver the business panels to the Division Logo Coordinator once removed.

CADD Files

After acceptance of RFC Signing Plans, the Design-Build Team shall provide the final Signing Plans to the Department in .pdf and MicroStation format.

Construction Revisions

After submittal of RFC Signing Plans, the Design-Build Team shall submit all construction revisions to the Department for review and acceptance prior to incorporation. The Design-Build Team shall provide an updated excel spreadsheet with all construction revisions that modify an overhead sign structure's geographic coordinate information. (Reference the Overhead Sign Structures Inventory Numbers section above)

As-Built Plans

After project completion, the Design-Build Team shall provide final electronic Signing Plans to the Department. At a minimum, these Signing Plans shall include all revisions that occurred during construction, as well as field verifications for ground mounted sign supports and overhead structures. These Signing Plans shall be provided in .pdf and MicroStation format.

STRUCTURES SCOPE OF WORK (7-12-21)

Project Details

The Design-Build Team shall design and construct the structures necessary to complete the project, including but not limited to, the following:

- Replace Bridge Nos. 670270 and 670271 on I-40 over SR 1009 (Old NC 86)
- Widen Bridge Nos. 670264 and 670265 on I-40 over Norfolk Southern Railway (NSR) and SR 1725 (Millhouse Road)
- All retaining walls required by the Design-Build Team's design
- All sound barrier walls required by the Design-Build Team's design (Reference the Roadway Scope of Work found elsewhere in this RFP)
- All reinforced concrete box culverts / reinforced concrete box culvert extensions required by the Design-Build Team's design

All bridges shall meet the geometric criteria shown in the accepted Preliminary Roadway Plans developed by the Design-Build Team.

The minimum vertical clearance for bridges constructed / widened over all local roads and collector roads, shall be 15'-6". The minimum vertical clearance for bridges constructed / widened over a railroad shall be 23'-0". The minimum vertical clearance for bridges that remain in place over I-85 and / or I-40 shall be 16'-0".

The proposed bridges on I-40 over SR 1009 (Old NC 86) shall be single span bridges (without interior bents) that are long enough and high enough to accommodate:

1. the addition of one future 12-foot outside through lane in each direction of I-40, as well as any additional width required to accommodate the associated future hydraulic spread (Reference the Roadway and Hydraulics Scopes of Work found elsewhere in this RFP) and,

2. the future SR 1009 (Old NC 86) widening, as shown on the typical section provided by the Department;

without the need to

1. reconstruct any of the substructure elements, including but not limited to retaining walls located at the end bents or,

2. obtain a future design exception, including but not limited to all minimum vertical clearance requirements noted elsewhere in this RFP.

The Design-Build Team shall indicate in the Technical Proposal how the aforementioned future construction can be accomplished without the need to reconstruct any of the substructure elements or obtain a future design exception.

At the bridges on I-40 over NSR and SR 1725 (Millhouse Road), the Design-Build Team shall design and construct reinforced concrete crashwalls at all piers adjacent to the NSR.

The Design-Build Team will not be required to widen the bridges on I-40 over NSR and SR 1725 (Millhouse Road) to accommodate the addition of a future 12-foot outside through lane in each direction of I-40.

Each set of dual bridges on 1) I-40 over SR 1009 (Old NC 86), and 2) on I-40 over Norfolk Southern Railway (NSR) and SR 1725 (Millhouse Road) shall be designed and constructed as two separate structures; and shall not be connected in the median.

Bridge barrier rails shall be per Standard Drawing CBR1.

The minimum horizontal setbacks from the closest edge of travel lane to face of barrier in front of walls shall be 14’-0” for bridges over interstates, freeways, and arterials.

End bents shall be integral if the criteria listed in the NCDOT *Structures Management Unit Manual* is met. The criteria in Section 6.2.3.2 of the NCDOT *Structures Management Unit Manual* shall apply to all roadways, including Secondary Routes that meet the criteria for North Carolina Routes.

End bents and end slopes at each end of a bridge shall have the same appearance.

Link slabs may be used for bridges with spans up to 100 feet, provided the girders in adjacent spans are the same depth.

The Design-Build Team shall furnish and install a four-inch duct conduit system for NCDOT ITS communications cable on one of the bridges on I-40 over SR 1009 (Old NC 86) and on one of the bridges on I-40 over NSR and SR 1725 (Millhouse Road). (Reference the ITS Scope of Work and the Fiber Optic Conduit System (RGC - Hanging) Project Special Provision found elsewhere in this RFP, and Standard Drawing ECS1)

Unless noted otherwise elsewhere in this RFP, the following will not be allowed on the project:

- Cored slab, box beam, fracture critical, deck girder and cast-in-place deck slab bridges
- Precast bridge barrier rails
- Precast reinforced box culverts
- Metal plate arch culverts
- Interior pile bents at roadway grade separations or railroad grade separations
- Attachment of sign structures to bridges
- Bridge attachments (excluding ITS) in the overhang of roadway grade separation structures
- Casting of conduit in the bridge deck or barrier rail for roadway bridges
- For new bridges, bridge piers adjacent to a roadway shoulder, excluding interior median piers
- Modular expansion joints
- Monotube or cantilever DMS (if required on project) support structures

- Shallow foundations behind MSE abutment walls
- Bridges with less than four (4) girder lines
- For new bridges, multiple girder depths on an individual bridge
- Sound barrier walls constructed on top of retaining walls

** **NOTE** ** Deleted concrete cylinder pile bullet

Rehabilitation of Existing Structures

The Design-Build Team shall rehabilitate bridges in accordance with the requirements noted below, and the special provisions found elsewhere in this RFP and on the Structures Management Unit website. Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall perform all rehabilitation work for the entire bridge.

Bridge No. 670079 on SR 1134 (Dimmocks Mill Road) over I-40 and I-85

- Properly prepare existing concrete bridge deck and apply epoxy overlay
- Properly prepare existing concrete barrier rails and apply Silane Treatment to the traffic face and top of bridge rails
- Replace existing joints with new foam joint seals
- Clean, properly prepare, and paint ends of beams
- Shotcrete / concrete repair and / or crack injection to bridge elements underneath the deck
- Replace approaches with new 25-foot approach slabs

Bridge No. 670258 on SR 1734 (Erwin Road) over I-40

- Properly prepare existing concrete bridge deck and approach slabs, and apply epoxy overlay
- Properly prepare existing concrete barrier rails and apply Silane Treatment to the traffic face and top of bridge rails
- Replace existing joints with new foam joint seals
- Clean, properly prepare, and paint ends of beams
- Shotcrete / concrete repair and / or crack injection to bridge elements underneath the deck

Bridge No. 670259 on SR 1732 (Sunrise Road) over I-40

- Properly prepare existing concrete bridge deck and apply epoxy overlay
- Properly prepare existing concrete barrier rails and apply Silane Treatment to the traffic face and top of bridge rails
- Replace existing joints with new foam joint seals
- Clean, properly prepare, and paint ends of beams
- Heat straighten beam 4 in span 1
- Shotcrete / concrete repair and / or crack injection to bridge elements underneath the deck
- Repair slope protection, including but not limited to vegetation removal, sealing cracks, and spall repair
- Replace approaches with new 25-foot approach slabs

Bridge No. 670266 on NC 86 (Martin Luther King, Jr. Boulevard) over I-40

- Properly prepare existing concrete bridge deck and approach slabs, and apply Polyester Polymer Concrete (PPC) overlay
- Properly prepare existing concrete barrier rails and apply Silane Treatment to the traffic face and top of bridge rails
- Replace existing joints with new foam joint seals
- Clean, properly prepare, and paint ends of beams
- Shotcrete / concrete repair and / or crack injection to bridge elements underneath the deck
- Repair cracks, settlement and all voids at the northeast concrete shoulder / approach slab

Bridge No. 670260 on SR 1723 (New Hope Church Road) over I-40

- Properly prepare existing concrete bridge deck and apply epoxy overlay
- Properly prepare existing concrete barrier rails and apply Silane Treatment to the traffic face and top of bridge rails
- Replace existing joints with new foam joint seals
- Clean, properly prepare, and paint ends of beams
- Shotcrete / concrete repair and / or crack injection to bridge elements underneath the deck
- Repair slope protection, including but not limited to vegetation removal, sealing cracks, and spall repair
- Replace approaches with new 25-foot approach slabs

Bridge No. 670262 on SR 1006 (Orange Grove Road) over I-40

- Properly prepare existing concrete bridge deck and apply epoxy overlay
- Properly prepare existing concrete barrier rails and apply Silane Treatment to the traffic face and top of bridge rails
- Replace existing joints with new foam joint seals
- Clean, properly prepare, and paint ends of beams
- Shotcrete / concrete repair and / or crack injection to bridge elements underneath the deck
- Replace approaches with new 25-foot approach slabs

Bridge No. 670267 on I-85 southbound to I-40 eastbound flyover over I-85 and I-40 eastbound

- Properly prepare existing concrete bridge deck and approach slabs, and apply PPC overlay
- Properly prepare existing concrete barrier rails and apply Silane Treatment to the traffic face and top of bridge rails
- Replace existing joints with new foam joint seals
- Shotcrete / concrete repair and / or crack injection to bridge elements underneath the deck

Bridge No. 670268 on I-40 westbound over I-85

- Properly prepare existing concrete bridge deck and approach slabs, and apply PPC overlay
- Properly prepare existing concrete barrier rails and apply Silane Treatment to the traffic face and top of bridge rails
- Replace existing joints with new foam joint seals
- Shotcrete / concrete repair and / or crack injection to bridge elements underneath the deck
- Replace anchor bolts as directed by the Engineer

Bridge Nos. 670264 and 670265 on I-40 over NSR and SR 1725 (Millhouse Road)

- Properly prepare existing concrete bridge deck and approach slabs, and apply PPC overlay
- Apply PPC overlay to widening
- Properly prepare existing and new concrete barrier rails and apply Silane Treatment to the traffic face and top of bridge rails
- Replace existing joints with new foam joint seals

All Class II and Class III Surface Preparation repairs, anchor bolt replacement, concrete / shotcrete repairs underneath bridge decks, and crack injections underneath bridge decks, including slope protection repairs and injections, will be paid for as extra work in accordance with Subarticle 104-8(A) of the 2018 *Standard Specifications for Roads and Structures* at the unit prices noted below. Prior to performing Class II and Class III Surface Preparation repairs, anchor bolt replacement, concrete / shotcrete repairs underneath bridge decks, and crack injections underneath bridge decks, including slope protection repairs and injections, the Design-Build Team shall obtain approval from the Engineer, in writing. All work tasks, required to complete the rehabilitation activities, including but not limited to traffic control and portable lighting, shall be incidental to the unit prices noted below.

- All Class II and Class III Surface Preparation repairs will be paid for at the unit price of $300.00 per square yard and $700.00 per square yard, respectively.

- All anchor bolt replacements will be paid for at the unit price of $700.00 per each.

- All concrete repairs underneath bridge decks, including slope protection concrete repairs, will be paid for at the unit price of $810.00 per cubic foot.

- All shotcrete repairs underneath bridge decks, including slope protection shotcrete repairs, will be paid for at the unit price of $745.00 cubic foot.

- All crack injection underneath bridge decks, including slope protection crack injection, will be paid for at the unit price of $115.00 per linear foot.

Box Culverts

As required by the Design-Build Team's design, the Design-Build Team shall design and construct all proposed reinforced concrete box culverts and lengthen or replace all existing reinforced

concrete box culverts. Reinforced concrete box culvert designs shall be in accordance the Hydraulic Culvert Survey Reports prepared by the Design-Build Team and accepted by the Department. (Reference the Hydraulics Scope of Work found elsewhere in the RFP)

Sound Barrier Walls and Retaining Walls

The Design-Build Team shall design and construct all sound barrier walls required by the Design-Build Team's design. If possible, sound barrier walls on bridges should be avoided. If the final design requires a sound barrier wall on a bridge, the maximum height of the sound barrier wall shall be limited to ten feet, measured from the top of the roadway deck to top of the sound barrier wall. (Reference the Roadway Scope of Work found elsewhere in this RFP)

Regardless of wall height, sound barrier walls shall be designed in accordance with the latest edition of the AASHTO *LRFD Bridge Design Specifications*.

All proposed sound barrier wall and retaining wall surfaces shall have equivalent surface treatment. (Reference the *Architectural Concrete Surface Treatment* Project Special Provisions found elsewhere in this RFP)

All ground mounted sound barrier walls shall be detailed in accordance with Structure Standard Drawings SBW1 and SBW2, and concrete piles shall be used. (Reference the *Sound Barrier Wall* and *Architectural Concrete Surface Treatment* Project Special Provisions, and the Roadway Scope of Work found elsewhere in this RFP)

The Design-Build Team shall apply non-sacrificial anti-graffiti coating on all exposed surfaces of sound barrier walls and all retaining walls, including MSE walls. (Reference the *Architectural Concrete Surface Treatment* Project Special Provision found elsewhere in this RFP)

General

The Design-Build Team's primary design firm shall be on the Department's list of firms qualified for structure design and maintain an office in North Carolina.

Unless allowed or directed otherwise in this RFP, designs shall be in accordance with the latest editions of the *AASHTO LRFD Bridge Design Specifications* (with exceptions noted in the NCDOT *Structures Management Unit Manual*), NCDOT *LRFD Driven Pile Foundation Design Policy*, NCDOT *Structures Management Unit Manual* (including Policy Memos) and NCDOT *Bridge Policy Manual.*

Use of Florida Department of Transportation Prestressed Florida I-Beams (FIB), the Prestressed Concrete Committee for Economic Fabrication (PCEF) prestressed concrete girders, and Modified Bulb Tee girders will be allowed. However, the structural details associated with the aforementioned items, including but not limited to mild reinforcing and reinforcing cover, shall be subject to Department review and acceptance post-award.

Unless allowed or directed otherwise in this RFP, all construction and materials shall be in accordance with 2018 NCDOT *Standard Specifications for Roads and Structures*, NCDOT *Structures Management Unit Project Special Provisions* and NCDOT *Structures Management Unit Standard Drawings*. Reference the Structures Management Unit website below:

https://connect.ncdot.gov/resources/Structures/Pages/default.aspx

Alternate designs, details or construction practices (such as those employed by other states, but not standard practice in NC) are subject to Department review and approval, and will be evaluated on a case by case basis.

TRAFFIC SIGNALS AND SIGNAL COMMUNICATIONS SCOPE OF WORK (7-12-21)

I. GENERAL

The Design-Build Team shall design and prepare plans for the temporary traffic signal installations required by the construction phasing and / or detour routes, permanent traffic signal installations, traffic signal revisions, and signal communication plans for connection to an existing Closed Loop Signal System and the Town of Chapel Hill Signal System. This work shall include, but not be limited to, the preparation of Traffic Signal Plans, Metal Pole Loading Diagrams, Electrical and Programming Details, Utility Make-Ready Plans, Signal Communication Fiber Optic Communication and Splicing Plans, Wireless Communication Plans, and Project Special Provisions. These plans shall be prepared in accordance with the *Design-Build Submittal Guidelines* and the *Guidelines for the Preparation of ITS & Signal Plans by Private Engineering Firms* available on the Design-Build Unit's website located at:

https://connect.ncdot.gov/letting/Pages/Design-Build-Resources.aspx

The Design-Build Team shall select a Private Engineering Firm (PEF) that has experience designing and sealing Traffic Signal, Electrical Detail, and Signal Communications Plans for NCDOT on comparable projects. The Private Engineering Firm selected shall also have experience preparing Utility Make Ready plans. The Technical Proposal shall list projects, including description and similarity to the subject project, for which the PEF has developed Traffic Signal, Electrical Detail, and Signal Communications Plans.

A pre-design meeting shall take place between the NCDOT Transportation Systems Management & Operations Unit (TSMOU), the Work Zone Traffic Control Group, the Design-Build Team, the Design-Build Unit, the Division Traffic Engineer, the Regional Traffic Engineer, Statewide Operations Center (STOC), the Triad Regional Traffic Management Center (TRTMC), the Town of Chapel Hill Traffic Engineer, and any other pertinent NCDOT personnel before signal submittals begin. Traffic Signal, Electrical Detail, and Signal Communications Plan submittals shall only be reviewed and accepted by the Department after this pre-design meeting. All Traffic Signal and Signal Communications Plans shall be reviewed by the TSMOU. Additionally, plans shall be concurrently submitted to the appropriate authorities in which the plans are associated (e.g. Town of Chapel Hill, Division 7 personnel, etc.) for comments. However, final approval on all Traffic Signal Plans and Signal Communications Plans submittals will ultimately be the responsibility of the NCDOT TSMOU. All Traffic Signal Plans and Signal Communication Plans shall be accepted by the TSMOU prior to beginning traffic signal construction or plan implementation.

The Design-Build Team shall coordinate and implement all signal designs at the appropriate time as directed by the Engineer. Prior to final design and installation, the Design-Build Team shall coordinate all signal phasing recommendations with the Division Traffic Engineer, the Regional Traffic Engineer, the Town of Chapel Hill Traffic Engineer, and the TSMOU. Prior to placing traffic in a new pattern, all traffic signals shall be installed and operational, including but not limited to, signal system timing plans and interconnection to the Signal System, if required below.

Except as noted otherwise elsewhere in this RFP, the Design-Build Team shall maintain, monitor and adjust the traffic signals, both vehicle and pedestrian, as needed throughout the project construction. The Design-Build Team shall be responsible for the design and implementation of all temporary signal designs, including but not limited to signal system timing plans, needed to maintain vehicular and pedestrian traffic during construction, and all final traffic signal timing plans for the final traffic configurations. If necessary, temporary traffic signal designs and implementation, shall include, but not be limited to, new local controller, signal timing, inductive loops / vehicle detection, cables, poles, signal span, controllers, cabinets, and / or signal heads. Prior to implementation, all signal timing plans shall be reviewed and accepted by the TSMOU.

Where construction activities necessitate a detour, the Design-Build Team shall evaluate the effects of that detour on all traffic signals along the detour route. The Design-Build Team shall make operational changes as necessary and as directed by the Engineer.

Throughout the project construction, the Design-Build Team shall maintain full actuation of the traffic signals located within the project limits, unless allowed otherwise by the Engineer in writing.

The Design-Build Team shall maintain or incorporate all traffic signals on this project into the Closed Loop Signal System or the Chapel Hill Signal System, as detailed below. To connect sidewalk networks, the Design-Build Team shall provide crosswalks and pedestrian signal heads for all approaches, as appropriate, based on field conditions. Crosswalks and pedestrian signal heads will not be required where there is no sidewalk on a quadrant.

All final signal installations shall utilize galvanized metal strain poles. All temporary signal installations may utilize wood poles for signal supports. All plans and associated design material and specifications shall be reviewed and accepted by NCDOT before installation. See Section II below for final traffic signal support requirements.

The Design-Build Team shall deliver all existing cabinets and their contents, including but not limited to fiber and cellular modems, that are not reinstalled on this project to the Division Traffic Services Office located at 4256 Camp Burton Road, McLeansville, NC 27301. The Design-Build Team shall dispose of and / or retain ownership of all other traffic signal equipment.

Signal Inventory Numbers (SIN) will be assigned for each new signalized location by the NCDOT ITS & Signals Management Section. Once all the traffic signal locations have been finalized and accepted by the Department, the Design-Build Team shall submit a written request for the SINs to the NCDOT ITS & Signals Management Section, via the Design-Build Unit. At a minimum, this request shall list each signal location that requires a SIN and include the following:

- County
- Nearest Municipality
- Names of all intersecting roads that will be under signal control, including state route numbers (Interstate, US, NC or SR) and common street names
- The dominant through movement

The Design-Build Team shall be responsible for providing a safe and economical design for the public. The Design-Build Team shall prepare all plans and designs in accordance with the current

NCDOT TSMOU design standards, including but not limited to, the version of the following documents effective on the Technical Proposal submittal date:

- NCDOT *Standard Specifications for Roads and Structures*
- NCDOT *Standard Roadway Drawings*
- Signals and ITS Project Special Provisions
- ITS and Signals Design Manual
- *Manual on Uniform Traffic Control Devices (MUTCD)*
- *North Carolina Supplement to the Manual on Uniform Traffic Control Devices (NCMUTCD)*
- *Guidelines for the Preparation of ITS & Signal Plans by Private Engineering Firms*
- NCDOT *Signal System Timing Philosophy Manual*

Links to additional TSMOU design standards and aides are available on website noted below:

https://connect.ncdot.gov/resources/safety/Pages/ITS-and-Signals.aspx

II. TRAFFIC SIGNALS

Unless allowed otherwise elsewhere in this RFP, the Design-Build Team shall install one (1) new traffic signal, modify five (5) existing traffic signals, and remove one (1) existing traffic signal within the project limits. All of these signals shall be interconnected into one of two (2) systems as noted in the tables below (Reference Section III below for the system interconnection requirements). The traffic signal detection for the final traffic patterns shall be inductive loop detection unless 1) the required location of the inductive loop is within a bridge deck, and / or 2) the Department provides written approval otherwise. The Design-Build Team shall only provide out of street detection for 1) temporary traffic patterns during construction and 2) final traffic patterns at locations where inductive loops would be located within a bridge deck. The out of street detection shall be approved by the Department, in writing, prior to incorporation, and appear on the NCDOT Qualified Products List. Unless allowed otherwise elsewhere in this RFP, the required traffic signal work and signal communications for the intersections are listed below:

NCDOT - Existing Signals in Closed Loop System (CLS) to be Modified (2)		
Signal Inventory Number	**Intersection Description**	**Work Requirements**
07-XXXX 07-YYYY	SR 1009 (Old NC 86) at I-40 EB Ramps SR 1009 (Old NC 86) at SR 1223 (Service Road)	These signals are scheduled to be installed prior to or during the early stages of this project as part of a private development project. The Design-Build Team shall assume these signals are existing. The Design-Build Team shall modify these existing traffic signals as needed to match all temporary construction phasing and the proposed final traffic pattern. This may require, but not be limited to, additional lanes, signal phasing changes, signal head changes, system detectors, and / or system interconnections equipment. The Design-Build Team shall install new galvanized metal strain poles with span wire at these locations. The Design-Build Team shall design and install new fully actuated traffic signals with 2070LX controllers operating ASC/3 Software in a 170 cabinet with an auxiliary output file, including base extenders. The Design-Build Team shall provide Flashing Yellow Arrow signal heads at all protected / permissive and permissive left turns and U-Turn movements, including time of day phasing options, as appropriate. The Design-Build Team shall provide crosswalks and pedestrian signal heads at each approach with existing or proposed sidewalk. The Design-Build Team shall maintain and / or provide the required system communication equipment as described in Section III.

NCDOT - New Signal to be Installed (1) into existing CLS		
Signal Inventory Number	**Intersection Description**	**Work Requirements**
07-ZZZZ	SR 1009 (Old NC 86) at I-40 WB Ramps	The Design-Build Team shall install new traffic signals to match all temporary construction phasing and the proposed final traffic pattern. This may require, but not be limited to, additional lanes, signal phasing changes, signal head changes, system detectors, and / or system interconnection equipment. The Design-Build Team shall install new galvanized metal strain poles with span wire at these locations. The Design-Build Team shall design and install new, fully actuated traffic signals with 2070LX controllers operating ASC/3 Software in a 170 cabinet with an auxiliary output file, including base extenders. The Design-Build Team shall provide Flashing Yellow Arrow signal heads at all protected / permissive and permissive left turns and U-Turn movements, including time of day phasing options, as appropriate. The Design-Build Team shall provide crosswalks and pedestrian signal heads at each approach with existing or proposed sidewalk. The Design-Build Team shall maintain and / or provide the required system communication equipment as described in Section III.

NCDOT - Existing Signal to be Modified and Added to Existing CLS (1)		
Signal Inventory Number	**Intersection Description**	**Work Requirements**
07-2129	SR 1009 (Old NC 86) at SR 1224 (Rippy Lane) and Waterstone Drive	The Design-Build Team shall modify this traffic signal to bring displays to current standards and upgrade equipment as required to interconnect signal into a closed loop system. This may require, but not be limited to, signal phasing changes, signal head changes, new controller and / or conflict monitor, system detectors, and / or system interconnection equipment. The Design-Build Team shall design and install a 2070LX controller operating ASC/3 Software in a 170 cabinet with an auxiliary output file, as well as a conflict monitor and other hardware required to support the operation of a 2070 LX controller. The existing cabinet may be retained if it will accommodate the necessary equipment required for system interconnection, in the Department's sole discretion. The Design-Build Team shall provide the required system communication equipment as described in Section III.

NCDOT - Existing Signals to be Modified in Chapel Hill System (2)		
Signal Inventory Number	**Intersection Description**	**Work Requirements**
07-1234 07-1550	NC 86 (MLK Jr. Blvd.) at SR 1730 (Whitfield Road) and I-40 WB Ramps NC 86 (MLK Jr. Blvd.) at I-40 EB Ramps ** **NOTE** ** Deleted traffic signal at NC 86 (MLK Jr. Blvd.) at SR 1727 (Eubanks Road)	The Design-Build Team shall modify these traffic signals as needed to match all temporary construction phasing and the proposed final traffic pattern. This may require, but not be limited to, additional lanes, signal phasing changes, signal head changes, system detectors, and / or system interconnection equipment. The Design-Build Team shall install new galvanized metal strain poles with span wire at these locations. The new metal strain poles at the I-40 EB ramps (07-1550), shall be designed and constructed to accommodate the addition of one future 12-foot left turn lane on Ramp C. The Design-Build Team shall design and install new fully actuated traffic signals with 2070E controllers operating OASIS Software in a 170 cabinet with an auxiliary output file, including base extenders, compatible with the Chapel Hill Signal System. The Design-Build Team shall provide Flashing Yellow Arrow signal heads at all protected / permissive and permissive left turns and U-Turn movements, including time of day phasing options, as appropriate. The Design-Build Team shall provide crosswalks and pedestrian signal heads at each approach with existing or proposed sidewalk. The Design-Build Team shall maintain and / or provide the required system communication equipment for the Chapel Hill Signal System as described in Section III.

Existing Signal to be Removed (1)		
Signal Inventory Number	**Intersection Description**	**Work Requirements**
07-1551	NC 86 (MLK Jr. Blvd.) at I-40 WB Ramps	The Design-Build Team shall, upon completion of the final interchange configuration, and at a time agreed upon with the Engineer, remove this existing traffic signal. The Design-Build Team shall coordinate the removal of the traffic signal with the Division Traffic Engineer and the Town of Chapel Hill Traffic Engineer. The traffic signal shall not be removed prior to 1) the closure of the existing I-40 WB ramps and 2) the proposed I-40 WB entrance ramp / I-40 WB exit loop / NC 86 (MLK, Jr. Blvd.) / SR 1730 (Whitfield Road) intersection is complete and the associated traffic signal has been modified and operational. The Design-Build Team shall return the traffic signal controllers, cabinets, and signal heads to the Division 7 Traffic Services Office, unless otherwise directed. The Design-Build Team shall dispose of and / or retain ownership of all other equipment.

III. SIGNAL COMMUNICATION PLANS

The Design-Build Team shall coordinate all proposed downtime and / or disruptions in service in accordance with the Project Operations Requirements Section of this Scope of Work. Unless allowed otherwise elsewhere in this RFP, the Design-Build Team shall maintain the existing communications infrastructure and communication integrity of the signals located within the project boundaries, including but not limited to the fiber optic, wireless, and cellular modem infrastructure and equipment.

A. SIGNAL COMMUNICATIONS

The Design-Build Team shall design, install, and maintain / upgrade the following communications networks as noted below:

a) Existing NCDOT Closed Loop Signal System - Signal communications fiber, ASC/3 software with Ethernet communications

b) Existing Town of Chapel Hill Signal System - Signal communications fiber, Oasis software with serial communications

c) Existing Town of Chapel Hill IT Fiber

d) **** NOTE **** Deleted relocation of Town of Chapel Hill Variable Message Sign (VMS) and CCTV camera

All existing main trunk line fibers shall remain the same size or larger upon completion of the project.

Existing SR 1009 (Old NC 86) NCDOT Closed Loop System	
Signal Inventory Number and Intersection Description	**Description of Work**
(07-2129) SR 1009 (Old NC 86) at SR 1224 (Rippy Lane) and Waterstone Drive (Existing) (07-XXXX) SR 1009 (Old NC 86) at I-40 EB Ramps (To be installed by others / Existing) (07-YYYY) SR 1009 (Old NC 86) at SR 1223 (Service Road) (To be installed by others / Existing) (07-ZZZZ) SR 1009 (Old NC 86) at I-40 WB Ramps (New)	The Design Build Team shall install a new 24-fiber trunk line along SR 1009 (Old NC 86) from the existing signal at SR 1224 (Rippy Lane) and Waterstone Drive to SR 1223 (Service Road) south of I-40. The Design Build Team shall splice the new 24-fiber trunk line into an existing 12-fiber trunk line utilizing a new splice enclosure at SR 1224 (Rippy Lane) and Waterstone Drive. The Design Build Team shall install aerial or underground fiber optic splice enclosures at or near each traffic signal and install a new 12-fiber drop cable to each traffic signal cabinet. The Design Build Team shall install a new Ethernet switch in each new and existing signal cabinet. The Design Build Team shall install new fiber optic interconnect centers, fiber optic pigtails, and fiber optic jumpers in each new and existing traffic signal cabinet.

Existing Town of Chapel Hill Signal System and Town of Chapel Hill IT Communications	
Signal Inventory Number and Intersection Description	**Description of Work**
**** NOTE **** **Deleted 07-1452** NC 86 (Martin Luther King, Jr. Blvd.) at SR 1727 (Eubanks Road) (Existing) 07-1550 NC 86 (Martin Luther King, Jr. Blvd.) at I-40 EB Ramps (Existing) 07-1551 NC 86 (Martin Luther King, Jr. Blvd.) at I-40 WB Ramps (Remove) 07-1234 NC 86 (Martin Luther King, Jr. Blvd.) at SR 1730 (Whitfield Road) and I-40 WB Ramps (Existing)	** **NOTE** ** Deleted replacement of the existing Town of Chapel Hill Signal System 144-fiber trunk line and Town of Chapel Hill IT 144-fiber trunk line along NC 86 (Martin Luther King, Jr. Blvd.) ** **NOTE** ** Deleted replacement of the existing Town of Chapel Hill Signal System 144-fiber trunk line and Town of Chapel Hill IT 144-fiber trunk line along SR 1727 (Eubanks Road). The Design Build Team shall replace the existing Town of Chapel Hill Signal System 12-fiber trunk line along NC 86 (Martin Luther King, Jr. Blvd.) from SR 1727 (Eubanks Road) to SR 1730 (Whitfield Road) with a new 24-fiber trunk line. The Design Build Team shall maintain the existing fiber communications at signal 07-1551 - NC 86 (Martin Luther King, Jr. Blvd.) at I-40 WB Ramps, until it is removed from service. The Design Build Team shall install aerial or underground fiber optic splice enclosures at or near each signal and install a new 12-fiber drop cable to each signal cabinet. The Design Build Team shall install new fiber optic transceivers in each new signal cabinet. The transceivers must be 100% compatible with the existing Town of Chapel Hill Signal System. The Design Build Team shall install new fiber optic interconnect centers, fiber optic pigtails, and fiber optic jumpers in each new signal cabinet.

**** NOTE **** Deleted existing Town of Chapel Hill CCTV camera and VMS requirements

B. PLANS AND SUBMITTALS

The Signal Communications Plans shall consist of the three major items listed below:

- Signal Communications Plans, including Splice Plans
- Project Special Provisions
- Catalog Cut Sheets

The Design-Build Team shall install all traffic signal equipment, communications cables and conduit systems in such a manner that avoids conflicts with other utilities. All aerial communications cable installations shall be installed in accordance with the National Electrical Safety Code. The Design-Build Team shall be responsible for coordinating all Utility Make-Ready Work with the proper utility representatives.

Prior to construction, the Design-Build Team shall provide a detailed set of Signal Communications Plans, Project Special Provisions and Catalog Cut Sheets as required above for the Department's review and acceptance. No construction related to the installation of the communications system shall begin until NCDOT has accepted the RFC Signal Communications Plans, Project Special Provisions and Catalog Cut Sheets.

Utility Make-Ready Plans

In conjunction with the development of the Traffic Signal and Signal Communications Plans, the Design-Build Team shall also develop, if applicable, a set of Utility Make-Ready Plans.

The Design-Build Team shall coordinate with all affected utilities to make necessary utility adjustments and / or pole change outs for all new fiber optic cable to be installed aerially. The Design-Build Team shall schedule coordination meetings with each affected utility owner and pertinent NCDOT personnel.

Junction Boxes

The Town of Chapel Hill Signal System fiber optic cable and the Town of Chapel Hill IT fiber optic cable shall be placed in separate junction boxes.

For all underground splice enclosure locations, the Design-Build Team shall furnish and install new *Special Oversized Heavy-Duty Junction Boxes* that meet the requirements of Sections 1098-5 and 1716 of the 2018 NCDOT *Standard Specifications for Roads and Structures* and have minimum inside dimensions of 36" (l) x 24" (w) x 24" (d).

For all other locations, the Design-Build Team shall furnish and install new *Oversized Heavy-Duty Junction Boxes* that meet the requirements of Sections 1098-5 and 1716 of the 2018 NCDOT *Standard Specifications for Roads and Structures* and have minimum inside dimensions of 30" (l) x 15" (w) x 24" (d).

Store 50 feet of spare cable, for each cable, in all junction boxes; and 20 feet of spare cable in all signal cabinets.

Furnish junction box lids with "NCDOT Fiber Optic" logo for NCDOT fiber optic cable, "Fiber Optic Cable" logo for Town of Chapel Hill Signal System fiber optic cable and the Town of Chapel Hill IT fiber optic cable.

C. MATERIALS

When existing equipment (signal cabinets, hub cabinets, Ethernet equipment, electronic equipment, fiber, conduit, messenger cable, etc.) is replaced, the Design-Build Team shall replace existing equipment with new equipment. All material, equipment and work shall adhere to the 2018 *NCDOT Standard Specifications for Roads and Structures* requirements. Materials, where applicable, shall be pre-approved on the Department's Qualified Products List (QPL). The QPL web site is:

https://connect.ncdot.gov/resources/safety/Pages/default.aspx

Prior to incorporation, the Design-Build Team shall provide detailed specifications for all material, equipment and / or work that is not covered in the 2018 *NCDOT Standard Specifications for Roads and Structures* for Department approval. The Design-Build Team shall provide specifications and plans that address the material requirements and construction methods. No equipment or material shall be installed until it has been approved by the Department, in writing. Catalog cuts will not be required for items on the QPL. Items not listed on the QPL will require Department written approval prior to incorporation.

Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall return all existing electronic equipment to the Department. A minimum of one week prior to removal of electronic equipment, the Design-Build Team shall contact Mike Garrison, Division 7 Traffic Signal Tech Supervisor, during normal business hours at 336-690-6780 to coordinate a specific day and time for the Design-Build Team to deliver the salvaged material to the Department. Prior to delivery to the Department, the Design-Build Team shall stockpile all salvaged material to prevent damage.

D. MAINTENANCE AND REPAIR REQUIREMENTS

From the beginning of construction until the final project acceptance, the Design-Build Team shall maintain and repair all system components within the project scope, including but not limited to, signal cabinets, loops, signal heads, conduit systems, communications lines, hub cabinets, etc. After project acceptance, the Design-Build Team shall perform all system repairs resulting from faulty materials and / or workmanship, in accordance with the *Twelve Month Guarantee* Project Special Provision found elsewhere in this RFP, or longer if the Design-Build Team extends the aforementioned warranty period.

E. PLAN OF RECORD DOCUMENTATION

The Design-Build Team shall prepare and submit to the Department Plan of Record (POR) documentation that depicts the conduit and equipment device locations. The Design-Build Team shall submit final POR documentation in electronic and hard copy format for acceptance by the Department. At a minimum, the POR documentation shall include, but not be limited to, the following:

- Electronic plans in MicroStation (latest release in use by the Department) format on CD

- Hard copy documentation on 22 x 34 inch plan sheets
- Final location and depth of conduits, wiring external to the cabinets, locations of splice closures, junction box locations, and single mode fiber optic (SMFO) cable terminations
- Real world coordinates for all devices, splice enclosures, junction boxes, and equipment cabinets installed or utilized under this project
- Coordinates in English units using the North Carolina State Plane coordinate system (1983 North American Datum also known as NAD ’83)
- Coordinates that do not deviate more than 1.7 feet in the horizontal plane and 3.3 feet in the vertical plane. Global positioning system (GPS) equipment able to obtain the coordinate data within these tolerances may be used.

F. LOCAL AREA NETWORK

For all Ethernet based systems, the Design-Build Team shall furnish and install media access control (MAC) addresses for all equipment utilized as part of this project. MAC address labels shall be affixed to each device utilized. IP addresses shall be furnished for all equipment utilized as part of this project. When replacing existing equipment or installing new equipment, IP address information shall be obtained from the equipment operator to ensure proper operations within their respective systems. Final IP address labels shall be affixed to each device utilized. LAN equipment shall be fully integrated, providing local device failover and fault tolerance, virus protection, user authentication, and security functions to prevent unauthorized user and data from entering the LAN.

The Design-Build Team shall ensure that all plans and designs conform to the NCDOT and NC Statewide IT Policies and Standards as described at:

https://www.scio.nc.gov/mission/itPoliciesStandards.aspx

The Design-Build Team shall submit all architecture of the IT modules for review and approval by NCDOT IT and the NC Office of Information Technology architecture groups.

G. INTEGRATION & TESTING

The Design-Build Team shall integrate each system device with its respective system, and work with the system operator to ensure that each device is functioning properly within the system.

The Design-Build Team shall develop unit and system test plans and procedures for each device and component and submit to the Engineer for review and approval. This includes, but is not limited to, signal equipment, fiber optic communications cable, local and central equipment. Upon completion of the system installation and integration, the Design-Build Team shall conduct unit and system tests according to the approved test plans and procedures. The Design-Build Team shall be responsible for providing all necessary test equipment.

In case of failures and substandard performance, the Design-Build Team shall identify the cause of failure and / or substandard performance, repair or replace the faulty parts and components and repeat the test. If the problem persists, the Design-Build Team shall replace the entire unit causing the problem prior to repeating the test at no additional cost.

After successful completion of all units and system test, the Design-Build Team shall submit the test reports, along with the record of repairs and part replacements, to the Engineer.

IV. PROJECT OPERATION REQUIREMENTS

Intermediate Contract Time #18 for Failure to Repair a Damaged NCDOT or Town of Chapel Hill Fiber Optic Communications Cable and Restore Communication.

The Design-Build Team shall repair all existing fiber optic communication cables damaged during construction. The Design-Build Team shall immediately report damages to the Engineer, NCDOT Division Traffic Engineer (336-487-0175), NCDOT Regional ITS Engineer (336-315-7080), the TRTMC, the STOC, and as appropriate, the Town of Chapel Hill Traffic Engineer (919-969-4999), and Town of Chapel Hill IT Engineer (919-969-5155). The Design-Build Team shall repair all damages within 24 hours at no cost to the Department or the Town of Chapel Hill. The Design-Build Team shall bring all affected NCDOT and / or Town of Chapel Hill fiber optic communication cables back online within the same 24 hours. A "damaged" NCDOT or Town of Chapel Hill fiber optic communications cable is any fiber optic communications cable that is determined damaged due to an accidental or unscheduled outage event.

Liquidated Damages for Intermediate Contract Time #18 for failure to repair a damaged NCDOT or Town of Chapel Hill fiber optic communications cable and restore communications within 24 hours are $500.00 per hour or any portion thereof.

Intermediate Contract Times #19 and #20 for Failure to Reestablish NCDOT or Town of Chapel Hill Fiber Optic Communications.

During construction, the Design-Build Team shall coordinate any disruption in NCDOT fiber optic communications and Town of Chapel Hill fiber optic communications with the Engineer, NCDOT Division Traffic Engineer, NCDOT Regional ITS Engineer, the STOC, and as appropriate, the Town of Chapel Hill Traffic Engineer, and Town of Chapel Hill IT Engineer. The Design-Build Team shall notify the Engineer, NCDOT Division Traffic Engineer, NCDOT Regional ITS Engineer, the TRTMC and the STOC, and as appropriate, the Town of Chapel Hill Traffic Engineer, and Town of Chapel Hill IT Engineer a minimum of seven days prior to all proposed disruptions in service. A minimum of 21 days prior to any disruption in NCDOT fiber optic communications or Town of Chapel Hill fiber optic communications the Design-Build Team shall develop and provide a plan for the Department's and the Town of Chapel Hill's, as appropriate, approval that defines 1) an anticipated disruption timeframe and 2) a plan of action for reestablishing NCDOT and / or Town of Chapel Hill communications within 24 hours.

Liquidated Damages for Intermediate Contract Time #19 for failure to reestablish NCDOT or Town of Chapel Hill fiber optic communications within 24 hours are $ 2,500.00 per calendar day or any portion thereof.

Liquidated Damages for Intermediate Contract Time #20 for failure to provide a plan that defines 1) an anticipated NCDOT or Town of Chapel Hill fiber optic communications disruption timeframe, and 2) a plan of action for reestablishing NCDOT or Town of Chapel Hill fiber optic communications a minimum of 21 calendar days prior to a proposed disruption in service are $10,000.00 per failure.

V. SIGNAL SYSTEM TIMING PLANS

The Design-Build Team shall develop and implement all temporary and final coordinated timing plans for the closed loop signal system along SR 1009 (Old NC 86)) and the Town of Chapel Hill Signal System along NC 86 (Martin Luther King, Jr. Blvd). This work shall include the design, implementation and fine-tuning of signal timing plans, and evaluation of the final operational benefits associated with work performed on the project. The signal timing plans shall be designed to address all possible traffic needs within the project construction limits, including but not limited to:

- Roadway capacity modifications due to construction, including but not limited to, through / turn lane additions / removals, signal phasing changes, and traffic pattern changes
- Weekday peak / non-peak traffic periods (e.g. a.m., p.m., noon, off-peak, etc.)
- School / Universities start / end and / or class change peak traffic periods
- Seasonal traffic patterns
- Pre-scheduled holiday(s) traffic patterns
- Incident management traffic patterns (e.g. detour routes, hurricane evacuations, etc.)
- Other special events traffic patterns

The Design-Build Team shall select a Private Engineering Firm (PEF) that is prequalified by NCDOT in *Discipline Code 210 - Signal System Timing Development and Implementation* and under the direct charge of a North Carolina certified Professional Engineer.

The Design Build Team shall coordinate the number of timing plans with the Division, the Signal System Timing and Operations (SSTO) Section, and the Town of Chapel Hill Traffic Engineer, as appropriate. The Design Build Team shall submit a set of preliminary signal system timing plans, with supporting *Tru-Traffic*, *SYNCHRO* 9.0, and *Translink32* database files, to the SSTO Section, Division, and the Town of Chapel Hill, as appropriate. All Signal System Timing Plans shall be reviewed and accepted by the SSTO Section, Division, and the Town of Chapel Hill, as appropriate, prior to implementation. The Design-Build Team shall coordinate the development and implementation of all signal system timing plans at the appropriate times, as directed by the Engineer.

The Design Build Team shall field implement signal system timing plans in accordance with the SSTO Section, Division, and the Town of Chapel Hill's requirements. In the event of conflicting design parameters in the requirements noted above, the proposed design shall adhere to the most conservative values. The Design-Build Team shall:

- Ensure all signal system timing plans are operational in the Central Control Center, Master and local controller(s)
- Observe new traffic operations at the intersections and along the corridor and collect trip logs for each signal system timing plan implemented, by riding the system with Tru-Traffic synched with the plan in operation at the time
- Fine-tune signal system timing plans, as necessary, for optimal system performance.

Prior to Final Project Acceptance, the Design-Build Team shall submit a final report, including final implemented signal timing plans and all supporting documents in *SYNCHRO* 9.0, *Tru-Traffic* Reports and data, *Translink32* database files to the SSTO Section, Division, and the Town of Chapel Hill, as appropriate.

Please note, the Department is developing signal timing plans designed to prioritize I-40 traffic diverted from the freeway during incidents. These signal timing plans will be designed, implemented, maintained, and activated by the Department. These signal timing plans shall not be removed, edited, or otherwise changed by the Design-Build Team.

TRANSPORTATION MANAGEMENT SCOPE OF WORK (7-12-21)

LAWS, STANDARDS, AND SPECIFICATIONS

The Design-Build Team shall design the Transportation Management Plan (TMP) in accordance with the requirements of this RFP and the version of the standards listed below that are effective on the Technical Proposal submittal date.

- NCDOT *Standard Specifications for Roads and Structures*
- NCDOT *Roadway Standard Drawings*
- FHWA *Manual on Uniform Traffic Control Devices* (MUTCD)
- NCDOT *Supplement to the Manual on Uniform Traffic Control Devices* (NCSMUTCD)
- AASHTO *A Policy on Geometric Design of Highways and Streets*
- NCDOT *Roadway Design Manual*
- AASHTO *Roadside Design Guide*
- Americans with Disabilities Act of 1990 (ADA)
- FHWA *Standard Highway Signs*
- NCDOT *Design-Build Submittal Guidelines*
- FHWA *Rule on Work Zone Safety and Mobility* (23 CFR 630 Subpart J and K)
- Transportation Research Board *Highway Capacity Manual*
- NCDOT *Transportation Management Plans Design Manual*

References

The Design-Build Team shall use the references provided on the site below as supplementary guidelines and requirements for the design and implementation of the TMP.

https://connect.ncdot.gov/projects/WZTC/

Prequalification

The Design-Build Team shall select a Private Engineering Firm (PEF) that has experience developing TMPs on comparable projects for the North Carolina Department of Transportation (NCDOT) and prequalified through NCDOT in Work Code 00541 (Traffic Management Plan - Level 1 and 2).

TRANSPORTATION MANAGEMENT PLANS

A pre-design meeting shall take place between the NCDOT Transportation Systems Management & Operations Unit (TSMOU), the Work Zone Traffic Control Group, the Design-Build Team, the Design-Build Unit, the Division Traffic Engineer, the Regional Traffic Engineer, Statewide Operations Center (STOC), the Triad Regional Transportation Management Center (TRTMC), local municipalities (if applicable), and any other pertinent NCDOT personnel. Excluding TMPs required to temporarily remove the existing I-40 westbound left lane drop near US 15-501

(Exit 270), TMP submittals shall only be reviewed and accepted by the Department after this pre-design meeting.

The Design-Build Team shall prepare TMPs that include Temporary Traffic Control Plans (TTCP), an Incident Management Plan (IMP), and a Traffic Operations Plan (TOP), the requirements of which are included in this Scope of Work. In accordance with the Public Involvement and Information Scope of Work found elsewhere in this RFP, the Design-Build Team shall assist the Department in the development of a Public Involvement and Information Plan (PIIP).

The Design-Build Team shall produce TMPs for each phase of work that impacts road users. The TMPs shall include details of all planned detours, traffic control devices, striping, and signage applicable to each phase of work. The information on the TMP shall be of sufficient detail to allow verification of design criteria and safety requirements, including but not limited to, typical sections, alignment, striping layout, drop off conditions, and temporary drainage. The Design-Build Team shall develop TMPs that include procedures to communicate TMP information to the public about road and travel conditions within the work zone and affected roadway network.

Transportation Management Phasing Concept

A Transportation Management Phasing Concept (TMPC) shall be prepared by the Design-Build Team to present the Design-Build Team's approach to all areas covered under the TMP, including but not limited to, hauling of materials to, from, and within the project right of way. The Design-Build Team shall include the TMPC in the Technical Proposal. The Design-Build Team shall submit the TMPC for Department review and acceptance and shall address NCDOT comments on the TMPC prior to commencing production of the TMP for each phase of work or any construction. Any changes to the TMPC after acceptance by NCDOT shall require a submittal for review prior to any future phasing submittals.

Incident Management Plan

The Design-Build Team shall be an active partner in developing an Incident Management Plan (IMP) in and around the work zone.

The Design-Build Team shall develop an IMP that documents 1) the roles and responsibilities of each response agency that may participate in traffic incident management activities, and 2) the procedural and coordination aspects of managing unplanned incidents on I-40 that impact the flow of traffic. These incidents shall include, but are not limited to, environmental events, stalled vehicles, multi-vehicle crashes, and hazardous materials incidents that impact the shoulder, travel lane or close the entire roadway. The objective of the IMP is to reduce the severity of the capacity reduction, incident duration, and / or traffic demand around the incident scene. The IMP shall be reviewed, revised and updated as necessary throughout the construction of the project.

The IMP shall be developed in coordination with the Division Traffic Engineer, State Traffic Operations Engineer and response agencies; and shall be reviewed and accepted by the Department and the STOC. During development of the IMP, a minimum of two coordination meetings shall take place between the Design-Build Team and all relevant NCDOT incident management

personnel and response agencies. Once accepted by the Department and the STOC, the Design-Build Team shall share the IMP with all response agencies to ensure they have a clear understanding of the procedures and available resources for responding to, processing of, and clearing unplanned incidents.

Excluding construction activities required to temporarily remove the existing I-40 westbound left lane drop near US 15-501 (Exit 270), the Design-Build Team shall not begin any construction activities that disrupt traffic operations on I-40, in the Department's sole discretion, until 1) the Department and the STOC have accepted the IMP, 2) the Design-Build Team has installed all portable ITS devices for incident management and they are communicating with the TRTMC and the STOC, and 3) the Design-Build Team has installed all temporary stationary signing for all Incident Management Routes.

Prior to beginning construction activities required to temporarily remove the existing I-40 westbound left lane drop near US 15-501 (Exit 270), the Design-Build Team shall provide and install the temporary portable changeable message signs (PCMS), to be used solely for incident management, on I-40 westbound east of the NC 147 northbound exit (Exit 279B). These PCMS are included in the minimum number of devices for incident management required below in the Temporary Portable ITS Devices Section.

At a minimum, the IMP shall address the following components:

IMP – Incident Levels and Associated Actions

Incident levels define the extent and duration of the impact anticipated on the roadway. For consistency across NCDOT, the STOC, Regional TMCs, and NCDOT administered towing contracts, the Design-Build Team shall utilize the following incident levels and document the actions that shall occur for each incident level:

- **Minor:** Minor traffic incidents are typically disabled vehicles and minor crashes with minimal disruption to the flow of traffic. On-scene responders are typically law enforcement, towing companies, and occasionally Incident Management Assistance Patrol (IMAP). Impacts to the traveled roadway are estimated to be less than 30 minutes with no lane blockage.

- **Intermediate:** Intermediate traffic incidents typically affect travel lanes for a time period. Full roadway closures might be needed for short periods during traffic incident clearance to allow traffic incident responders to accomplish their tasks. Impacts to the traveled roadway are estimated to be greater than 30 minutes, but less than two hours with lane blockages, but not necessarily a full closure of the roadway.

- **Major:** Major traffic incidents typically involve hazardous materials, fatal traffic crashes, and other natural or man-made disasters. These traffic incidents typically involve closing all or part of a roadway facility. Congestive impact to traveled roadway is estimated to be greater than two hours or the roadway is fully closed in a single direction.

IMP List of Response Agencies

The Design Build Team shall develop a list of response agencies for NCDOT review and acceptance. This list may include, but is not limited to the following:

- NCDOT
- Municipalities (e.g. Hillsborough, Chapel Hill and Durham)
- Law enforcement
- Fire / Rescue
- 911 dispatch
- Towing and recovery
- Emergency Medical Service (EMS)
- Hazardous materials
- Media
- Coroner and Medical Examiner
- Emergency Management

During construction, the Design-Build Team shall hold monthly meetings with incident management personnel and response agencies. These meetings may be incorporated into regular Maintenance of Traffic (MOT) or Traffic Task Force Meetings. Additionally, the Design-Build Team shall hold After Action Review meetings with incident management personnel, response agencies, and all other relevant parties following fatal and major traffic incidents.

IMP Contact Information

The Design-Build Team shall develop a contact matrix of local emergency response agencies and Design-Build Team points of contact for traffic incidents.

IMP Incident Management Routes

Preliminary Incident Management Routes with portable incident management ITS device locations will be provided by the Department. The Design-Build shall provide, install and maintain a minimum of twenty (20) static trailblazer signs along the Department's Preliminary Incident Management Routes.

If the Design-Build Team's design or construction methods impact the Preliminary Incident Management Routes provided by the Department, the Design-Build Team shall develop alternate routes and alternate Incident Management Route Plans, as necessary, to mitigate impacts to the Department's Preliminary Incident Management Routes. Prior to incorporation, the alternate Incident Management Route Plans shall be reviewed and accepted by STOC and NCDOT. At a minimum, the alternate Incident Management Route Plans shall include:

- All incident management routes
- Changeable and / or static trailblazer sign locations

- The location of ITS devices for incident management (portable changeable message signs (PCMS) and portable CCTV cameras)
- Existing stationary and temporary alternate route signing locations (reference *NCUTCD Item No. 18A-GMI-01)*
- Police traffic control during incident response plan activation (e.g. at stop-controlled intersections)
- Signal locations
- Median access locations available for emergency response vehicles on I-40
- Route identification using NCDOT naming convention (e.g. I40W MM 266-263)

Prior to routing traffic on an alternate Incident Management Route, 1) the Design-Build Team shall install all portable incident management ITS devices and signs, including but not limited to trailblazing signs, 2) the Design-Build Team shall modify traffic signals, if necessary, and 3) all ITS devices shall be communicating with the TRTMC and STOC. (Reference the Traffic Signals and Signal Communications Scope of Work found elsewhere in this RFP)

LANE AND ROAD CLOSURE NOTIFICATION

Lane Closure Notice (LCN)

The Design-Build Team shall issue a Lane Closure Notice (LCN) to NCDOT and affected government entities a minimum of thirty (30) calendar days prior to the publication of any notices or placement of any traffic control devices associated with lane closures, detour routing, or other change in traffic control requiring lane closures. The Design-Build Team will be allowed to issue a single LCN for multiple / consecutive lane closures that occur in the same location. For a LCN utilizing a non-NCDOT controlled facility, the Design-Build Team shall secure concurrence, in writing, from the controlling government entity.

A LCN shall contain the estimated date, time, duration, and location of the proposed work. The Design-Build Team shall keep NCDOT informed of any and all changes or cancellations of proposed lane closures prior to the date of their implementation.

If an emergency condition should occur, a LCN shall be provided to NCDOT within two (2) days after the event. For non-NCDOT controlled facilities, the Design-Build Team shall immediately notify the controlling government entity.

Road Closure Notice (RCN)

Proposed road closures on any road shall be approved by the Engineer prior to incorporation in the TMP and shall adhere to the following requirements:

- Unless allowed otherwise elsewhere in this Scope of Work, all roads, ramps, and loops shall remain open.

- The Design-Build Team shall not concurrently close -Y- Lines with overlapping detours.

- The Design-Build Team shall not permanently close any existing ramp or loop until the proposed replacement ramp or loop that provides the same traffic movement as the movement to be closed is open to traffic in the final pattern.

Unless required otherwise by this RFP, the Design-Build Team shall issue a Road Closure Notice (RCN) to NCDOT and affected government entities a minimum of thirty (30) calendar days prior to the publication of any notices or placement of any traffic control devices associated with road closures, detour routing, or other change in traffic control requiring road closures. For a RCN utilizing a non-NCDOT controlled facility, the Design-Build Team shall secure concurrence, in writing, from the controlling government entity.

A RCN shall contain the estimated date, time, duration, and location of the proposed work. The Design-Build Team shall keep NCDOT and any other affected government entity informed of any and all changes or cancellations of proposed road closures prior to the date of their implementation.

If an emergency condition should occur, a RCN shall be provided to NCDOT within two (2) days after the event. For non-NCDOT controlled facilities, the Design-Build Team shall immediately notify the controlling government entity.

STOC Coordination

Lane Closures

In addition to the aforementioned minimum thirty (30) calendar day notice for a LCN, the Design-Build Team shall notify the STOC when the process of closing a lane, ramp or paved shoulder begins.

Lane Opening

The Design-Build Team shall notify the STOC when the process of re-opening a lane, ramp or paved shoulder begins, and again when the lane, ramp or paved shoulder is completely open.

GENERAL DESIGN AND CONSTRUCTION REQUIREMENTS

Maintenance of Access

Maintain access to all businesses, schools, residences, bus stops, mass transit facilities, park and ride lots, and emergency services at all times. Prior to incorporation, obtain written approval from the Engineer on the method to maintain access.

In accordance with the Department's Policy on Evaluating Temporary Accommodations for Pedestrians during Construction, found on the website noted below, the Design-Build Team shall maintain pedestrian accommodations in all areas as follows:

Roadway	Minimum Level of Pedestrian Accommodation
NC 86 (Martin Luther King Jr. Boulevard) SR 1727 (Eubanks Road)	Basic
SR 1006 (Orange Grove Road) SR 1009 (Old NC 86) SR 1723 (New Hope Church Road) SR 1725 (Millhouse Road) SR 1732 (Sunrise Road) SR 1734 (Erwin Road) US 15-501 (Durham-Chapel Hill Boulevard) SR 1134 (Dimmocks Mill Road)	Absence of Need

https://connect.ncdot.gov/projects/WZTC/Pages/PedSafety.aspx

On all roadways within the project limits, the Design-Build Team shall provide safe access for wide-loads and oversized permitted vehicles through the work zone. Safe access shall include, but not be limited to, a sufficient pavement structure (Reference the Pavement Management Scope of Work found elsewhere in this RFP), maintaining the existing vertical clearance of overhead structures, providing the required vertical clearance of proposed overhead structures, and providing the minimum horizontal clear widths as follows:

Roadway	Minimum Clear Width *
Interstates, US routes, NC Routes, and all ramps and loops	20 feet
All other roadways	18 feet

* For temporary alignments, the Design-Build Team shall provide the wider of the width in the Table above or the required design criteria found elsewhere in this Scope of Work.

Traffic Control Supervisor

The Design-Build Team shall furnish a Traffic Control Supervisor for the project who is knowledgeable of TMP design, devices, and application, and has full authority to ensure traffic is maintained in accordance with the plans and specifications.

The Traffic Control Supervisor shall be on the project site overseeing all road closures and median crossover operations to ensure traffic control devices are properly installed and adjusted as necessary. The Traffic Control Supervisor shall also make necessary changes to the traffic control operations and aide in the monitoring of traffic queuing.

The Design-Build Team shall identify a Traffic Control Supervisor in their Technical Proposal that has the following qualifications:

- A minimum 24 months of On-the-Job Training in supervision and work zone set up and implementation on similar projects.

- Be certified by an approved NCDOT training provider. If the Design-Build Contractor or their traffic control subcontractor is approved by NCDOT to train their own staff, a notarized certification letter shall be furnished to the Engineer at the preconstruction meeting. The letter shall state certification and re-certification dates. It shall also state the Traffic Control Supervisor has the knowledge and experience as well as the authority to ensure traffic is maintained in accordance with the contract documents.

The Traffic Control Supervisor for the project shall perform the following:

- During construction, be available or on call 24 hours per day, 7 days per week to address mobility and / or safety concerns within the work zone and direct / make any necessary changes in the traffic control operations in a timely and safe manner. The Design-Build Team shall provide NCDOT the name of the Traffic Control Supervisor and support personnel, and the phone number(s) where they can be reached 24 hours per day, seven days per week.

- Coordinate and cooperate with traffic control supervisors of adjacent, and overlapping construction projects, as well as construction projects in proximity to the subject project, to ensure safe and adequate traffic control is maintained throughout the project at all times, including periods of construction inactivity.

- Coordinate and cooperate with the NCDOT Division Incident Management staff.

- Coordinate and cooperate with the TRTMC and STOC to ensure proper messages are displayed on the DMSs and any PCMSs that are required to communicate with the NCDOT TRTMC and STOC.

- Coordinate with Hospitals, EMS, Fire Departments, and Law Enforcement throughout construction to alert these entities to traffic control impacts that may affect their services.

- Provide traffic control setup that ensures safe traffic operations and workers' safety throughout the construction area.

- Attend all scheduled traffic control coordination meetings, as required by the Engineer.

- Monitor traffic delays and backups within the work zone.

- Ensure all employees working inside NCDOT right of way have received the proper training appropriate to the job decisions each individual is required to make.

- Reference the *Dynamic Traveler Information System* Project Special Provision found elsewhere in this RFP for additional requirements.

Work Zone Installer

The Design-Build Team shall provide the service of at least one qualified work zone installer during the setup, installation, and removal of temporary traffic control devices within any 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 devices. If multiple temporary traffic control installations and / or removals are occurring simultaneously, then each crew leader shall be 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, reference the Work Zone Safety Training webpage noted below:

https://connect.ncdot.gov/projects/WZTC/Pages/Training.aspx

In accordance with Article 1101-13 of the 2018 *Standard Specifications for Roads and Structures*, a work zone supervisor may fulfill the role of the work zone installer during the setup, installation, and removal of temporary traffic control devices within any highway right of way, provided they are on site and directing the installation and removal of temporary traffic control devices.

At a minimum, all other individuals participating in the setup, installation, and removal of temporary traffic control devices within any highway right of way shall be certified as a qualified flagger in accordance with Article 1150-3 of the 2018 *Standard Specifications for Roads and Structures*, even if flagging is not being performed as part of the traffic control operation.

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

The Work Zone Installer does not replace or change the requirements of the Traffic Control Supervisor described above.

Traffic Control Devices

The Design-Build Team shall use traffic control devices that conform to all NCDOT requirements and are listed on the NCDOT Approved Products List. The Approved Products List may be referenced on the website noted below:

https://apps.ncdot.gov/vendor/approvedproducts/

The use of any devices that are not shown on the NCDOT Approved Products List shall require written approval from the Design-Build Unit prior to incorporation.

Excluding areas within 1,000 feet of a signalized intersection, channelizing device spacing shall not exceed a distance in feet equal to twice the posted speed limit. When channelizing devices are installed within 1,000 feet of a signalized intersection, their spacing shall not exceed a distance in feet equal to the posted speed limit. Channelizing devices shall be spaced ten feet on-center in radii. Channelizing devices shall be two feet off the edge of an open travelway when lane closures are not in effect. Skinny drums shall only be allowed as defined in Section 1180 of the NCDOT *Standard Specifications for Roads and Structures*.

Place Type III barricades, with "ROAD CLOSED" signs (R11-2) attached, of sufficient length to close entire roadway. Stagger or overlap barricades as needed to allow for ingress or egress.

PCMS should be placed off the shoulder of the roadway and behind a traffic barrier, if practical. Where placement of a traffic barrier is not practical to shield the PCMS, the PCMS should be placed off the shoulder and outside of the clear zone. If a PCMS must be placed on the roadway shoulder or within the clear zone, it shall be delineated with retroreflective temporary traffic control (TTC) devices. When PCMSs are not being used to display TTC messages, they shall be relocated such that they are outside of the clear zone or shielded behind a traffic barrier and turned away from traffic.

If any trailer mounted traffic control device must be placed on the roadway shoulder or within the clear zone, it shall be delineated with retroreflective temporary traffic control (TTC) devices.

All traffic control devices, including but not limited to, temporary or permanent barrier systems, shall be placed / located a minimum two-foot offset (shy distance) from the edge of an open travel lane.

Temporary Portable ITS Devices

In addition to the PCMSs required by the NCDOT Roadway Standard Drawings and portable devices required in the ITS Scope of Work and the *Dynamic Traveler Information System* Project Special Provision found elsewhere in this RFP, the Design-Build Team shall provide a minimum of thirteen (13) temporary PCMSs and five (5) portable CCTV cameras to be used solely for incident management. The Design-Build Team shall provide additional temporary PCMSs and portable CCTV cameras for incident management, as necessary, along alternate Incident Management Routes developed by the Design-Build Team. (Reference the IMP Incident Management Routes Section of this Scope of Work) The Design-Build Team will be allowed to relocate temporary PCMSs and portable CCTV cameras from an inactive Incident Management Route to an active Incident Management Route.

The PCMSs for incident management shall be used to display alternate route information ahead of detour points for incidents in the project area. The Design-Build Team shall coordinate with the STOC when alternate route information needs to be displayed. In the event of an incident, the STOC will control the applicable PCMSs to provide incident management information to motorists.

The temporary portable ITS devices for incident management shall be installed, relocated as necessary, operated, and maintained from the initiation of project construction to project completion or completion of their usefulness as determined by the Engineer.

A preliminary location plan for the incident management ITS devices has been provided by the Department. Final locations and positioning of these devices shall be coordinated with the STOC and NCDOT and included in the IMP for STOC and NCDOT for review and acceptance prior to installation. Once the location of the ITS devices for incident management have been accepted by the STOC and NCDOT, the locations shall not be changed without STOC and NCDOT approval.

Unless noted otherwise elsewhere in this Scope of Work, all portable ITS devices shall be capable of communicating with the existing software utilized by the TRTMC and STOC and have the functionality to be operated locally in the field and controlled remotely from the TRTMC and STOC. All portable ITS devices provided must be fully National Transportation Communications for ITS Protocol (NTCIP) compliant and on the NCDOT ITS and Signals QPL as of the Technical Proposal submittal date. No vendor specific or third-party software will be allowed. PCMSs used solely by the Design-Build Team for daily traffic control operations do not need to communicate with the TRTMC or STOC.

The Department will provide cellular modems to establish the communications link between the portable ITS devices for incident management and the TRTMC and STOC. The portable ITS devices shall have a fully configurable, standard ethernet port for connection to the cellular modem. Devices with built-in or onboard modems shall have an available ethernet port to allow communications with the Department-furnished modem. Devices designed specifically for serial communications and devices without an available ethernet port will not be accepted. All modems provided by the NCDOT shall be returned to the NCDOT once the project is complete or the Engineer determines the device is no longer needed. (Reference the ITS Scope of Work found elsewhere in this RFP)

Temporary Traffic Barrier Systems

Placement of temporary traffic barrier systems shall be shown on the TMPC and shall be designed in accordance with the requirements below.

The Design-Build Team shall maintain positive median cross-over protection for the entire I-40 project limits. The Design-Build Team shall indicate in the Technical Proposal the type of positive protection proposed and replacement / resetting requirements.

Determine the need for temporary traffic barrier in accordance with the FHWA *Rule on Temporary Traffic Control Devices* (23 CFR 630 Subpart K). Reference the NCDOT Work Zone Traffic Control website noted below for examples and *Guidelines for the Use of Positive Protection in Work Zones*.

https://connect.ncdot.gov/projects/WZTC/Pages/Design-Resources.aspx

The Design-Build Team shall adhere to the AASHTO *Roadside Design Guide* in determining the length of need, flare rate, and clear zone. The Design-Build Team shall adhere to the maximum

deflections from crash testing of the proposed temporary traffic barrier system in accordance with NCHRP-350 *Recommended Procedures for the Safety Performance Evaluation of Highway Features* and 2016 AASHTO *Manual for Assessing Safety Hardware* (MASH).

The Design-Build Team shall only use an NCDOT approved temporary traffic barrier system.

The temporary traffic barrier system shall not be installed more than two weeks prior to beginning work in any location. Once the temporary traffic barrier system is installed at any location, the Design-Build Team shall proceed in a continuous manner to complete the proposed work in that location.

Excluding water filled barrier, protect the approach end of temporary traffic barrier systems from oncoming traffic at all times with a truck mounted impact attenuator (maximum 72-hour duration) or a temporary crash cushion unless the approach end of the temporary traffic barrier system is offset from oncoming traffic as follows:

Posted speed limit (mph)	**Minimum offset (feet)**
40 or less	15
45 - 50	20
55	25
60 mph or higher	30

Crash cushions shall be installed according to the manufacturer's recommendations, including offsets from fixed objects.

The Design-Build Team shall provide the proper connection between the existing guardrail or bridge rail and the temporary traffic barrier system. Connection details shall be included in the TTCP.

Install temporary traffic barrier system with the traffic flow, beginning with the upstream side of traffic. Remove the temporary traffic barrier system against the traffic flow, beginning with the downstream side of traffic.

All temporary traffic barrier systems utilized for traffic control shall be placed on a paved surface. Unless permitted otherwise by the barrier manufacturer, the paved surface shall extend a minimum of two feet behind all unanchored barrier.

The Design-Build Team shall use a minimum six-foot offset to temporary traffic barrier along any shifting or merging taper, including but not limited to, existing, temporary, and / or proposed shifting or merging tapers. At the start of a taper, temporary traffic barrier shall continue along the tangent to achieve this six-foot offset. For all ramp / loop merge tapers, temporary traffic barrier shall continue parallel to the travel lanes a minimum of 200' beyond the start of the merge taper before flaring back towards the travel lanes in accordance with Roadway Standard Drawing No. 1101.11, Sheet 3 of 4.

When temporary traffic barrier is placed on a roadway shoulder, the Design-Build Team shall install shoulder closure signs and devices in advance of the barrier in accordance with the NCDOT Roadway Standard Drawings.

The Design-Build Team shall not place temporary traffic barrier in any paved gore area. If the work cannot be safely performed without placing temporary traffic barrier in the paved gore area, the Design-Build Team shall temporarily close the ramp or loop in accordance with ICT #6.

Temporary traffic barrier used for traffic control shall not act as a retaining wall.

Temporary Alignments and Traffic Shifts

The Design-Build Team shall notify the Engineer in writing at least thirty (30) calendar days prior to any traffic pattern alteration. (Reference the Public Involvement and Information Scope of Work found elsewhere in this RFP).

Excluding median crossovers, the design speed for temporary alignments of interstates, US routes, and NC routes shall not be lower than the current posted speed limit. The minimum allowable design speed for temporary alignments on secondary roads shall be the higher of 10 mph below the posted speed limit or 35 mph.

All on-site detours shall meet the minimum number of existing lanes per direction and shall adhere to all temporary alignment requirements noted elsewhere in the RFP. All pavement transitions, including but not limited to cross slopes / superelevation, at on-site detour tie-ins shall adhere to the on-site detour design speed.

The Design-Build Team shall provide a smooth pavement surface for traffic at all times. The Design-Build Team shall not place traffic on lanes containing rumble strips unless the Design-Build Team mills the rumble strips and installs a uniform overlay on the lane prior to placing traffic on the lane. (Reference the Pavement Management Scope of Work found elsewhere in this RFP)

For temporary traffic patterns that will remain in place for a period longer than three days, including but not limited to traffic shifts, merges, and temporary alignments, breaks in the superelevation and / or breaks in a normal crown section will not be allowed within the shifting taper. Excluding the aforementioned temporary traffic patterns, breaks in the superelevation and / or breaks in a normal crown section shall only occur on a lane line or lane midpoint, and shall not exceed 0.04.

The Design-Build Team shall provide proper drainage for all temporary alignments and / or traffic shifts.

The NCDOT Roadway Standard Drawing No. 1101.11 shall be used to calculate the length of temporary merges for lane closures and temporary traffic shifts. All straight-line traffic shifts on interstate and US routes shall be designed for the full L distance (L = width of traffic shift times speed limit in mph).

Straight line traffic shifts of six feet or greater shall have the appropriate lane shift warning signs and solid white line pavement markings that separate the travel lanes. For straight line traffic shifts less than six feet, the need for signing and solid line pavement markings shall be determined by the Design-Build Team and accepted by the Department.

Temporary traffic shifts that are not covered by a standard and / or require vertical grades shall be considered a temporary alignment. All temporary alignments shall adhere to the NCDOT *Roadway Design Manual*, including all revisions, 2018 AASHTO *A Policy on Geometric Design of Highways and Streets* and the most current Transportation Research Board *Highway Capacity Manual*.

Lane and Shoulder Requirements

Unless permitted otherwise elsewhere in this RFP, maintain the existing number of travel lanes on all roads. The Design-Build Team shall adhere to the minimum lane width requirements noted below. Maintaining these requirements will not be considered lane narrowing:

- Existing travel lanes that are equal to or greater than 11 feet wide, maintain minimum 11-foot travel lanes.

- Existing travel lanes that are narrower than 11 feet, maintain the existing travel lane widths.

For all temporary travel lanes (through lanes and exclusive turn lanes), excluding temporary traffic shift transitions and tapers, the wheel path of all design vehicles listed in Table 2-4a, *Design Vehicle Dimensions (U.S. Customary Units)* of the 2018 AASHTO *A Policy on Geometric Design of Highways and Streets* shall not be located within one-foot of a temporary or permanent longitudinal pavement joint line. The aforementioned one-foot measurements shall occur with the design vehicles centered within the temporary travel lanes.

Maintain a minimum inside and outside paved shoulder width of four feet in each direction of I-40 unless temporary traffic barrier is placed on the paved shoulder. This requirement may be reduced to two feet paved shoulders under structures and one-foot paved shoulders along ramps. If temporary traffic barrier is placed on the shoulder, refer to the Traffic Control Devices and Temporary Traffic Barrier Systems subsections for shy distance and placement requirements.

On two-lane, two-way facilities, the Design-Build Team shall not install more than one (1) mile of lane closure in any one direction on any roadway within the project limits or in conjunction with this project, measured from the beginning of the merge taper to the end of the lane closure.

On multi-lane facilities, the Design-Build Team shall not install more than two (2) miles of lane closure in any one direction, measured from the beginning of the merge taper to the end of the lane closure.

For simultaneous lane closures in any one direction on any road within the project limits, a minimum of three (3) miles shall be provided between lane closures. The distance between lane

closures shall be measured from the end of one closure to the beginning of the taper of the next lane closure.

Through traffic traveling in the same direction shall not be split, including separation by any type of barrier, bridge piers, existing or proposed median, or any other device.

The Design-Build Team shall remove lane closure devices from the lane when work is not being performed behind the lane closure or when a lane closure is no longer needed.

Place sets of three drums perpendicular to the edge of the travelway on 500-foot centers when unopened lanes are closed to traffic. These drums shall be in addition to channelizing devices.

When personnel and / or equipment are working within 15 feet of an open travel lane, the Design-Build Team shall close the nearest open shoulder using the NCDOT Roadway Standard Drawings, unless the work area is protected by an approved temporary traffic barrier or guardrail.

When personnel and / or equipment are working on the shoulder adjacent to an undivided facility and within five feet of an open travel lane, the Design-Build Team shall, at a minimum, close the nearest open travel lane using the NCDOT Roadway Standard Drawings, unless the work area is protected by an approved temporary traffic barrier or guardrail.

When personnel and / or equipment are working on the shoulder adjacent to a divided facility and within ten feet of an open travel lane, the Design-Build Team shall, at a minimum, close the nearest open travel lane using the NCDOT Roadway Standard Drawings, unless the work area is protected by an approved temporary traffic barrier or guardrail.

When personnel and / or equipment are working within a lane of travel of an undivided or divided facility, the Design-Build Team shall, at a minimum, close the lane using the NCDOT Roadway Standard Drawings. The Design-Build Team shall conduct the work so that all personnel and / or equipment remain within the closed travel lane.

The Design-Build Team shall not perform work involving heavy equipment within 15 feet of the edge of travelway when work is being performed behind a lane closure on the opposite side of the travelway.

The Design-Build Team shall provide paved motorist pull-offs along any full control of access freeway facility in accordance with the Motorist Pull-Off Area detail found on the NCDOT Work Zone Traffic Control's webpage below. The Design-Build Team shall submit a temporary pavement design for the pull off areas to the Department for review and acceptance prior to installation. (Reference the Pavement Management Scope of Work found elsewhere in this RFP).

https://connect.ncdot.gov/projects/WZTC/Pages/Design-Resources.aspx

Off-site Detours

Prior to incorporation, obtain written approval from the Engineer for all road and / or access point closures. Access point closures will only be allowed for locations that have multiple access points and all access point closures shall be coordinated with the property owner and the Engineer.

Excluding ICM detours provided by the Department, all offsite detour routes shall receive Department written approval prior to incorporation. All roads and lanes along the detour route shall remain open to traffic while the detour is in effect. Submit detour routes and all associated sign designs for review and acceptance prior to incorporation.

Excluding ICM detours provided by the Department, the Design-Build Team shall investigate all proposed detour routes. At a minimum, this investigation shall include analyzing the detour route capacity and geometry / characteristics to ensure the additional volume can be supported, investigating impacts to emergency services (access and response times) and schools, and investigating the structural integrity of the bridges and pavement along the detour route, including the existing shoulders. The Design-Build Team shall submit recommendations resulting from the aforementioned investigations / analyses for the Department's review and acceptance. The recommendations shall include mitigation for any impacts to emergency services (access and response times).

As determined by the Engineer, the Design-Build Team shall provide all improvements required to accommodate detoured traffic prior to utilizing detour routes.

Offsite detours that have non-signalized at-grade railroad crossings shall not be allowed.

Unless approved otherwise by the controlling government entity, in writing, use only state-maintained roads for off-site detour routes.

All proposed road closures, detour routes, durations, and justifications shall be incorporated into the Technical Proposal. (All proposed road closures, detour routes, durations and justifications incorporated into the Technical Proposal shall require Department approval.)

Impacts to Other Network Roadways

The Design-Build Team shall coordinate with the Division Maintenance Engineer, Resident Engineer, Division Traffic Engineer, Rail Division, and STOC to manage traffic operations within the work zone and other roadways within the network that may be affected by the work zone activities. Coordination shall include, but not limited to, providing notification of planned lane or road closures, traffic detours, public information, traffic management, access management, and incidents.

On all roads, the Design-Build Team shall make all modifications to existing pavement markings, markers, and / or signing located outside the project limits that are necessitated by the TMP. Additionally, the Design-Build Team shall readjust the markings, markers, and / or signing located outside the project limits to the existing / proposed pattern when the temporary changes are no longer needed.

The Design-Build Team shall take steps to minimize disruptions to existing roadway facilities during construction and shall demonstrate in the TMPC how the traffic control phasing minimizes inconvenience to motorists on all roads.

Pavement Edge Drop-off Requirements

Using suitable compacted material, the Design-Build Team shall backfill with a 6:1 or flatter slope up to the edge and elevation of the existing pavement in areas adjacent to an open travel lane that has an edge of pavement drop-off as follows:

- Elevation differences greater than two inches on roadways with posted speed limits of 45 mph or greater and a paved shoulder four-foot wide or less.

- Elevation differences greater than three inches on roadways with posted speed limits less than 45 mph and a paved shoulder four-foot wide or less.

- Refer to the current AASHTO *Roadside Design Guide* for proper treatment of all other conditions.

Do not exceed a difference of two inches in elevation between open lanes of traffic for nominal lifts of 1.5 inches. Install advance warning "UNEVEN LANES" signs (W8-11) 1,000 feet in advance and a minimum of every half mile throughout the uneven area.

Signing

The Design-Build Team shall install advance work zone warning signs when work is within 40 feet from the edge of travel lane. The advance work zone warning signs shall be installed no more than three days prior to beginning construction.

When no work is being conducted for a period longer than one week, the Design-Build Team shall remove or cover all advance work zone warning signs, as directed by the Engineer. Stationary work zone warning signs shall be covered with an opaque material that prevents reading of the sign at night by a driver traveling in either direction.

When portable work zone signs are not in use for periods longer than 30 minutes, the Design-Build Team shall lay the portable work zone sign flat on the ground and collapse the sign stand and lay it flat on the ground.

The Design-Build Team shall install and maintain all detour signing and devices required for road closures. The Design-Build Team shall cover or remove all detour signs and devices required for road closures, within and outside of the project limits, when a detour is not in operation.

The Design-Build Team shall ensure proper signing is in place at all times during construction as required by the MUTCD. Guide signs shall be maintained and modified, as required by the TMP, throughout the entire project construction duration. All temporary signing shall be shown on the

TTCP, IMP, and / or Temporary Signing Plans to be reviewed and approved by the Work Zone Traffic Control Section, the Signing and Delineation Unit and STOC as appropriate, prior to incorporation.

Temporary Pavement Markings, Markers, and Delineation

The Design-Build Team shall install pavement markings and markers in accordance with the NCDOT *Standard Specifications for Roads and Structures*, and in accordance with the manufacturer's procedures and specifications.

The Design-Build Team shall install temporary pavement markings and markers for temporary traffic patterns as follows.

Road	Marking	Marker
I-40, including all ramps and loops (excluding structures)	Work Zone Performance Pavement Markings (Reference the *Work Zone Performance Pavement Markings* Project Special Provision found elsewhere in this RFP)	Raised Temporary
All other roads and structures	Any Marking on the Approved Product List	Raised Temporary

Prior to shifting traffic to a new pattern, the Design-Build Team shall 1) remove all conflicting markers and snowplowable marker castings, and patch all casting holes, and 2) remove, conceal, or mill and fill / overlay all conflicting markings in accordance with the following requirements: (Reference the Pavement Management Scope of Work found elsewhere in this RFP)

- Pavement markings on concrete surfaces shall only be removed by hydroblasting.

- Pavement markings on ultra-thin bonded wearing courses of I-40 and I-85, including all ramps and loops, shall be removed by milling the existing ultra-thin bonded wearing course and overlaying with an ultra-thin bonded wearing course.

- Pavement markings on asphalt surfaces of I-40 and I-85, including all ramps and loops, shall be concealed by applying a uniform pavement overlay.

- Conflicting pavement markings on all other asphalt surfaces shall be concealed (in accordance with the requirements above), removed, or milled and filled.

Unless noted otherwise elsewhere in this RFP, removal of the temporary pavement markings on asphalt surfaces (other than I-40 and I-85, including all ramps and loops) shall be accomplished by an NCDOT approved system to minimize damage to the road surface. Pavement markings shall not be obscured with any type of black pavement markings (paint or other material). The Design-

Build Team shall remove all temporary pavement markings without removing more than 1/32 inch of the pavement surface.

By the end of each day's operation, and in accordance with the requirements above, the Design-Build Team shall conceal, remove, or mill and fill, as appropriate, all conflicting markings, replace all damaged markings, and remove / replace all conflicting / damaged markers.

Excluding pavement markings and markers not visible to traffic, conflicting pavement markings and markers shall be defined as any pavement marking or marker not being used for the current traffic pattern which is within six feet of any pavement marking required for the current traffic pattern.

The Design-Build Team shall tie proposed pavement marking lines to existing pavement marking lines.

The Design-Build Team shall show temporary pavement markings on the TMP that meet the requirements of the RFP and the NCDOT *Transportation Management Plans Design Manual*.

The Design-Build Team shall only use pavement marking and marker products that conform to all NCDOT requirements and are listed on the NCDOT Approved Products List. The use of any devices that are not shown on the NCDOT Approved Products List shall require written approval from the Design-Build Unit prior to incorporation.

The Design-Build Team shall install temporary pavement markings that are the same width as existing pavement markings. For roadways that do not have existing pavement markings, the Design-Build Team shall install temporary pavement markings that are the same width required for the final pavement markings in the Pavement Markings Scope of Work found elsewhere in this RFP.

For Work Zone Performance Pavement Markings, the Design-Build Team shall maintain a minimum retroreflectivity in accordance with the *Work Zone Performance Pavement Markings* Project Special Provision found elsewhere in this RFP. For all other pavement markings, the Design-Build Team shall maintain a minimum retroreflectivity for existing and temporary pavement markings at all times during construction as follows:

White:	125 mcd/lux/m2
Yellow:	100 mcd/lux/m2

When using Cold Applied Plastic Type 4 pavement markings, place temporary raised markers half on and half off edge lines and centerlines to help secure the tape to the roadway. Markers shall be spaced an appropriate distance apart as described by the NCDOT Roadway Standard Drawing No. 1250.01, Sheet 1 of 3.

The Design-Build Team shall trace existing and / or proposed monolithic island locations with the proper color pavement marking prior to removal and / or installation. The Design-Build Team shall place drums to delineate existing and / or proposed monolithic islands after the removal and / or before installation.

The Design-Build Team shall not place temporary markings other than Cold Applied Plastic Type 4 - Removable Tape on any final asphalt pavement surface unless the temporary markings are placed in the exact location of the final pavement markings.

The Design-Build Team shall not place temporary markings other than Polyurea Pavement Marking Material - Type 2 on any final concrete pavement surface unless the temporary markings are placed in the exact location of the final pavement markings.

The Design-Build Team shall readjust the markings , markers, and / or signing located outside the project limits to the existing / proposed pattern when the temporary changes are no longer needed.

Temporary Traffic Signals

At all intersections, multi-lane turn lanes shall be 15 feet in width at the midpoint of the turn.

If the Design-Build Team proposes temporary traffic signals for maintenance of traffic, include the following as part of the TMP General Notes:

- Notify the Engineer in writing a minimum of two months before a temporary traffic signal installation is required.

- Shift and revise all signal heads as shown on the accepted Traffic Signal Plans.

Lighting

The Design-Build Team shall provide portable temporary construction and equipment lighting to conduct night work in accordance with the NCDOT *Standard Specifications for Road and Structures*.

For nighttime lane closures along I-40, furnish and install Work Zone Presence Lighting and Sequential Flashing Warning Lights. (Reference the *Work Zone Presence Lighting* and *Sequential Flashing Warning Lights* Project Special Provision found elsewhere in this RFP)

Temporary Shoring for Maintenance of Traffic

Temporary shoring for the maintenance of traffic shall be defined as shoring necessary to provide lateral support to the side of an excavation or embankment parallel to an open travelway when a theoretical 2:1 (H:V) slope from the bottom of the excavation or embankment intersects the existing ground line closer than five feet from the edge of pavement of the open travelway.

The Design-Build Team shall be responsible for all required temporary shoring including designing, furnishing, installing, maintaining, and removing the shoring.

The Design-Build Team shall identify where temporary shoring will be used for maintenance of traffic on the TMPC and include cut sections showing offsets to the travelway.

The Design-Build Team shall install temporary traffic barrier as shown on the "PCB at Temporary Shoring Locations" detail available on the Work Zone Traffic Control website noted below. This detail provides design information on the temporary traffic barrier location in relation to the temporary shoring and traffic location. Notes related to Temporary Shoring are not required in the General Notes sheet for the TMP.

The NCDOT Geotechnical Engineering Unit and Work Zone Traffic Control websites contain more information on the design and use of temporary shoring. The Design-Build Team shall adhere to all additional requirements for temporary shoring located on the websites below:

https://connect.ncdot.gov/resources/Geological/Pages/default.aspx

https://connect.ncdot.gov/projects/WZTC/Pages/Design-Resources.aspx

Law Enforcement

Law enforcement officers shall be used during any rolling roadblock operation and to direct traffic when installing / removing / shifting traffic signal heads at intersections. Law enforcement officers may be used to maintain traffic through the work area and / or intersections. The use of law enforcement officers shall adhere to the following requirements:

- The Design-Build Team shall be responsible for coordinating with the law enforcement agency for the use of law enforcement officers.

- The Design-Build Team shall only utilize officers who are outfitted with law enforcement uniforms and marked vehicles equipped with proper lights mounted on top of the vehicle and agency emblems.

- The Design-Build Team shall coordinate with the Engineer where and how law enforcement officers will be used during construction.

The Design-Build Team shall address where and how law enforcement officers will be used in the Technical Proposal.

PROJECT REQUIREMENTS AND TIME RESTRICTIONS

All time restrictions and notes shall be included in the TMP General Notes, unless noted otherwise elsewhere in this RFP.

In the event any self-imposed liquidated damages are included in the Technical Proposal, an Intermediate Contract Time(s) shall be established and shall become part of the contract.

Intermediate Contract Times #2, #3 and #4 for Lane Narrowing, Lane Closure, Holiday and Special Event Restrictions

Except as allowed otherwise elsewhere in this RFP, the Design-Build Team shall maintain the existing traffic pattern and shall not close or narrow a lane of traffic during the times listed below. Construction operations requiring a lane closure on a ramp / loop section with a single lane shall be defined as a road closure and shall be subject to the intermediate contract times for road closures noted in ICT # 6 found elsewhere in this Scope of Work.

Intermediate Contract Time	Facility	Days	Time Restrictions
#2	I-40	Monday through Sunday	5:00 a.m. to 9:00 p.m.
#3	All ramps and loops US 15-501 (Durham-Chapel Hill Boulevard) NC 86 (Martin Luther King Jr. Boulevard)	Monday through Friday	5:00 a.m. to 8:00 p.m.
		Saturday and Sunday	9:00 a.m. to 8:00 p.m.
#4	SR 1006 (Orange Grove Road) SR 1009 (Old NC 86) SR 1723 (New Hope Church Road) SR 1725 (Millhouse Road) SR 1732 (Sunrise Road) SR 1734 (Erwin Road) SR 1134 (Dimmocks Mill Road)	Monday through Friday	6:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m.

In addition, the Design-Build Team shall not close or narrow a lane of traffic on the aforementioned facilities, detain, and / or alter the traffic flow on or during holidays, holiday weekends, special events, or any other time when traffic is unusually heavy. At a minimum, these requirements / restrictions shall apply to the following schedules:

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

- For New Year's between the hours of 5:00 a.m. December 31st and 9:00 p.m. January 2nd. If New Year's Day is on a Friday, Saturday, Sunday or Monday then between the hours of 5:00 a.m. December 31st and 9:00 p.m. the following Tuesday.

- For Easter, between the hours of 5:00 a.m. Thursday and 9:00 p.m. Monday.
- For Memorial Day, between the hours of 5:00 a.m. Friday and 9:00 p.m. Tuesday.
- For Independence Day, between the hours of 5:00 a.m. July 3rd and 9:00 p.m. July 5th. If Independence Day is on a Friday, Saturday, Sunday or Monday, then between the hours of 5:00 a.m. the Thursday before Independence Day and 9:00 p.m. the Tuesday after Independence Day.
- For Labor Day, between the hours of 5:00 a.m. Friday and 9:00 p.m. Tuesday.
- For Thanksgiving Day, between the hours of 5:00 a.m. Tuesday and 9:00 p.m. Monday.
- For Christmas, between the hours of 5:00 a.m. the Friday before the week of Christmas Day and 9:00 p.m. the following Tuesday after the week of Christmas Day.
- For football games, basketball games, and graduations at the Dean Smith Center or the Kenan Memorial Stadium, from three (3) hours before the beginning of the event to two (2) hours after the end of the event.

Liquidated Damages for Intermediate Contract Time #2 for the above lane narrowing, lane closure, holiday and special event time restrictions on I-40 are $2,500.00 per 15-minute period or any portion thereof.

Liquidated Damages for Intermediate Contract Time #3 for the above lane narrowing, lane closure, holiday and special event time restrictions on all ramps and loops, US 15-501 (Durham-Chapel Hill Boulevard) and NC 86 (Martin Luther King Jr. Boulevard) are $1,250.00 per 15-minute period or any portion thereof.

Liquidated Damages for Intermediate Contract Time #4 for the above lane narrowing, lane closure, holiday and special event time restrictions on SR 1006 (Orange Grove Road), SR 1009 (Old NC 86), SR 1723 (New Hope Church Road), SR 1725 (Millhouse Road), SR 1732 (Sunrise Road), SR 1734 (Erwin Road) and SR 1134 (Dimmocks Mill Road) are $500.00 per 15-minute period or any portion thereof.

Intermediate Contract Times #5 and #6 for Road Closure Restrictions for Construction Operations

Unless allowed otherwise elsewhere in this RFP, at a minimum, the Design-Build Team shall maintain the existing traffic pattern and follow the road closure restrictions for all roadways listed below. When a road closure is used, the Design-Build Team shall reopen the travel lanes by the end of the road closure duration to allow the traffic queue to deplete before re-closing the roadway.

Unless allowed otherwise elsewhere in this RFP, the Design-Build Team shall not close any direction of travel on the following roads or any ramps / loops during the times noted below; and only close the following roads or any ramps / loops for the operations listed in this intermediate

contract time. Using a median crossover, exclusively for the operations listed below, shall be defined as a closure of a direction of travel.

A crossover providing one lane in each direction on I-40 will be allowed for the purpose of bridge demolition, and girder, overhang, and falsework installation and / or removal during the times set forth below. No other roads shall be put in a crossover pattern. If the Design-Build Team elects to use a crossover for the aforementioned activities, during the times set forth below, the crossover shall be designed and constructed to meet a design speed of no more than 20 mph below the posted speed limit prior to implementation of a reduced work zone speed limit. Unless approved otherwise by the Engineer, in writing, the maximum allowable distance between the crossovers shall be 2,750 feet. The Design-Build Team shall monitor the traffic queue during operation of the crossover. Should the traffic queue extend to the advance warning signs, traffic shall be returned to the existing number of lanes in each direction until the traffic queue is depleted.

Intermediate Contract Time	**Facility**	**Days**	**Time Restrictions**
#5	I-40	Monday through Sunday	5:00 a.m. to 11:00 p.m.
#6	All ramps and loops SR 1009 (Old NC 86) SR 1725 (Millhouse Road)	Monday through Sunday	5:00 a.m. to 11:00 p.m.

For the operations noted below, the maximum road closure duration shall not exceed thirty (30) minutes without an approved offsite detour. With an approved offsite detour, the roadways listed may be closed according to the time restrictions listed in the appropriate Road Closure ICT for the operations listed below:

- Bridge demolition
- Girder, overhang, and falsework installation and / or removal
- Installation of overhead sign assemblies and / or work on existing overhead sign assemblies over travel lanes, or traffic signal poles and cables across roadways
- Tie-in work to implement or remove an on-site detour

Proposed road closures for any road within the project limits shall be approved by the Engineer, in writing, prior to incorporation in the TMP.

Liquidated Damages for Intermediate Contract Time #5 for the above road closure time restrictions for construction operations on I-40 are $5,000.00 per 15-minute period or any portion thereof.

Liquidated Damages for Intermediate Contract Time #6 for the above road closure time restrictions for construction operations on all ramps and loops, SR 1009 (Old NC 86) and SR 1725 (Millhouse Road) are $1,250.00 per 15-minute period or any portion thereof.

Intermediate Contract Times #7 and #8 for Ramp Reconstruction

One road closure, with an approved offsite detour, will be permitted for the reconstruction of each ramp listed below, for the maximum durations listed below. The Design-Build Team shall not concurrently close the entrance and exit ramps.

Intermediate Contract Time	Interchange	Duration
#7	I-40 westbound exit ramp onto SR 1009 (Old NC 86)	15 consecutive calendar days
#8	I-40 westbound entrance ramp from SR 1009 (Old NC 86)	15 consecutive calendar days

The date of availability shall be the date the Design-Build Team elects to close the ramp. The Design-Build Team shall provide the Engineer a minimum of 30 days written notice prior to the date of availability. The date of completion shall be the number of consecutive days proposed by the Design-Build Team in the Technical Proposal, and such number of consecutive days proposed shall not be greater than the days noted above.

Liquidated Damages for Intermediate Contract Time #7 for the above road closure time restrictions for ramp reconstruction at the I-40 westbound exit ramp onto SR 1009 (Old NC 86) are $2,000.00 per calendar day or any portion thereof.

Liquidated Damages for Intermediate Contract Time #8 for the above road closure time restrictions for ramp reconstruction at the I-40 westbound entrance ramp from SR 1009 (Old NC 86) are $2,000.00 per calendar day or any portion thereof.

Intermediate Contract Times #9, #10 and #11 for Bridge Rehabilitation

One road closure, with an approved offsite detour, will be permitted for rehabilitation work on each bridge listed below for the maximum durations listed below.

Intermediate Contract Time	Facility	Duration
#9	Bridge on SR 1134 (Dimmocks Mill Road) over I-40 and I-85	Ten consecutive calendar days
#10	Bridge on SR 1732 (Sunrise Road) over I-40	Ten consecutive calendar days
#11	Bridge on SR 1723 (New Hope Church Road) over I-40	Ten consecutive calendar days

The date of availability shall be the date the Design-Build Team elects to close the bridge. The Design-Build Team shall provide the Engineer a minimum of 30 days written notice prior to the date of availability. The date of completion shall be the number of consecutive calendar days proposed by the Design-Build Team in the Technical Proposal, and such number of consecutive calendar days proposed shall not be greater than the days noted above.

Liquidated Damages for Intermediate Contract Time #9 for the above road closure time restrictions for rehabilitation work on the bridge on SR 1134 (Dimmocks Mill Road) over I-40 and I-85 are $1,000.00 per calendar day or any portion thereof.

Liquidated Damages for Intermediate Contract Time #10 for the above road closure time restrictions for rehabilitation work on the bridge on SR 1732 (Sunrise Road) over I-40 are $1,000.00 per calendar day or any portion thereof.

Liquidated Damages for Intermediate Contract Time #11 for the above road closure time restrictions for rehabilitation work on the bridge on SR 1723 (New Hope Church Road) over I-40 are $2,000.00 per calendar day or any portion thereof.

Intermediate Contract Time #12 for Bridge Rehabilitation Work

One long-term lane closure, maintaining one-lane, two-way traffic using flaggers, automated flagger assistance devices (AFADs), or a temporary / portable traffic signal, will be permitted for rehabilitation work on the bridge listed below for the maximum duration listed below.

Intermediate Contract Time	Facility	Duration
#12	Bridge on SR 1006 (Orange Grove Road) over I-40	15 consecutive calendar days

The date of availability shall be June 15th of the year the Design-Build Team elects to close the lane. The Design-Build Team shall provide the Engineer a minimum of 30 days written notice prior to the date of availability. The date of completion shall be the number of consecutive calendar days proposed by the Design-Build Team in the Technical Proposal, and such number of consecutive calendar days proposed shall not be greater than the days noted above.

Liquidated Damages for Intermediate Contract Time #12 for the above lane closure time restrictions for rehabilitation work on the bridge on SR 1006 (Orange Grove Road) over I-40 are $1,000.00 per calendar day or any portion thereof.

Intermediate Contract Times #13 for Bridge Rehabilitation Work

One long-term lane closure between the ramp terminals will be permitted for rehabilitation work on the bridge listed below for the maximum duration listed below. The Design-Build Team shall maintain a minimum of three lanes (one through lane in each direction and a left turn lane) between the ramp terminals during this ICT duration.

Intermediate Contract Time	Facility	Duration
#13	Bridge on NC 86 (Martin Luther King Jr. Boulevard) over I-40	14 consecutive calendar days

The date of availability shall be the date the Design-Build Team elects to close the lane(s). The Design-Build Team shall provide the Engineer a minimum of 30 days written notice prior to the date of availability. The date of completion shall be the number of consecutive calendar days proposed by the Design-Build Team in the Technical Proposal, and such number of consecutive calendar days proposed shall not be greater than the days noted above.

Liquidated Damages for Intermediate Contract Time #13 for the above lane closure time restrictions for rehabilitation work on the bridge on NC 86 (Martin Luther King Jr. Boulevard) over I-40 are $5,000.00 per calendar day or any portion thereof.

Intermediate Contract Times #14 for Road Closure Restrictions for Bridge Widening

One road closure, with an approved offsite detour, will be permitted for widening the bridges on I-40 over NSR and SR 1725 (Millhouse Road), for the maximum duration listed below.

Intermediate Contract Time	Facility	Duration
#14	SR 1725 (Millhouse Road)	120 consecutive calendar days

The date of availability shall be the date the Design-Build Team elects to close the road. The Design-Build Team shall provide the Engineer a minimum of 30 days written notice prior to the date of availability. The date of completion shall be the number of consecutive calendar days proposed by the Design-Build Team in the Technical Proposal, and such number of consecutive calendar days proposed shall not be greater than the days noted above.

Liquidated Damages for Intermediate Contract Time #14 for the above road closure time restrictions for widening the bridges on I-40 over NSR and SR 1725 (Millhouse Road) are $1,250.00 per calendar day or any portion thereof.

Intermediate Contract Time #15 for Failure to Repair a Damaged or Malfunctioning Dynamic Traveler Information System Device

The Design-Build Team shall provide uninterrupted, continuous operation of all devices included in the *Dynamic Traveler Information System* Project Special Provision found elsewhere in this RFP. The Design-Build Team shall immediately report device damages and malfunctions to the Engineer, the TRTMC and the STOC. The Design-Build Team shall repair all damages and malfunctions, and bring all devices back online within 72 hours at no cost to the Department.

Liquidated Damages for Intermediate Contract Time #15 for failure to repair a damaged or malfunctioning Dynamic Traveler Information System device and restore operation within 72 hours are $250.00 per calendar day or any portion thereof.

Intermediate Contract Times #16 for Median Barrier and Overhead Sign Assembly Foundation Construction

One long term lane closure will be permitted for median barrier and overhead sign assembly foundation construction on I-85 northbound / I-40 eastbound to replace the first of two diagrammatic overhead sign assemblies located west of the proposed I-40 eastbound exit lane taper west of SR 1134 (Dimmocks Mill Road), for the maximum duration listed below.

Intermediate Contract Time	Facility	Duration
#16	I-85 northbound / I-40 eastbound (west of the proposed I-40 eastbound exit lane taper located west of SR 1134 (Dimmocks Mill Road))	30 consecutive calendar days

The date of availability shall be the date the Design-Build Team elects to close the lane. The Design-Build Team shall provide the Engineer a minimum of 30 days written notice prior to the date of availability. The date of completion shall be the number of consecutive calendar days proposed by the Design-Build Team in the Technical Proposal, and such number of consecutive calendar days proposed shall not be greater than the days noted above.

Liquidated Damages for Intermediate Contract Time #16 for the above lane closure time restrictions for median barrier and overhead sign assembly foundation construction to replace the first of two diagrammatic overhead sign assemblies on I-85 northbound / I-40 eastbound west of the proposed I-40 eastbound exit lane taper located west of SR 1134 (Dimmocks Mill Road) are $1,000.00 per calendar day or any portion thereof.

Intermediate Contract Times #17 for Median Barrier and Overhead Sign Assembly Foundation Construction

One long term lane closure will be permitted for median barrier and overhead sign assembly foundation construction on I-85 northbound / I-40 eastbound to replace the second of two diagrammatic overhead sign assemblies located west of the proposed I-40 eastbound exit lane taper west of SR 1134 (Dimmocks Mill Road), for the maximum duration listed below.

Intermediate Contract Time	Facility	Duration
#17	I-85 northbound / I-40 eastbound (west of the proposed I-40 eastbound exit lane taper located west of SR 1134 (Dimmocks Mill Road))	30 consecutive calendar days

The date of availability shall be the ICT #16 completion date. The Design-Build Team shall provide the Engineer a minimum of 30 days written notice prior to the date of availability. The date of completion shall be the number of consecutive calendar days proposed by the Design-Build Team in the Technical Proposal, and such number of consecutive calendar days proposed shall not be greater than the days noted above.

Liquidated Damages for Intermediate Contract Time #17 for the above lane closure time restrictions for median barrier and overhead sign assembly foundation construction to replace the second of two diagrammatic overhead sign assemblies on I-85 northbound / I-40 eastbound west of the proposed I-40 eastbound exit lane taper located west of SR 1134 (Dimmocks Mill Road) are $1,000.00 per calendar day or any portion thereof.

Hauling Restrictions

The Design-Build Team shall adhere to the hauling restrictions noted in the NCDOT *Standard Specifications for Roads and Structures*.

The Design-Build Team shall conduct all hauling operations as follows:

- The Design-Build Team shall not conduct any hauling operations against the flow of traffic of an open travelway unless an approved temporary traffic barrier or guardrail separates the traffic from the hauling operation.

- All entrances, exits and crossings for hauling to and from the work zone shall be shown on the TMP. Entrances and exits for access to and from medians shall be in accordance with the NCDOT Roadway Standard Drawings and the *Typical Median Access Areas* Project Special Provision found elsewhere in this RFP.

- Haul vehicles shall not enter and / or exit an open travel lane at speeds more than 10 mph below the posted speed limit. Haul vehicle acceleration to within 10 mph of the posted speed limit shall only occur on a paved surface.

- Signs with activated Beacons or LED flashers shall be installed and used when hauling from the median. These signs shall be activated once haul vehicles are detected to warn motorists of vehicles entering the highway from the median. (Reference the *Typical Median Access Areas* Project Special Provision found elsewhere in this RFP)

- Hauling operations that perpendicularly cross a roadway shall require Transportation Management Plans and shall be subject to the lane narrowing / lane closure time restrictions, and holiday and special event time restrictions listed in ICT #2 - ICT #4.

Excluding hauling operations that are conducted entirely behind a temporary traffic barrier or guardrail, multi-vehicle hauling shall not be allowed ingress and egress from any open travel lane during the following time restrictions:

Multi-Vehicle Hauling

Facility	Days	Time Restrictions
I-40, including all ramps and loops	Monday through Sunday	5:00 a.m. to 7:00 p.m.

The Design-Build Team shall address how hauling will be conducted in the Technical Proposal, including hauling of any materials to and from the site and hauling material within the NCDOT right of way.

Work Zone Speed Limit Reduction and $250 Speeding Penalty

In order to have a lawfully enforceable speed limit, all speed limits shall be ordinance by the State Traffic Engineer. No speed limit messages / signs shall be installed prior to receiving a signed ordinance. NCDOT has sole authority of the speed limits displayed within the work zone.

NCDOT will pursue a Variable Work Zone Speed Limit Reduction Ordinance and $250 Speeding Penalty Ordinance along the I-40 project limits. The speed reduction will range between 55 mph, 60 mph, and 65 mph based on work zone conditions.

A Work Zone Variable Speed Reduction is intended to temporarily reduce the speed within the work zone based on specific traffic control strategies needed during construction. When a Variable Work Zone Speed Limit Reduction Ordinance is in effect, all existing speed limit signs located within the active work area shall be removed or covered. The speed limit shall only be displayed using Digital Speed Limit Signs. Additionally, supplemental signing will be required to notify motorists of the increased fines throughout the ordinance area. Reference *Digital Speed Limit Signs* Project Special Provision found elsewhere in this RFP.

The Design-Build Team shall include all relevant details required of the Work Zone Speed Limit Reduction Ordinance and $250 Speeding Penalty Ordinance in the TMP. The Design-Build Team shall also include any devices or signs required to implement the Variable Work Zone Speed Limit Reduction Ordinance and $250 Speeding Penalty Ordinance in the lump sum bid for the entire project.

NCDOT Contract Towing

The NCDOT anticipates administering a Towing Contract in conjunction with this project. If a Towing Contract is administered by NCDOT, the Design-Build Team shall be responsible for the following:

- Prior to any construction activity, excluding activities to temporarily remove the existing I-40 westbound left lane drop near US 15-501 (Exit 270), the Design-Build Team shall hold a towing coordination meeting with the Design-Build Unit, Division, STOC, towing contractor(s), State Highway Patrol (SHP), and local law enforcement. The meeting shall finalize the locations where vehicles will be towed, the process by which specific towing information will be conveyed to the appropriate personnel and confirm the towing requirements. Potential recovery vehicle staging and safety tow locations shall also be identified.

- The Design-Build Team shall coordinate with the NCDOT Communications Office to ensure the towing operation information is shown on the project website and accurate. This information shall include, but not limited to vehicle tow locations, reasons for work zone

towing, time frame allowed before the abandoned vehicle will be towed, how to retrieve the vehicle and any necessary phone numbers for retrieval.

- A representative of the towing service provider(s) shall be invited to regular traffic team meetings (e.g. Traffic Task Force, Maintenance of Traffic, etc.).

UTILITIES COORDINATION SCOPE OF WORK (5-17-21)

**** NOTE ** Within 45 days of contract execution, the Design-Build Team shall meet with representatives of all the utility companies and the appropriate NCDOT Utility and Design-Build personnel.**

The Design-Build Team shall obtain the services of a Professional Services Firm (PSF) knowledgeable in the NCDOT Utility Coordination Process involved with utility relocation / installation and highway construction. The aforementioned PSF shall be responsible for coordinating all utility relocations, removals and / or adjustments where the Design-Build Team and utility owner, with concurrence from the Department, determine that such work is essential for highway safety and performance of the required highway construction. Coordination shall be for all utilities, whether or not they are specifically identified in this Scope of Work, and shall include any necessary utility agreements when applicable. NCDOT will be the approving authority for all utility agreements and approval of plans.

During the procurement phase and throughout the project duration, the Design-Build Team will only be allowed direct contact with the utility owners when the aforementioned PSF is present. The Design-Build Team shall not contact any utility owner until after the first Question and Answer Sessions with the Design-Build Teams have been conducted. (Reference the *Individual Meetings with Proposers* Project Special Provision found elsewhere in this RFP)

In accordance with the requirements herein, the Design-Build Team shall relocate / coordinate the relocation of all existing facilities that are 1) parallel to a roadway in full control of access, 2) in physical conflict with the construction, 3) within the existing or proposed right of way and structurally inadequate, and / or 4) within the existing or proposed right of way, consist of unacceptable material, and the project will change the grade over the facilities and / or heavy equipment is likely to be operated over the facilities. (Reference the NCDOT *Utilities Accommodation Manual*) Proposed / relocated underground facilities that are located beneath the pavement structure shall only be allowed to cross the roadway as close to perpendicular as possible.

Project Details

The Design-Build Team shall be responsible for verifying the utility locations, type of facilities, and identifying the utility owners in order to coordinate the relocation of any utilities, known and unknown, in conflict with the project. The following utilities are known to be located within the project construction limits:

Utility Owner List		
Utility Type	**Utility Owner**	**Cost Responsibility**
Water / Sewer	Aqua NC	Design-Build Team
Telecommunications	AT&T	Utility Company or NCDOT (w / approved Prior Rights)
Telecommunications	Century Link	Utility Company or NCDOT (w / approved Prior Rights)
Gas	Dominion Energy	Utility Company or NCDOT (w / approved Prior Rights)
Power (Transmission)	Duke Energy	Utility Company or NCDOT (w / approved Prior Rights)
Power (Distribution)	Duke Energy	Utility Company or NCDOT (w / approved Prior Rights)
Telecommunications	Frontier Communications	Utility Company or NCDOT (w / approved Prior Rights)
CATV	Google	Utility Company
Water / Sewer	OWASA	Design-Build Team
Power	Piedmont Electric Membership Corporation	Utility Company or NCDOT (w / approved Prior Rights)
Water / Sewer	Town of Hillsborough	Design-Build Team
Telecommunications	TWC / Charter	Utility Company or NCDOT (w / approved Prior Rights)
Telecommunications	Verizon (MCI)	Utility Company or NCDOT (w / approved Prior Rights)

Water and Sewer

After the Department accepts the Preliminary Roadway Plans developed by the Design-Build Team, a pre-design meeting shall take place between the utility owners and / or their representatives, the Design-Build Team, and appropriate NCDOT Utilities Unit and Design-Build Unit representatives. The Department will only review and accept water and sewer design submittals after the aforementioned pre-design meeting has been held and the 100% Hydraulic Design provided by the Design-Build Team has been accepted by the Department.

The Design-Build Team shall develop water and sewer designs; prepare all water and sewer plans required for agreements and permits; submit permits directly to the agencies and obtain approval from the agencies. The Design-Build Team shall be responsible for all permit fees.

The Design-Build Team shall provide water and sewer designs for all water and sewer facilities impacted by the project, including but not limited to all haul roads and temporary conditions resulting from the Design-Build Team's methods of operation and / or sequence of work. **All** water and sewer designs, including all temporary relocations and / or protection of existing water and sewer facilities, shall be coordinated with the NCDOT Utilities Unit and the utility owners or their representatives.

The relocation and / or protection of all water and sewer facilities shall be done in accordance with the NCDOT policies and standards, as well as the latest water and sewer design requirements / specifications for each individual utility company that are current on the Technical Proposal submittal date or the Best and Final Offer submittal date, whichever is later. In the event of conflicting design parameters in the requirements noted above, the proposed design shall adhere to the most conservative values. The materials and appurtenances proposed by the Design-Build Team shall require approval by both NCDOT and the appropriate utility owner prior to installation.

The Design-Build Team shall design and construct water / sewer facility extensions to all parcels with access to existing water and / or sewer facilities, including parcels subdivided by the project. The aforementioned water facility extensions shall be installed completely within the right of way. The aforementioned sewer facility extensions shall be installed completely within the right of way or a recorded easement.

Excluding water and / or sewer extensions due to encroachment into wells and / or septic systems, all costs associated with the design and construction for relocation, extension, and / or protection of water and / or sewer facilities shall be the responsibility of the Design-Build Team and shall be included in the lump sum bid for the entire project. Protection of water and sewer facilities shall include, but not be limited to encasement, lining and bridging. (Reference the General Section below for requirements associated with encroachment into wells and / or septic systems)

The Design-Build Team shall concurrently submit all water and sewer design submittals to the NCDOT State Utilities Manager, via the Design-Build Unit, and the appropriate utility owner for review and acceptance. All water and sewer design submittals shall include a title sheet, plan sheets, profile sheets and special provisions, if required. All water and sewer design submittals shall include all the aforementioned information in a full-size .pdf. Excluding the Release for Construction Water and / or Sewer Plans, the Design-Build Team shall allow the utility owners 30 days to review each water and / or sewer design submittal. At a minimum, the water and / or sewer design submittals shall consist of the following:

(A) Preliminary Water and / or Sewer Plans shall be submitted after the Department accepts the 100% Hydraulic Plans.

(B) Final Water and / or Sewer Plans shall be submitted after the Department accepts the Right of Way / 60% Roadway Plans.

(C) Release for Construction Water and / or Sewer Plans shall be submitted after the Department accepts the Final Water and / or Sewer Plans.

The Design-Build Team shall provide a set of Agreement Plans that will be used in a Utility Agreement (UCA or U&O) to be prepared by NCDOT and executed with the utility owners. The Agreement Plans shall include Release for Construction Plans, special provisions, and a construction estimate with unit quantities. The Department will send the appropriate agreement, with the Agreement Plans, to the utility owner for their review and concurrence.

Upon completion of the water and sewer relocations and protective measures, the Design-Build Team shall concurrently provide 1) lump sum construction costs for the relocations and protective

measures that are separated by individual utility owner and TIP project to the Department; and 2) electronic As-Built Plans to the Department and the utility owner. At a minimum, the As-Built Plans shall include all revisions that occurred during construction, as well as all field adjustments. The As-Built Plans shall be in accordance with NCDOT requirements or the utility owner's requirements, whichever is more conservative. The As-Built Plans shall be provided in .pdf format and MicroStation format to the Department and in the CADD format required by the utility owner.

Utility Relocation Plans

Excluding water and sewer conflicts, if the Design-Build Team's design and / or construction creates a utility conflict, the Design-Build Team shall request that the utility owner submit relocation plans (Highway Construction Plans to be provided by the Design-Build Team to utility owners) that show existing utilities and proposed utility relocations for approval by the NCDOT.

In .pdf format, the Design-Build Team shall electronically submit one half-size set and one full size set of the Utility Relocation Plans to the NCDOT State Utilities Manager, via the Design-Build Unit, for review and approval. The Department shall approve the Utility Relocation Plans prior to any utility relocation work beginning. The Design-Build Team shall also be responsible for submitting the appropriate agreements to be used with the Utility Relocation Plans (See Agreements Section found elsewhere in this Scope of Work). After the review process is complete, the NCDOT Utilities Unit will submit an electronic copy of the authorization letter to the Design-Build Team. The NCDOT Utilities Unit will also submit an electronic copy of the approved Utility Relocation Plans, estimate and agreement to the Department's Resident Engineer. If the Utility Relocation Plans are approved subject to changes, it shall be the Design-Build Team's responsibility to coordinate these changes with the appropriate utility owner.

Prior Rights and Compensable Interest

The Design-Build Team shall verify / determine the prior rights and compensable interest for all utility relocations. Typically, affidavits, recorded easements or NCDOT agreements can serve as evidence of prior rights. The Design-Build Team shall provide documentation that verifies / determines the prior rights and / or compensable interest. If the verification process is not complete prior to right of way acquisition, the Design-Build Team shall provide documentation of all Utility Easement costs. A compensable interest shall be identified as follows:

(A) Existing or prior easement rights within the project limits, either by recorded right of way or adverse possession.

(B) Entities covered under *General Statute 136-27.1* and *136-27.2.* Statute requires the NCDOT to pay the non-betterment cost for certain water, sewer and gas relocations.

(C) Utilities that have a joint-use agreement that constitutes a compensable interest with entities that have existing or prior easement rights within the project limits.

Work Performed by Design-Build Team for Utility Owners

If the Design-Build Team elects to make arrangements with a utility owner for proposed utility construction not required herein, in which the utility owner shall be responsible for the costs of work to be performed by the Design-Build Team, the Design-Build Team shall be responsible for negotiating all costs associated with the proposed construction. Once the Design-Build Team and the utility owner agree on a plan and a lump sum estimated cost for the utility construction, the Design-Build Team shall electronically submit one half-size set and one full size set of the utility construction drawings, in .pdf format, to the NCDOT State Utilities Manager, via the Design-Build Unit, for further handling. Each set shall include a title sheet, plan sheets, profiles, and special provisions, if required. Also, a letter from the utility owner agreeing to the plans and lump sum cost must accompany this package. The NCDOT will reimburse the Design-Build Team the estimated lump sum cost under a Supplemental Agreement. The necessary Utility Construction Agreement (UCA) to the utility owner for reimbursement shall be a two-party agreement between the NCDOT and the utility owner; and will be developed and executed by the Department.

If the Design-Build Team is requested, in writing, by a utility owner to relocate facilities not impacted by the project's construction, upgrade existing facilities and / or incorporate new facilities as part of the highway construction, designs shall be coordinated with the utility owner and NCDOT Utilities Unit. The associated design and construction costs shall be negotiated and agreed upon between the Design-Build Team and the utility owner. The Design-Build Team shall develop designs; prepare all plans for needed agreements and permits; submit permits directly to the agencies and obtain approval from the agencies. The Design-Build Team shall be responsible for all permit fees.

Cable TV

The cost in relocating CATV due to highway construction shall be the responsibility of the CATV Company; however, 1) if the CATV Company can validate a recorded easement for facilities outside the maintained NCDOT right of way, the Department will bear the relocation expense; and 2) if the adjustment is needed on existing utility poles to accommodate a proposed NCDOT Traffic Management System Fiber Optic Communication Cable Project, the Design-Build Team shall be responsible for the relocation cost.

The NCDOT will not permit CATV to place poles within the highway right of way but will allow down guys for their facilities within the highway right of way. Under most circumstances, the CATV Company will continue a joint-use attachment with the local power and telephone company. If the CATV proposed relocation places buried facilities within the highway right of way, then plans and encroachment agreements shall be required by the NCDOT.

Communication Cables / Electrical Services for ITS

Prior to establishing the location for new meter poles, the Design-Build Team shall coordinate with the local power distribution company concerning accessibility of E/C service and safety in maintenance of the meter.

Prior to installation, the Design-Build Team shall provide plans for review and approval for all service taps that require a parallel installation within the control of access (C/A).

Parallel service installation within a C/A shall be buried and located as close to the right of way line as practical. Only due to unusual circumstances will parallel aerial service installations within the C/A be allowed. The Design-Build Team shall justify the allowance of parallel aerial service installation and obtain NCDOT written approval prior to installation.

The Design-Build Team shall be responsible for all coordination activities, including deposit fees, required for the utility company to provide service taps. Prior to the Design-Build Team developing the associated design and / or instructing the utility company to proceed with providing the service taps, the Design-Build Team shall obtain written approval of the service tap locations from the NCDOT Resident Engineer.

The Design-Build Team shall be responsible for all costs associated with providing communication cables / electrical service from the service tap to the ITS devices.

Adjusting Existing Utilities due to Proposed Traffic Management Systems Fiber Optic Communications Cables

The Design-Build Team shall be responsible for all costs for coordinating and adjusting any existing utilities that are in conflict with any proposed communication cables to be installed as part of the project.

Requirements for Attachments to Existing and / or Proposed Structures

Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall avoid attachments to structures where feasible. Attachments shall only be considered when other alternatives are cost prohibitive and / or are not feasible due to environmental or geographical features, in the Department's sole discretion. All utility related attachments must be evaluated and approved by the NCDOT State Utilities Manager, including any existing attachments to any structure(s) that require modification or replacement. Attachments shall be prohibited under the following conditions:

(A) No attachments shall be allowed to a bridge located parallel within the C/A carrying the freeway over streams, other roadways or railroads. (No parallel utility installations within the C/A)

(B) No attachments shall be allowed to cored-slab bridges.

(C) No attachments shall be allowed to curved bridges.

Attachments to structures, if approved by the NCDOT State Utilities Manager, shall meet the following criteria:

(A) No attachments shall be allowed below the bottom of the beams and / or girders.

(B) Drilling of, or attachments to, beams and / or girders shall not be allowed. Attachments shall only be allowed to the bottom of the bridge deck.

(C) For water and sewer force mains, only restrained joint ductile iron pipe shall be allowed.

(D) A minimum of 18" of clearance to beams and / or girders shall be maintained, if possible.

Documentation of adverse conditions or cost estimates of all feasible alternatives shall be submitted to the NCDOT State Utilities Manager, via the Design-Build Unit, when seeking approval of a structure attachment. Cost estimates shall consider all costs involved with each alternative and impacts to the utility and the highway project as a whole.

General

The Design-Build Team shall not commence work at points where the highway construction operations are adjacent to utility facilities, until making arrangements with the utility owner to protect against damage that might result in expense, loss, disruption of service or other undue inconvenience to the public or utility owner. The Design-Build Team shall be responsible for damage to the existing or relocated utilities resulting from the Design-Build Team's operations. In the event of interruption of any utilities by the project construction, the Design-Build Team shall promptly notify the utility owner and cooperate with the utility owner in the prompt restoration of service.

The Design-Build Team shall accommodate utility adjustments, reconstruction, new installation and routine maintenance work that may be underway or take place during the progress of the contract.

If total property acquisition is unavoidable due to encroachment into wells and / or septic systems, the Design-Build Team shall investigate and determine if extending water and / or sewer lines to the affected property is cost effective. If the Department concurs with the determination that a utility extension is cost effective, the costs associated with the utility design and construction shall be paid for as extra work in accordance with Article 104-7 of the 2018 NCDOT *Standard Specifications for Roads and Structures*.

Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall be required to use the guidelines as set forth in the following:

(A) NCDOT *Utilities Accommodation Manual* posted on the following website:

https://connect.ncdot.gov/municipalities/Utilities/Pages/UtilitiesManuals.aspx

(B) *Federal Aid Policy Guide* - Subchapter G, Part 645, Subparts A & B

(C) *Federal Highway Administration's Program Guide, Utility Adjustments & Accommodations on Federal Aid Highway Projects*

(D) NCDOT *Construction Manual* - Section 105-8

(E) NCDOT *Right of Way Manual* - Chapter 16 Utility Relocations

(F) *NCDEQ Public Water Supply* - Rules governing public water supply

(G) *NCDEQ Division of Water Resources* - Title 15A - Environment and Natural Resources

Agreements

If a utility company can provide evidence of prior rights of way or a compensable interest in their facilities, the Design-Build Team shall coordinate the non-betterment utility relocation costs with the utility company and develop the Utility Relocation Agreement (URA).

The NCDOT State Utilities Manager must execute approved agreements on Design-Build projects. The URAs and Encroachment Agreements are available from the NCDOT Utilities Unit. Reference the *NCDOT Utilities Accommodation Manual* for the different types of Encroachment Agreements available for use.

The Design-Build Team shall develop a preliminary Utility Analysis and Routing Report (UARR (p)) to identify potential utility conflicts, determine preliminary alignments and schedules for the relocation of each utility, and identify any anticipated Permanent Utility Easements (PUE) and Aerial Utility Easements (AUE). The aforementioned UARR (p) shall be submitted to the NCDOT Utility Unit, via the Design-Build Unit, for review a minimum of ten days before the Right of Way Plans submittal.

The Design-Build Team shall submit all utility agreements, and all supporting documents to the NCDOT State Utilities Manager, via the Design-Build Unit, in electronic format. Prior to submittal, all agreements shall be signed electronically by an authorized representative of the utility owner. These electronic agreement packets will be reviewed, approved and signed electronically by the NCDOT State Utilities Manager, or designated representative, before being distributed to the field.

The Design-Build Team shall utilize the NCDOT Standard Utility Encroachment Agreements, as necessary, in relocating utilities. The Encroachment Agreements shall be used under the following conditions:

(A) If a utility company is not occupying a valid right of way / compensable interest and the proposed relocation will place the relocated utilities within the existing or proposed highway right of way.

(B) For **all** new utility installations, not covered under a Utility Construction Agreement and within the existing or proposed highway right of way. This includes

all water, sewer and gas lines owned by entities covered under *General Statute 136-27.1* and *136-27.2*.

*** STANDARD SPECIAL PROVISIONS ***

RESTRICTIONS ON ITS EQUIPMENT AND SERVICES

(10-2-20) DB01 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.**

PLANT AND PEST QUARANTINES

(Imported Fire Ant, Gypsy Moth, Witchweed, Emerald Ash Borer, Guave Root Knot Nematode and Other Noxious Weeds)

(8-31-13)(Rev. 4-1-19) DB1 G130

Within Quarantined Area

This project may be within a county regulated for plant and / or pests. If the project or any part of the Design-Build Team'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, guave root knot nematode or other noxious weeds.

COAL COMBUSTION PRODUCTS IN EMBANKMENTS

(Rev. 4-10-15) (Rev.10-26-20) 235 DB2 R70

Description

This specification allows the Design-Build Team an option, with the approval of the Engineer in writing, to use coal combustion products (CCPs) in embankments as a substitute for conventional borrow material. The amount of CCPs allowed to be used for this project shall be less than 80,000 tons total and less than 8,000 tons per acre.

Materials

Supply coal combustion products from the Department list of potential suppliers maintained by the Materials and Tests Unit. Site specific approval of CCP material shall be required prior to beginning construction.

The following CCPs shall be unacceptable:

(A) Frozen material
(B) Ash from boilers fired with both coal and petroleum coke
(C) Material with a maximum dry unit weight of less than 65 pounds per cubic foot when tested in accordance with AASHTO T-99 Method A or C

Collect and transport CCPs in a manner that will prevent nuisances and hazards to public health and safety. Moisture condition the CCPs as needed and transport in covered trucks to prevent dusting.

Preconstruction Requirements

When CCPs are to be used as a substitute for earth borrow material, request written approval from the Engineer at least ninety (90) days in advance of the intent to use CCPs and include the following details using the NCDOT Form CCP-2015-V1 in accordance with NCGS § 130A-309.219(b)(1):

(A) Description, purpose and location of project
(B) Estimated start and completion dates of project
(C) Estimated volume of CCPs to be used on project with specific locations and construction details of the placement
(D) Toxicity Characteristic Leaching Procedure analysis from a representative sample of each different CCP source to be used in the project for, at minimum, all of the following constituents: arsenic, barium, cadmium, lead, chromium, mercury, selenium, and silver

(E) The names, address, and contact information for the generator of the CCPs
(F) Physical location of the project at which the CCPs were generated

Submit the form to the Engineer and the Resource Conservation Program (RCP) Engineer at **ResourceConservation@ncdot.gov** for review. The Engineer and the RCP Engineer will coordinate the requirements of NCGS § 130A-309.219(a)(1) and notify the Design-Build Team that all the necessary requirements have been met before the placement of structural fill using coal combustion products will be allowed.

Construction Methods

In accordance with the details in the plans developed by the Design-Build Team, place CCPs in the core of the embankment section with at least four feet of earth cover to the outside limits of the embankments or subgrade and at least five feet above the seasonal high ground-water table. CCPs used in embankments shall not be placed as follows:

(A) Within 50 feet of any property boundary
(B) Within 300 horizontal feet of a private dwelling or well
(C) Within 50 horizontal feet of the top of the bank of a perennial stream or other surface water body
(D) Within a 100-year floodplain except as authorized under NCGS § 143-215.54A(b). A site located in a floodplain shall not restrict the flow of the 100-year floodplain or result in washout of solid waste so as to pose a hazard to human life, wildlife or land and water resources
(E) Within 50 horizontal feet of a wetland, unless, after consideration of the chemical and physical impact on the wetland, the United States Army Corps of Engineers issues a permit or waiver for the fill.

Construct embankments by placing CCPs in level uniform lifts with no more than a lift of ten inches and compacted to at least a density of 95 percent as determined by test methods in AASHTO T-99, Determination of Maximum Dry Density and Optimum Moisture Content, Method A or C depending upon particle size of the product. Provide a moisture content at the time of compaction of within four percent of optimum but not greater than one percent above optimum as determined by AASHTO T-99, Method A or C.

Divert surface waters resulting from precipitation from the CCPs placement area during filling and construction activities. Construct embankments such that rainfall will not run directly off of the CCPs. Provide dust control to minimize airborne emissions. Construct fill in a manner that prevents water from accumulating and ponding and do not pump nor discharge waters from CCP's filling and construction areas.

ROCK AND BROKEN PAVEMENT FILLS

(12-29-15) (Rev. 8-31-17) 235 DB2 R85

Revise the 2018 *Standard Specifications for Roads and Structures* as follows:

Page 2-23, Article 235-2 MATERIALS, add the following after Line 15:

Item	Section
Geotextile for Rock and Broken Pavement Fills, Type 2	1056

Provide Type 2 geotextile for filtration geotextiles. Use rip rap and No. 57 stone from either a quarry or onsite material to fill voids in rock and broken pavement fills. Provide small and large size rip rap with stone sizes that meet Class A and B in accordance with Table 1042-1 and No. 57 stone with a gradation that meets Table 1005-1 or use similar size onsite material approved by the Engineer.

Page 2-24, Subarticle 235-3(B) Embankment Formation, Lines 18 - 19, delete the third sentence in the seventh paragraph.

Page 2-24, Subarticle 235-3(B) Embankment Formation, **Lines 21 - 23**, replace the eighth paragraph with the following:

Before placing embankment fill material or filtration geotextiles over rock and broken pavement, fill voids in the top of rock and broken pavement fill with rip rap and No. 57 stone. Place and compact larger rip rap first followed by smaller rip rap. Then, fill any remaining voids with No. 57 stone so geotextiles are not torn, ripped or otherwise damaged when installed and covered. Compact rip rap and No. 57 stone with tracked equipment or other approved methods. Install filtration geotextiles on top of rock, broken pavement, rip rap and No. 57 stone in accordance with Article 270-3 before placing remaining embankment fill material.

Remove any rocks, debris or pavement pieces from the roadbed larger than two inches within 12" of the subgrade or finished grade, whichever is lower.

POLYPROPYLENE CULVERT PIPE

(7-1-19) 305, 310 DB3 R35

Revise the 2018 *Standard Specifications for Roads and Structures* as follows:

Page 3-5, Article 305-1 DESCRIPTION, Lines 12 - 14, replace with the following:

Where shown in the plans developed by the Design-Build Team, the Design-Build Team may use reinforced concrete pipe, aluminum alloy pipe, aluminized corrugated steel pipe, HDPE pipe, polypropylene pipe, or PVC pipe in accordance with the following requirements.

Page 3-5, Article 305-2 MATERIALS, add the following after **Line 16:**

Item	Section
Polypropylene Pipe	1032-9

Page 3-6, Article 310-2 MATERIALS, add the following after **Line 9**:

Item	Section
Polypropylene Pipe	1032-9

Page 3-6, Article 310-4 SIDE DRAIN PIPE, Lines 24 - 25, replace the first sentence of the second paragraph with the following:

Where shown in the plans developed by the Design-Build Team, side drain pipe may be Class II reinforced concrete pipe, aluminized corrugated steel pipe, corrugated aluminum alloy pipe, polypropylene pipe, HDPE pipe or PVC pipe.

Page 3-7, Article 310-5 PIPE END SECTIONS, **Lines 2 - 4**, replace the second sentence with the following:

Both corrugated steel and concrete pipe end sections will work on concrete pipe, corrugated steel pipe, polypropylene pipe, and HDPE smooth lined corrugated plastic pipe.

Page 10-60, add Article 1032-9:

(A) General

Use polypropylene pipe from sources participating in the Department's Polypropylene Pipe QA / QC Program. A list of participating sources is available from the Materials and Tests Unit. The Department will remove a manufacturer of polypropylene pipe from this program if the monitoring efforts indicated that non-specification material is being provided or test procedures are not being followed.

Use polypropylene culvert pipe that meets AASHTO M 330 for Type S or Type D, or ASTM F2881 or ASTM F2764 Double or Triple wall; and has been evaluated by NTPEP.

(B) End Treatments, Pipe Tees and Elbows

End treatments, pipe tees and elbows shall meet AASHTO M 330, Section 7.7, or ASTM F2764, Section 6.6.

(C) Marking

Clearly mark each section of pipe, end section, tee and elbow and other accessories according to the Department's Polypropylene Pipe QA / QC Program:

(1) AASHTO or ASTM Designation
(2) The date of manufacture
(3) Name or trademark of the manufacturer

When polypropylene pipe, end sections, tees and elbows have been inspected and accepted a sticker shall be applied to the inside of the pipe. Do no use pipe sections, flared end sections, tees or elbows which do not have this seal of approval.

BRIDGE APPROACH FILLS

(10-19-10) (Rev. 11-22-17) 422 DB4 R02A

Description

Bridge approach fills consist of backfilling behind bridge end bents with select material or aggregate to support all or portions of bridge approach slabs. Install drains to drain water from bridge approach fills and geotextiles to separate approach fills from embankment fills, ABC and natural ground as required. For bridge approach fills behind end bents with mechanically stabilized earth (MSE) abutment walls, reinforce bridge approach fills with MSE wall reinforcement connected to end bent caps. Construct bridge approach fills in accordance with the contract, accepted submittals and Roadway Standard Drawing No. 422.01, Roadway Standard Drawing No. 422.02 or Roadway Detail Drawing No. 422D10.

Define bridge approach fill types as follows:

Approach Fills - Bridge approach fills in accordance with Roadway Standard Drawing No. 422.01, Roadway Standard Drawing No. 422.02 or Roadway Detail Drawing No. 422D10

Standard Approach Fill - Type I Standard Bridge Approach Fill in accordance with Roadway Standard Drawing No. 422.01

Modified Approach Fill - Type II Modified Bridge Approach Fill in accordance with Roadway Standard Drawing No. 422.02

Reinforced Approach Fill - Type III Reinforced Bridge Approach Fill in accordance with Roadway Detail Drawing No. 422D10

Materials

Refer to Division 10 of the 2018 *Standard Specifications for Roads and Structures*.

Item	Section
Geotextiles, Type 1	1056
Portland Cement Concrete	1000
Select Materials	1016
Subsurface Drainage Materials	1044

Provide Type 1 geotextile for separation geotextiles and Class B concrete for outlet pads. Use Class V or Class VI select material for standard and modified approach fills. For an approach fill behind a bridge end bent with an MSE abutment wall, backfill the reinforced approach fill with the same aggregate type approved for the reinforced zone in the accepted MSE wall submittal. For MSE wall aggregate, reinforcement and connector materials, see the *Mechanically Stabilized Earth Retaining Walls* provision. Provide PVC pipes, fittings and outlet pipes for subsurface drainage materials. For PVC drain pipes, use pipes with perforations that meet AASHTO M 278.

Construction Methods

Excavate as necessary for approach fills in accordance with the contract. Notify the Engineer when foundation excavation is complete. Do not place separation geotextiles or aggregate until approach fill dimensions and foundation material are approved.

For reinforced approach fills, cast MSE wall reinforcement or connectors into end bent cap backwalls within three inches of locations shown in the accepted MSE wall submittals. Install MSE wall reinforcement with the orientation, dimensions and number of layers shown in the accepted MSE wall submittals. If a reinforced approach fill is designed with geogrid reinforcement embedded in an end bent cap, cut geogrids to the required lengths and after securing ends of geogrids in place, reroll and rewrap portions of geogrids not embedded in the cap to protect geogrids from damage. Before placing aggregate, pull geosynthetic reinforcement taut so that it is in tension and free of kinks, folds, wrinkles or creases.

Attach separation geotextiles to end bent cap backwalls and wing walls with adhesives, tapes or other approved methods. Overlap adjacent separation geotextiles at least 18" with seams oriented parallel to the roadway centerline. Hold geotextiles in place with wire staples or anchor pins as needed. Contact the Engineer when existing or future obstructions such as foundations, pavements, pipes, inlets or utilities will interfere with separation geotextiles or MSE wall reinforcement.

Install continuous perforated PVC drain pipes with perforations pointing down in accordance with Roadway Standard Drawing No. 422.01 or Roadway Standard Drawing No. 422.02. Connect drain pipes to outlet pipes just beyond wing walls. Connect PVC pipes, fittings and outlet pipes with solvent cement in accordance with Article 815-3 of the 2018 *Standard Specifications for Roads and Structures* and place outlet pads in accordance with Roadway Standard Drawing No. 815.03.

Install drain pipes so water drains towards outlets. If the groundwater elevation is above drain pipe elevations, raise drains up to maintain positive drainage towards outlets. Place pipe sleeves in or under wing walls so water drains towards outlets. Use sleeves that can withstand wing wall loads.

Place select material or aggregate in eight-inch to ten-inch thick lifts. Compact fine aggregate for reinforced approach fills in accordance with Subarticle 235-3(C) of the 2018 *Standard*

Specifications for Roads and Structures except compact fine aggregate to a density of at least 98%. Compact select material for standard or modified approach fills and coarse aggregate for reinforced approach fills with a vibratory compactor to the satisfaction of the Engineer. Do not displace or damage geosynthetics, MSE wall reinforcement or drains when placing and compacting select material or aggregate. End dumping directly on geosynthetics is not permitted. Do not operate heavy equipment on geosynthetics or drain pipes until they are covered with at least eight inches of select material or aggregate. Replace any damaged geosynthetics or drains to the satisfaction of the Engineer. When approach fills extend beyond bridge approach slabs, wrap separation geotextiles over select material or aggregate as shown in Roadway Standard Drawing No. 422.01 or Roadway Detail Drawing No. 422D10.

For temporary walls, use welded wire reinforcement for welded wire facing and Type 5 geotextile for reinforcement geotextiles. Use Type 5 geotextile with lengths and an ultimate tensile strength as shown in Roadway Standard Drawing No. 422.03. Provide Type 1 geotextile for separation geotextiles and Class B concrete for outlet pads. Use Class V or Class VI select material for alternate approach fills and temporary walls. Provide PVC pipes, fittings and outlet pipes for subsurface drainage materials. For PVC drain pipes, use pipes with perforations that meet AASHTO M 278.

ALTERNATE BRIDGE APPROACH FILLS FOR INTEGRAL ABUTMENTS

(11-21-17) 422 DB4 R02B

Description

At the Design-Build Team's option, use Type A Alternate Bridge Approach Fills instead of Type I or II Bridge Approach Fills to support bridge approach slabs for integral bridge abutments. An alternate bridge approach fill shall consist of constructing an approach fill with a temporary geotextile wall before placing all or a portion of the concrete for the backwall and wing walls of the integral end bent cap. The temporary geotextile wall shall be designed for a crane surcharge, shall remain in place and be aligned so the wall face functions as a form for the end bent cap backwall and wing walls. Install drains, welded wire facing and geotextiles and backfill approach fills and temporary walls with select material as required. Define "geotextiles" as separation or reinforcement geotextiles, "temporary wall" as a temporary geotextile wall and "alternate approach fill" as a Type A Alternate Bridge Approach Fill in accordance with Roadway Standard Drawing No. 422.03.

Materials

Refer to Division 10 of the 2018 *Standard Specifications for Roads and Structures*.

Item	Section
Geotextiles	1056
Portland Cement Concrete	1000
Select Materials	1016
Subsurface Drainage Materials	1044
Welded Wire Reinforcement	1070-3

For temporary walls, use welded wire reinforcement for welded wire facing and Type 5 geotextile for reinforcement geotextiles. Use Type 5 geotextile with lengths and an ultimate tensile strength as shown in Roadway Standard Drawing No. 422.03. Provide Type 1 geotextile for separation geotextiles and Class B concrete for outlet pads. Use Class V or Class VI select material for alternate approach fills and temporary walls. Provide PVC pipes, fittings and outlet pipes for subsurface drainage materials. For PVC drain pipes, use pipes with perforations that meet AASHTO M 278.

Construction Methods

Excavate as necessary for alternate approach fills and temporary walls in accordance with the contract. Notify the Engineer when foundation excavation is complete. Do not place geotextiles until approach fill dimensions and foundation material are approved.

Install geotextiles as shown in Roadway Standard Drawing No. 422.03. Attach separation geotextiles to end bent cap backwalls and wing walls as needed with adhesives, tapes or other approved methods. Overlap adjacent geotextiles at least 18" with seams oriented parallel to the roadway centerline. Hold geotextiles in place with wire staples or anchor pins as needed. Contact the Engineer when existing or future obstructions such as foundations, pavements, pipes, inlets or utilities will interfere with geotextiles.

Install continuous perforated PVC drain pipes with perforations pointing down in accordance with Roadway Standard Drawing No. 422.03. Connect drain pipes to outlet pipes just beyond wing walls. Connect PVC pipes, fittings and outlet pipes with solvent cement in accordance with Article 815-3 of the 2018 *Standard Specifications for Roads and Structures* and place outlet pads in accordance with Roadway Standard Drawing No. 815.03.

Install drain pipes so water drains towards outlets. If the groundwater elevation is above drain pipe elevations, raise drains up to maintain positive drainage towards outlets. Place pipe sleeves in or under wing walls so water drains towards outlets. Use sleeves that can withstand wing wall loads.

At the Design-Build Team’s option, construct bottom portion of integral end bents before temporary walls as shown in Roadway Standard Drawing No. 422.03. Erect and set welded wire facing so facing functions as a form for the end bent cap backwall. Place welded wire facing adjacent to each other in the horizontal and vertical directions to completely cover the temporary wall face. Stagger welded wire facing to create a running bond by centering facing over joints in the row below.

Wrap reinforcement geotextiles at the temporary wall face in accordance with Roadway Standard Drawing No. 422.03 and cover geotextiles with at least three inches of select material. Place layers of reinforcement geotextiles within three inches of locations shown in Roadway Standard Drawing No. 422.03. Before placing select material, pull reinforcement geotextiles taut so they are in tension and free of kinks, folds, wrinkles or creases. Install reinforcement geotextiles with the direction shown in Roadway Standard Drawing No. 422.03. Do not splice or overlap reinforcement geotextiles so seams are parallel to the temporary wall face.

Place select material in eight-inch to ten-inch thick lifts and compact select material with a vibratory compactor to the satisfaction of the Engineer. Do not displace or damage geotextiles or drains when placing and compacting select material. End dumping directly on geotextiles is not permitted. Do not operate heavy equipment on geotextiles or drain pipes until they are covered with at least eight inches of select material. Replace any damaged geotextiles or drains to the satisfaction of the Engineer. When alternate approach fills extend beyond bridge approach slabs, wrap separation geotextiles over select material as shown in Roadway Standard Drawing No. 422.03.

Temporary walls shall be designed for a surcharge pressure in accordance with Roadway Standard Drawing No. 422.03. If the crane surcharge will exceed the wall design, contact the Engineer before positioning the crane over reinforcement geotextiles.

AUTOMATED FINE GRADING

(9-1-11) (Rev. 9-13-17) DB5 R05

On mainline portions and ramps / loops of this project, prepare the subgrade and base beneath the pavement structure in accordance with the applicable sections of the 2018 *Standard Specifications for Roads and Structures* except use an automatically controlled fine grading machine utilizing string lines, laser controls, or other approved methods to produce final subgrade and base surfaces meeting the lines, grades, and cross sections required by the plans developed by the Design-Build Team or established by the Engineer.

AGGREGATE SUBGRADE

(3-9-18) DB05 R017A

Revise the 2018 *Standard Specifications for Roads and Structures* as follows:

Page 5-8, Article 505-1 DESCRIPTION, Lines 4 - 6, replace the paragraph with the following:

Construct aggregate subgrades in accordance with the contract. Install geotextile for soil stabilization and place Class IV subgrade stabilization at locations shown in the plans developed by the Design-Build Team and as directed.

Undercut natural soil materials if necessary to construct aggregate subgrades. Define “subbase” as the portion of the roadbed below the Class IV subgrade stabilization. For Type 2 aggregate subgrades, undercut subbases as needed. The types of aggregate subgrade with thickness and compaction requirements for each shall be as shown below.

Type 1 - A six-inch to 24-inch thick aggregate subgrade with Class IV subgrade stabilization compacted to 92% of AASHTO T 180 as modified by the Department or to the highest density that can be reasonably obtained.

Type 2 - An 8-inch thick aggregate subgrade on a proof rolled subbase with Class IV subgrade stabilization compacted to 97% of AASHTO T 180 as modified by the Department.

Page 5-8, Article 505-2 MATERIALS, Line 8, replace the line with the following:

Refer to Division 10 of the *Standard Specifications for Roads and Structures*.

Item	Section
Geotextiles, Type 5	1056
Select Material, Class IV	1016

Provide Type 5 geotextile for aggregate subgrade that meets the following tensile strength requirements in the machine direction (MD) and cross-machine direction (CD):

GEOTEXTILE FOR AGGREGATE SUBGRADE REQUIREMENTS		
Tensile Strength	**Requirement (MARV[A])**	**Test Method**
Tensile Strength @ 5% Strain (MD & CD[A])	1,900 lb/ft	ASTM D4595
Ultimate Tensile Strength (MD & CD[A])	4,800 lb/ft	ASTM D4595

A. MD, CD and MARV per Article 1056-3 of the 2018 *Standard Specifications for Roads and Structures*.

Page 5-8, Article 505-3 CONSTRUCTION METHODS, Line 12, insert the following after the first sentence of the first paragraph:

For Type 2 aggregate subgrades, proof roll subbases in accordance with Section 260 before installing geotextile for soil stabilization.

Page 5-8, Article 505-3 CONSTRUCTION METHODS, Lines 16 - 17, replace the last sentence of the first paragraph with the following:

Compact ABC as required for the type of aggregate subgrade constructed.

SEALING EXISTING PAVEMENT CRACKS - Polymer Patch

(5-4-07)(5-19-09) DB7 R 05A

Description

In areas designated by the Engineer, the Design-Build Team shall prepare and clean the cracks in failing concrete, and shall place Polypatch, Fibrescreed, Fibrecrete or like material that meets the specifications. Proper placement shall be performed as described by the manufacturer.

All materials shall be delivered unopened in their original containers bearing the manufacturer's label, specifying date of manufacture, batch number, trade name brand, and quantity.

Prior to any field preparation, sufficient material to perform the entire crack or spall repair application shall be in storage at the site or at the Design-Build Team's facility, so that there will be no delay in procuring the material for each day's application.

Stored materials may be inspected prior to their use and shall meet the requirements of these Special Provisions at the time of use.

Any material that is rejected because of failure to meet the required tests or material that has been damaged so as to cause rejections shall be immediately replaced by the Design-Build Team at no additional cost to the Department.

Each shipment of Polypatch, Fibrescreed, Fibrecrete or like material that meets the Specifications shall be accompanied by Material Safety Data Sheets (MSDS) and a Certificate of Compliance certifying that the materials conform to the requirements of these Special Provisions.

Materials Requirements

Prior to use, all materials shall meet the specifications, as approved by the Engineer.

Material Data

Specific Gravity	1.8
Application Temperature (degrees)	350º F to 392º F
Application Thickness	400 mils plus
Curing Time	10 – 40 minutes
Shelf Life	unlimited
Flash Point	446º F

Construction Requirements

The Design-Build Team shall prepare areas by removing all loose debris by using a pavement breaker, by using a mechanical planer, and other methods, as directed by the Engineer. When using a mechanical planer, the surface shall be milled out to a width and depth as directed by the Engineer. The recess shall then be cleaned and dried using hot compressed air to thoroughly prepare the surface, removing all debris and loose material. Use a concentrated hot air jet that is a minimum of 3000º F in temperature and that has a minimum air jet force of 3000 feet per second of blasting. Polypatch, Fibrescreed, Fibrecrete or like material shall be immediately poured or screeded to fill the recess, with edges overlapped by two inches. While the compound is still molten, a preheated high P.S.V. aggregate shall be applied and then compacted to ensure that the finished repair is flush with the surrounding surface.

When repairing pot holes deeper than two inches, that are not adjacent to or spanning the edge of pavement joints or cracks, the Design-Build Team shall include 1/2 - 1" sized washed aggregate at the rate of no more than 50% of volume, as directed by the Engineer. Then complete repair as previously stated.

FINAL SURFACE TESTING

(4-26-16) (Rev. 9-13-17) DB6 R45

On all new mainline travel lanes, including but not limited to all auxiliary lanes, and all -Y- Line travel lanes with 1) two or more layers of asphalt, 2) one mile or greater in length, and 3) a posted speed limit of 45 mph or greater, perform smoothness acceptance testing of the longitudinal profile of the finished pavement surface using an Inertial Profiler in accordance with Sections 610 and 710 of the 2018 *Standard Specifications for Roads and Structures.* The North Carolina Hearne Straightedge will not be permitted.

MILLING ASPHALT PAVEMENT

(12-17-18) 607 DB6 R59

Revise the 2018 *Standard Specifications for Roads and Structures* 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

(12-12-18) 610, 1012 DB6 R65

Revise the 2018 *Standard Specifications for Roads and Structures* as follows:

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

TABLE 609-3 LIMITS OF PRECISION FOR TEST RESULTS	
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:

TABLE 610-1 MIXING TEMPERATURE AT THE ASPHALT PLANT	
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:

TABLE 610-3
MIX DESIGN CRITERIA

Mix Type	Design ESALs millions [A]	Binder PG Grade [B]	Compaction Levels Gmm @		Max. Rut Depth (mm)	Volumetric Properties			
						VMA	VTM	VFA	%Gmm
			N_{ini}	N_{des}		% Min.	%	Min.-Max.	@ N_{ini}
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 ≤ 20%	21% ≤ %RBR ≤ 30%	%RBR > 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 Interstates, US Routes, and NC Routes (primary routes) that have four or more lanes and are 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 and -Y- Lines, that have four or more lanes and are median divided; and all 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 shall 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 will not be required on ramps, loops or 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 ten-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, and other irregular shaped areas of pavement, unless otherwise approved by the Engineer. In accordance with this provision, test all mainline travel lanes, full width acceleration lanes, full width 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 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
Test Method	*ASTM D5821*	*AASHTO T 304*	*AASHTO T 176*	*ASTM D4791*
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 two or more fractured faces.

OPEN GRADED ASPHALT FRICTION COURSE, PERMEABLE ASPHALT DRAINAGE COURSE, AND ULTRA-THIN BONDED WEARING COURSE

(4-17-12) (Rev. 9-13-17) 609 DB6 R62

When producing and constructing open graded asphalt friction course, permeable asphalt drainage course, and ultra-thin bonded wearing course revise the 2018 *Standard Specifications for Roads and Structures* as follows:

Page 6-9 Subarticle 609-6(B) Required Sampling and Testing Frequencies, delete the third paragraph and replace with the following:

Sample and test the completed mixture from each mix design per plant per year at the following minimum frequency during mix production:

Accumulative Production Increment	Number of Samples per Increment
500 tons	1

Page 6-9, Subarticle 609-6(C) Control Charts, delete the second paragraph and replace with the following:

Record the following data on the standardized control charts and in accordance with the requirements of Section 7.4 of the *HMA / QMS Manual*:

(a) Aggregate Gradation Test Results:

1. 12.5 mm (Types P57 & FC-2 Mod. Only)
2. 9.5 mm (Excluding Type P57)
3. 4.75 mm
4. 2.36 mm
5. 0.075 mm Sieves

(b) Binder Content, %, P_b

Page 6-10, Subarticle 609-6(D) Control Limits, Table 609-1 CONTROL LIMITS, replace with the following:

TABLE 609-1 CONTROL LIMITS			
Mix Control Criteria	**Target Source**	**Moving Average Limit**	**Individual Limit**
12.5 mm Sieve (Types P57 & FC-2 Mod)	JMF	± 4.0	± 8.0
9.5 mm Sieve (Excluding Type P57)	JMF	± 4.0	± 8.0
4.75 mm Sieve	JMF	± 4.0	± 8.0
2.36 mm Sieve	JMF	± 4.0	± 8.0
0.075 mm Sieve	JMF	± 1.5	± 2.5
Binder Content	JMF	± 0.3	± 0.7
TSR (Ultra-thin Only)	Min. Spec. Limit	-	- 15%

Page 6-12, Subarticle 609-6(F) Allowable Retesting for Mix Deficiencies, Table 609-2 RETEST LIMITS FOR MIX DEFICIENCIES, replace with the following**:**

TABLE 609-2 RETEST LIMITS FOR MIX DEFICIENCIES	
Property	**Limit**
% Binder Content	by more than ± 1.0%
12.5 mm Sieve (Types P 57 & FC-2 Mod)	by more than ± 9.0%
9.5 mm Sieve (Excluding Type P 57)	by more than ± 9.0%
4.75 mm sieve	by more than ± 9.0%
2.36 mm sieve	by more than ± 9.0%
0.075 mm sieve	by more than ± 3.0%
TSR (Ultra-thin only)	by more than -15% from Specification limit

Page 6-14, Subarticle 609-9 QUALITY ASSURANCE, **Table 609-3 LIMITS OF PRECISION FOR TEST RESULTS**, replace with the following:

TABLE 609-3 LIMITS OF PRECISION FOR TEST RESULTS	
Mix Property	**Limits of Precision**
12.5 mm Sieve (Types P 57 & FC-2 Mod. Only)	± 6.0%
9.5 mm Sieve (Excluding Type P 57)	± 5.0%
4.75 mm Sieve	± 5.0%
2.36 mm Sieve	± 5.0%
0.075 mm Sieve	± 2.0%
Asphalt Binder Content	± 0.5%
TSR (Ultra-thin HMA Only)	± 15.0%

ULTRA-THIN BONDED WEARING COURSE

(1-15-19) 661 DB6 R64

Revise the 2018 *Standard Specifications for Roads and Structures* as follows:

Page 6-49, Article 661-4, CONSTRUCTION METHODS, Lines 25 - 28, delete the third sentence of this Article and replace with the following:

Use a mobile grade reference system capable of averaging the existing grade or pavement profile over at least a 30-foot distance; or by non-contacting laser or sonar type ski with at least three referencing stations mounted on the paver at a minimum length of 24 feet.

Page 6-50, Article 661-4, CONSTRUCTION METHODS, Line 9, delete the word “four” and replace with “three”.

SUBSURFACE DRAINAGE

(9-1-11) (Rev. 9-14-17) DB8 R05

Revise the 2018 *Standard Specifications for Roads and Structures* as follows:

Page 8-11, Article 815-1, delete the first sentence and replace with the following:

The Design-Build Team shall construct subsurface drains, underdrains, blind drains and other types of drains where groundwater is within six feet of subgrade.

GUARDRAIL END UNITS, TYPE TL-3

(4-20-04) (Rev. 9-14-17) 862 DB8 R65

Description

Furnish and install guardrail end units in accordance with the details in the plans developed by the Design-Build Team, the applicable requirements of Section 862 of the 2018 *Standard Specifications for Roads and Structures*, and at locations shown in the plans developed by the Design-Build Team.

Materials

The Design-Build Team shall furnish guardrail end units listed on the NCDOT Approved Products List at **https://apps.dot.state.nc.us/vendor/approvedproducts/** or approved equal.

Prior to installation, the Design-Build Team shall submit to the Engineer:

1. FHWA acceptance letter for each guardrail end unit certifying it meets the requirements of the AASHTO Manual for Assessing Safety Hardware, Test Level 3, in accordance with Article 106-2 of the 2018 *Standard Specifications for Roads and Structures*.

2. Certified working drawings and assembling instructions from the manufacturer for each guardrail end unit in accordance with Article 105-2 of the 2018 *Standard Specifications for Roads and Structures*.

No modifications shall be made to the guardrail end unit without the express written permission from the manufacturer. Perform installation in accordance with the details in the plans developed by the Design-Build Team, and details and assembling instructions furnished by the manufacturer.

Construction Methods

Guardrail end delineation shall be required on all approach and trailing end sections for both temporary and permanent installations. Guardrail end delineation shall consist of yellow reflective sheeting applied to the entire end section of the guardrail in accordance with Article 1088-3 of the 2018 *Standard Specifications for Roads and Structures*.

GUARDRAIL ANCHOR UNITS AND TEMPORARY GUARDRAIL ANCHOR UNITS

(11-22-17) 862 DB8 R70

Guardrail anchor units shall be in accordance with the details in the plans developed by the Design-Build Team and the applicable requirements of Section 862 of the 2018 *Standard Specifications for Roads and Structures*.

IMPACT ATTENUATOR UNIT, TYPE TL-3

(4-20-04) (Rev. 12-12-18) DB8 R75

Description

The Design-Build Team shall furnish and install impact attenuator units and any components necessary to connect the impact attenuator units in accordance with the manufacturer's requirement, the details in the plans developed by the Design-Build Team, and at locations shown in the plans developed by the Design-Build Team.

Materials

The Design-Build Team shall furnish impact attenuator units listed on the NCDOT Approved Products List at **https://apps.dot.state.nc.us/vendor/approvedproducts/** or approved equal.

Prior to installation, the Design-Build Team shall submit to the Engineer:

1. FHWA acceptance letter for each impact attenuator unit certifying it meets the requirements of the Manual for Assessing Safety Hardware (MASH-16), Test Level 3, in accordance with Article 106-2 of the 2018 *Standard Specifications for Roads and Structures.*

2. Certified working drawings and assembling instructions from the manufacturer for each impact attenuator unit in accordance with Article 105-2 of the 2018 *Standard Specifications for Roads and Structures*.

No modifications shall be made to the impact attenuator unit without the express written permission from the manufacturer. Perform installation in accordance with the details in the plans developed by the Design-Build Team, and details and assembling instructions furnished by the manufacturer.

Construction Methods

If the median width is 40 feet or less, the Design-Build Team shall supply NON-GATING Impact Attenuator Units.

If the median width is greater than 40 feet, the Design-Build Team may use GATING or NON-GATING Impact Attenuator Units.

PORTLAND CEMENT CONCRETE PRODUCTION AND DELIVERY

(7-27-20) 1000, 1014, 1024 DB10 R01

Revise the 2018 *Standard Specifications for Roads and Structures* as follows:

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

TABLE 1000-1
REQUIREMENTS FOR CONCRETE

Class of Concrete	Min. Compressive Strength at 28 days	Maximum Water-Cement Ratio				Consistency Maximum Slump		Cement Content			
		Air-Entrained Concrete		Non-Air-Entrained Concrete		Vibrated	Non-Vibrated	Vibrated		Non-Vibrated	
		Rounded Aggregate	Angular Aggregate	Rounded Aggregate	Angular Aggregate			Min.	Max.	Min.	Max.
Units	*psi*					*inch*	*inch*	*lb/cy*	*lb/cy*	*lb/cy*	*lb/cy*
AA	4500	0.381	0.426	---	---	3.5[A]	---	639	715	---	---
AA Slip Form	4500	0.381	0.426	---	---	1.5	---	639	715	---	---
Drilled Pier	4500	---	---	0.450	0.450	---	5 – 7 dry 7 - 9 wet	---	---	640	800
A	3000	0.488	0.532	0.550	0.594	3.5 [A]	4.0	564	---	602	---
B	2500	0.488	0.567	0.559	0.630	1.5 machine placed 2.5 [A] hand placed	4.0	508	---	545	---
Sand Light-weight	4500	---	0.420	---	---	4.0 [A]	---	715	---	---	---
Latex Modified	3000 (at 7 days)	0.400	0.400	---	---	6.0	---	658	---	---	---
Flowable Fill excavatable	150 max. (at 56 days)	as needed	as needed	as needed	as needed	---	Flowable	---	---	40	100
Flowable Fill non-excavatable	125	as needed	as needed	as needed	as needed	---	Flowable	---	---	100	as needed
Pavement	4500 Design, field 650 flexural, design only	0.559	0.559	---	---	1.5 slip form 3.0 hand placed	---	526	---	---	---
Precast	See Table 1077-1	as needed	as needed	---	---	6.0	as needed	as needed	as needed	as needed	as needed
Prestressed	per contract	See Table 1078-1	See Table 1078-1	---	---	8.0	---	564	as needed	---	---

A. The slump may be increased to six 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 Design-Build Team'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.

MATERIALS FOR PORTLAND CEMENT CONCRETE

(8-4-20) 1000, 1024 DB10 R24

Revise the 2018 *Standard Specifications for Roads and Structures* 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:

TABLE 1024-2
PHYSICAL PROPERTIES OF WATER

Property	Requirement	Test Method
Compression Strength, minimum percent of control at three and seven days	90%	ASTM C1602
Time of set, deviation from control	From 1:00 hour earlier to 1:30 hour 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.

TEMPORARY SHORING
(2-20-07) (Rev. 11-22-17) DB11 R02

Description

Temporary shoring includes cantilever, braced and anchored shoring and temporary mechanically stabilized earth (MSE) walls. Temporary shoring does not include trench boxes. At the Design-Build Team's option, use any type of temporary shoring, unless noted otherwise in the plans developed by the Design-Build Team or as directed.

Design and construct temporary shoring based on actual elevations and shoring dimensions in accordance with the plans developed by the Design-Build Team and accepted submittals. Construct temporary shoring at locations shown in the plans developed by the Design-Build Team and as directed. Temporary shoring shall be required to maintain traffic when a 2:1 (H:V) slope from the top of an embankment or bottom of an excavation will intersect the existing ground line less than five feet from the edge of pavement of an open travelway. This standard special provision does not apply to pipe, inlet or utility installations unless noted otherwise in the plans developed by the Design-Build Team.

Positive protection includes concrete barrier and temporary guardrail. Provide positive protection for temporary shoring at locations shown in the plans developed by the Design-Build Team and as directed. Positive protection shall be required if temporary shoring is located in the clear zone in accordance with the AASHTO *Roadside Design Guide.*

(A) Cantilever and Braced Shoring

Cantilever shoring consists of steel sheet piles or H-piles with timber lagging. Braced shoring consists of sheet piles or H-piles with timber lagging and bracing such as beams, plates, walers, struts, rakers, etc. Define "piles" as sheet piles or H-piles.

(B) Anchored Shoring

Anchored shoring consists of sheet piles with walers or H-piles with timber lagging anchored with ground or helical anchors. Driven anchors may be accepted at the discretion of the Engineer. A ground anchor consists of a grouted steel bar or multi-strand tendon with an anchorage. A helical anchor consists of a lead section with a central steel shaft and at least one helix steel plate followed by extensions with only central shafts (no helixes) and an anchorage. Anchorages consist of steel bearing plates with washers and hex nuts for bars or steel wedge plates and wedges for strands. Use a prequalified Anchored Wall Contractor to install ground anchors. Define "anchors" as ground, helical or driven anchors.

(C) Temporary MSE Walls

Temporary MSE walls include temporary geosynthetic and wire walls. Define "temporary wall" as a temporary MSE wall and "Temporary Wall Vendor" as the vendor

supplying the temporary MSE wall. Define "reinforcement" as geotextile, geogrid, welded wire grid or metallic strip reinforcement.

Temporary geosynthetic walls consist of geotextile or geogrid reinforcement wrapped behind welded wire facing. Define "temporary geotextile wall" as a temporary geosynthetic wall with geotextile reinforcement and "temporary geogrid wall" as a temporary geosynthetic wall with geogrid reinforcement.

Temporary wire walls consist of welded wire grid or metallic strip reinforcement connected to welded wire facing. Define "Wire Wall Vendor" as the vendor supplying the temporary wire wall.

(D) Embedment

Define "embedment" for cantilever, braced and anchored shoring as the pile depth below the grade in front of shoring. Define "embedment" for temporary walls as the wall height below the grade in front of walls.

(E) Positive Protection

Define "unanchored or anchored portable concrete barrier" as portable concrete barrier (PCB) that meets Roadway Standard Drawing No. 1170.01. Define "concrete barrier" as unanchored or anchored PCB or an approved equal. Define "temporary guardrail" as temporary steel beam guardrail that meets Roadway Standard Drawing No. 862.02.

Materials

Refer to the 2018 *Standard Specifications for Roads and Structures*.

Item	Section
Concrete Barrier Materials	1170-2
Flowable Fill, Excavatable	1000-6
Geosynthetics	1056
Neat Cement Grout	1003
Portland Cement Concrete	1000
Select Materials	1016
Steel Beam Guardrail Materials	862-2
Steel Plates	1072-2
Steel Sheet Piles and H-Piles	1084
Untreated Timber	1082-2
Welded Wire Reinforcement	1070-3

Provide Type 6 material certifications for shoring materials in accordance with Article 106-3 of the 2018 *Standard Specifications for Roads and Structures*. Use Class IV select material for temporary guardrail. Use neat cement grout for Type 2 grout for ground anchors. Use Class A concrete that meets Article 450-2 of the 2018 *Standard Specifications for Roads and Structures*

or Type 1 grout for drilled-in piles. Provide untreated timber with a thickness of at least three inches and a bending stress of at least 1,000 pounds per square inch for timber lagging. Provide steel bracing that meets ASTM A36.

(A) Shoring Backfill

Use Class II, Type 1, Class III, Class V or Class VI select material or material that meets AASHTO M 145 for soil classification A-2-4 with a maximum PI of 6 for shoring backfill except do not use A-2-4 soil for backfill around culverts.

(B) Anchors

Store anchor materials on blocking a minimum of 12 inches above the ground and protect it at all times from damage; and when placing in the work make sure it is free from dirt, dust, loose mill scale, loose rust, paint, oil or other foreign materials. Load, transport, unload and store anchor materials so materials are kept clean and free of damage. Bent, damaged or defective materials shall be rejected.

(1) Ground Anchors

Use high-strength deformed steel bars that meet AASHTO M 275 or seven-wire strands that meet ASTM A886 or Article 1070-5 of the 2018 *Standard Specifications for Roads and Structures*. Splice bars in accordance with Article 1070-9 of the 2018 *Standard Specifications for Roads and Structures*. Do not splice strands. Use bondbreakers, spacers and centralizers that meet Article 6.3.5 of the AASHTO *LRFD Bridge Construction Specifications*.

(2) Helical Anchors

Use helical anchors with an ICC Evaluation Service, Inc. (ICC-ES) report. Provide couplers, thread bar adapters and bolts recommended by the Anchor Manufacturer to connect helical anchors together and to piles.

(3) Anchorages

Provide steel plates for bearing plates and steel washers, hex nuts, wedge plates and wedges recommended by the Anchor Manufacturer.

(C) Temporary Walls

(1) Welded Wire Facing

Use welded wire reinforcement for welded wire facing, struts and wires. For temporary wire walls, provide welded wire facing supplied by the Wire Wall Vendor or a manufacturer approved or licensed by the vendor. For temporary wire walls with separate reinforcement and facing components, provide connectors

(e.g., bars, clamps, plates, etc.) and fasteners (e.g., bolts, nuts, washers, etc.) required by the Wire Wall Vendor.

(2) Geotextiles

Provide Type 2 geotextile for separation and retention geotextiles. Provide Type 5 geotextile for geotextile reinforcement with ultimate tensile strengths in accordance with the accepted submittals.

(3) Geogrid Reinforcement

Use geogrids with a roll width of at least four feet and an "approved" or "approved for provisional use" status code. The list of approved geogrids is available from:

connect.ncdot.gov/resources/Materials/Pages/Materials-Manual-by-Material.aspx

Provide geogrids for geogrid reinforcement with design strengths in accordance with the accepted submittals. Geogrids are typically approved for ultimate tensile strengths in the machine direction (MD) and cross-machine direction (CD) or short-term design strengths for a three-year design life in the MD based on material type. Define material type from the website above for shoring backfill as follows:

Material Type	Shoring Backfill
Borrow	A-2-4 Soil
Fine Aggregate	Class II, Type 1 or Class III Select Material
Coarse Aggregate	Class V or VI Select Material

(4) Welded Wire Grid and Metallic Strip Reinforcement

Provide welded wire grid and metallic strip reinforcement supplied by the Wire Wall Vendor or a manufacturer approved or licensed by the vendor. Use welded wire grid reinforcement ("mesh", "mats" and "ladders") that meet Article 1070-3 of the 2018 *Standard Specifications for Roads and Structures* and metallic strip reinforcement ("straps") that meet ASTM A572 or A1011.

Preconstruction Requirements

(A) Concrete Barrier

Define "clear distance" behind concrete barrier as the horizontal distance between the barrier and edge of pavement. The minimum required clear distance for concrete barrier is shown in the plans developed by the Design-Build Team. At the Design-Build Team's option or if the minimum required clear distance is not available, set concrete barrier next to and up against traffic side of temporary shoring except for barrier above temporary

walls. Concrete barrier with the minimum required clear distance shall be required above temporary walls.

(B) Temporary Guardrail

Define "clear distance" behind temporary guardrail as the horizontal distance between guardrail posts and temporary shoring. At the Design-Build Team's option or if clear distance for cantilever, braced and anchored shoring is less than four feet, attach guardrail to traffic side of shoring as shown in the plans developed by the Design-Build Team. Place ABC in clear distance and around guardrail posts instead of pavement. Do not use temporary guardrail above temporary walls.

(C) Temporary Shoring Designs

Before beginning temporary shoring design, survey existing ground elevations in the vicinity of shoring locations to determine actual design heights (H). Submit .pdf files of working drawings and design calculations for temporary shoring designs in accordance with Article 105-2 of the 2018 *Standard Specifications for Roads and Structures*. Submit working drawings showing plan views, shoring profiles, typical sections and details of temporary shoring design and construction sequence. Do not begin shoring construction until a design submittal is accepted.

Have cantilever and braced shoring designed, detailed and sealed by an engineer licensed in the state of North Carolina. Use a prequalified Anchored Wall Design Consultant to design anchored shoring. Provide anchored shoring designs sealed by a Design Engineer approved as a Geotechnical Engineer (key person) for an Anchored Wall Design Consultant. Include details in anchored shoring working drawings of anchor locations and lock-off loads, unit grout / ground bond strengths for ground anchors or minimum installation torque and torsional strength rating for helical anchors and if necessary, obstructions extending through shoring or interfering with anchors. Include details in the anchored shoring construction sequence of pile and anchor installation, excavation and anchor testing.

Provide temporary wall designs sealed by an Engineer licensed in the state of North Carolina and employed or contracted by the Temporary Wall Vendor. Include details in temporary wall working drawings of geotextile and reinforcement types, locations and directions and obstructions extending through walls or interfering with reinforcement.

(1) Soil Parameters

Design temporary shoring for the assumed soil parameters and groundwater elevations shown in the plans developed by the Design-Build Team. Assume the following soil parameters for shoring backfill:

(a) Unit weight (γ) = 120 pcf;

(b)

Friction Angle (ϕ)	Shoring Backfill
30°	A-2-4 Soil
34°	Class II, Type 1 or Class III Select Material
38°	Class V or VI Select Material

(c) Cohesion (c) = 0 psf.

(2) Traffic Surcharge

Design temporary shoring for a traffic surcharge of 250 pounds per square foot if traffic will be above and within H of shoring. This traffic surcharge shall not apply to construction traffic. Design temporary shoring for any construction surcharge if construction traffic will be above and within H of shoring. For LRFD shoring designs, apply traffic (live load) surcharge in accordance with Figure C11.5.5-3 of the AASHTO *LRFD Bridge Design Specifications*.

(3) Cantilever, Braced and Anchored Shoring Designs

Use shoring backfill for fill sections and voids between cantilever, braced and anchored shoring and the critical failure surface. Use concrete or grout for embedded portions of drilled-in H-piles. Do not use drilled-in sheet piles.

Define "top of shoring" for cantilever, braced and anchored shoring as where the grade intersects the back of sheet piles or H-piles and timber lagging. Design cantilever, braced and anchored shoring for a traffic impact load of 2,000 pounds per foot applied 18 inches above top of shoring if concrete barrier is above and next to shoring or temporary guardrail is above and attached to shoring. For anchored shoring designs, apply traffic impact load as horizontal load (P_{H1}) in accordance with Figure 3.11.6.3-2(a) of the AASHTO LRFD specifications.

Extend cantilever, braced and anchored shoring at least 32 inches above top of shoring if shoring is designed for traffic impact. Otherwise, extend shoring at least six inches above top of shoring.

Design cantilever, braced and anchored shoring for a maximum deflection of three inches if the horizontal distance to the closest edge of pavement or structure is less than H. Otherwise, design shoring for a maximum deflection of six inches. Design cantilever and braced shoring in accordance with the plans developed by the Design-Build Team and AASHTO *Guide Design Specifications for Bridge Temporary Works*.

Design anchored shoring in accordance with the plans developed by the Design-Build Team and Article 11.9 of the AASHTO *LRFD Bridge Design Specifications*. Use a resistance factor of 0.80 for tensile resistance of anchors with bars, strands or shafts. Extend the unbonded length for ground anchors and the shallowest helix for helical anchors at least five feet behind the critical failure

surface. Do not extend anchors beyond right of way or easement limits. If existing or future obstructions such as foundations, guardrail posts, pavements, pipes, inlets or utilities will interfere with anchors, maintain a clearance of at least six inches between obstructions and anchors.

(4) Temporary Wall Designs

Use shoring backfill in the reinforced zone of temporary walls. Separation geotextiles are required between shoring backfill and backfill, natural ground or culverts along the sides of the reinforced zone perpendicular to the wall face. For Class V or VI select material in the reinforced zone, separation geotextiles are also required between shoring backfill and backfill or natural ground on top of and at the back of the reinforced zone.

Design temporary walls in accordance with the plans developed by the Design-Build Team and Article 11.10 of the AASHTO *LRFD Bridge Design Specifications*. Embed temporary walls at least 18 inches except for walls on structures or rock as determined by the Engineer. Use a uniform reinforcement length throughout the wall height of at least 0.7H or six feet, whichever is longer. Extend the reinforced zone at least six inches beyond end of reinforcement. Do not locate the reinforced zone outside right of way or easement limits.

Use the simplified method for determining maximum reinforcement loads in accordance with the AASHTO LRFD specifications. For geotextile reinforcement, use geotextile properties approved by the Department or default values in accordance with the AASHTO LRFD specifications. For geogrid reinforcement, use approved geogrid properties available from the website shown elsewhere in this provision. If the website does not list a short-term design strength for an approved geogrid, use a short-term design strength equal to the ultimate tensile strength divided by 3.5 for the geogrid reinforcement. Use geosynthetic properties for the direction reinforcement will be installed, a three-year design life and shoring backfill to be used in the reinforced zone.

Do not use more than four different reinforcement strengths for each temporary geosynthetic wall. Design temporary geotextile walls for a reinforcement coverage ratio (R_c) of 1.0. For temporary geogrid walls with an R_c of less than 1.0, use a maximum horizontal clearance between geogrids of three feet and stagger reinforcement so geogrids are centered over gaps in the reinforcement layer below.

For temporary geosynthetic walls, use “L” shaped welded wire facing with 18-inch to 24-inch long legs. Locate geotextile or geogrid reinforcement so reinforcement layers are at the same level as the horizontal legs of welded wire facing. Use vertical reinforcement spacing equal to facing height. Wrap geotextile or geogrid reinforcement behind welded wire facing and extend reinforcement at least three feet back behind facing into shoring backfill.

For temporary wire walls with separate reinforcement and facing components, attach welded wire grid or metallic strip reinforcement to welded wire facing with a connection approved by the Department. For temporary geogrid and wire walls, retain shoring backfill at welded wire facing with retention geotextiles and extend geotextiles at least three feet back behind facing into backfill.

(D) Preconstruction Meeting

The Engineer may require a shoring preconstruction meeting to discuss the construction, inspection and testing of the temporary shoring. If required and if this meeting occurs before all shoring submittals have been accepted, additional preconstruction meetings may be required before beginning construction of temporary shoring without accepted submittals. The Resident, District or Bridge Maintenance Engineer, Bridge or Roadway Construction Engineer, Geotechnical Operations Engineer, Design-Build Team and Shoring Contractor Superintendent will attend preconstruction meetings.

Construction Methods

Control drainage during construction in the vicinity of shoring. Direct run off away from shoring and shoring backfill. Contain and maintain backfill and protect material from erosion.

Install positive protection in accordance with the contract and accepted submittals. Use PCB in accordance with Section 1170 of the 2018 *Standard Specifications for Roads and Structures* and Roadway Standard Drawing No. 1170.01. Use temporary guardrail in accordance with Section 862 of the 2018 *Standard Specifications for Roads and Structures* and Roadway Standard Drawing Nos. 862.01, 862.02 and 862.03.

(A) Tolerances

Construct shoring with the following tolerances:

(1) Horizontal wires of welded wire facing are level in all directions,

(2) Shoring location is within six inches of horizontal and vertical alignment shown in the accepted submittals, and

(3) Shoring plumbness (batter) is not negative and within two degrees of vertical.

(B) Cantilever, Braced and Anchored Shoring Installation

If overexcavation behind cantilever, braced or anchored shoring is shown in the accepted submittals, excavate before installing piles. Otherwise, install piles before excavating for shoring. Install cantilever, braced or anchored shoring in accordance with the construction sequence shown in the accepted submittals. Remove piles and if applicable, timber lagging when shoring is no longer needed.

(1) Pile Installation

Install piles with the minimum required embedment and extension in accordance with Subarticles 450-3(D) and 450-3(E) of the 2018 *Standard Specifications for Roads and Structures* except that a pile driving equipment data form is not required. Piles may be installed with a vibratory hammer as approved by the Engineer.

Do not splice sheet piles. Use pile excavation to install drilled-in H-piles. After filling holes with concrete or grout to the elevations shown in the accepted submittals, remove any fluids and fill remaining portions of holes with flowable fill. Cure concrete or grout at least seven days before excavating.

Notify the Engineer if refusal is reached before pile excavation or driven piles attain the minimum required embedment. When this occurs, a revised design submittal may be required.

(2) Excavation

Excavate in front of piles from the top down in accordance with the accepted submittals. For H-piles with timber lagging and braced and anchored shoring, excavate in staged horizontal lifts with a maximum height of five feet Remove flowable fill and material in between H-piles, as needed, to install timber lagging. Position lagging with at least three inches of contact in the horizontal direction between the lagging and pile flanges. Do not excavate the next lift until timber lagging for the current lift is installed and, if applicable, bracing and anchors for the current lift are accepted. Backfill behind cantilever, braced or anchored shoring with shoring backfill.

(3) Anchor Installation

If applicable, install foundations located behind anchored shoring before installing anchors. Fabricate and install ground anchors in accordance with the accepted submittals, Articles 6.4 and 6.5 of the AASHTO *LRFD Bridge Construction Specifications* and the following unless otherwise approved:

(a) Materials in accordance with this provision shall be required instead of materials conforming to Articles 6.4 and 6.5.3 of the AASHTO LRFD Specifications,

(b) Encapsulation-protected ground anchors in accordance with Article 6.4.1.2 of the AASHTO LRFD specifications are not required, and

(c) Corrosion protection for unbonded lengths of ground anchors and anchorage covers are not required.

(d) Measure grout temperature, density and flow during grouting with at least the same frequency grout cubes are made for compressive strength. Perform density and flow field tests in the presence of the Engineer in accordance with American National Standards Institute / American Petroleum Institute Recommended Practice 13B-1 (Section 4, Mud Balance) and ASTM C939 (Flow Cone), respectively.

Install helical anchors in accordance with the accepted submittals and Anchor Manufacturer's instructions. Measure torque during installation and do not exceed the torsional strength rating of the helical anchor. Attain the minimum required installation torque and penetration before terminating anchor installation. When replacing a helical anchor, embed last helix of the replacement anchor at least three helix plate diameters past the location of the first helix of the previous anchor.

(4) Anchor Testing

Proof test and lock-off anchors in accordance with the accepted submittals and Article 6.5.5 of the AASHTO *LRFD Bridge Construction Specifications* except for the acceptance criteria in Article 6.5.5.5. For the AASHTO LRFD specifications, "ground anchor" refers to a ground or helical anchor and "tendon" refers to a bar, strand or shaft.

(a) Anchor Acceptance

Anchor acceptance is based in part on the following criteria.

(i) For ground and helical anchors, total movement is less than 0.04 inch between the one and ten minute readings or less than 0.08 inch between the six and 60 minute readings.

(ii) For ground anchors, total movement at maximum test load exceeds 80% of the theoretical elastic elongation of the unbonded length.

(b) Anchor Test Results

Submit .pdf files of anchor test records including movement versus load plots for each load increment within 24 hours of completing each row of anchors. The Engineer will review the test records to determine if the anchors are acceptable.

If the Engineer determines an anchor is unacceptable, revise the anchor design or installation methods. Submit a revised anchored shoring design for acceptance and provide an acceptable anchor with the revised design

or installation methods. If required, replace the anchor or provide additional anchors with the revised design or installation methods.

(C) Temporary Wall Installation

Excavate as necessary for temporary walls in accordance with the plans developed by the Design-Build Team and accepted submittals. If applicable, install foundations located in the reinforced zone before placing shoring backfill or reinforcement unless otherwise approved. Notify the Engineer when foundation excavation is complete. Do not place shoring backfill or reinforcement until excavation dimensions and foundation material are approved.

Erect welded wire facing so the wall position is as shown in the plans developed by the Design-Build Team and accepted submittals. Set welded wire facing adjacent to each other in the horizontal and vertical direction to completely cover the wall face with facing. Stagger welded wire facing to create a running bond by centering facing over joints in the row below.

Wrap geotextile reinforcement and retention geotextiles behind welded wire facing as shown in the plans developed by the Design-Build Team and accepted submittals, and cover geotextiles with at least three inches of shoring backfill. Overlap adjacent geotextile reinforcement and retention and separation geotextiles at least 18 inches with seams oriented perpendicular to the wall face. Hold geotextiles in place with wire staples or anchor pins as needed.

Place reinforcement within three inches of locations shown in the plans developed by the Design-Build Team and accepted submittals. Before placing shoring backfill, pull reinforcement taut so it is in tension and free of kinks, folds, wrinkles or creases. Install reinforcement with the direction shown in the plans developed by the Design-Build Team and accepted submittals. For temporary wire walls with separate reinforcement and facing components, attach welded wire grid or metallic strip reinforcement to welded wire facing as shown in the accepted submittals. Do not splice or overlap reinforcement so seams are parallel to the wall face. Contact the Engineer when unanticipated existing or future obstructions such as foundations, pavements, pipes, inlets or utilities will interfere with reinforcement.

Place shoring backfill in the reinforced zone in eight-inch to ten-inch thick lifts. Compact A-2-4 soil and Class II, Type 1 and Class III select material in accordance with Subarticle 235-3(C) of the 2018 *Standard Specifications for Roads and Structures*. Use only hand operated compaction equipment to compact backfill within three feet of welded wire facing. At a distance greater than three feet, compact shoring backfill with at least four passes of an eight-ton to ten-ton vibratory roller in a direction parallel to the wall face. Smooth wheeled or rubber tired rollers are also acceptable for compacting backfill. Do not use sheepsfoot, grid rollers or other types of compaction equipment with feet. Do not displace or damage reinforcement when placing and compacting shoring backfill. End dumping directly on geotextile or geogrid reinforcement shall not be

permitted. Do not operate heavy equipment on reinforcement until it is covered with at least eight inches of shoring backfill. Replace any damaged reinforcement to the satisfaction of the Engineer.

Backfill for temporary walls outside the reinforced zone in accordance with Article 410-8 of the 2018 *Standard Specifications for Roads and Structures*. Bench temporary walls into the sides of excavations where applicable. For temporary geosynthetic walls with top of wall within five feet of finished grade, remove top facing and incorporate top reinforcement layer into fill when placing fill in front of wall. Temporary walls remain in place permanently unless otherwise required.

POLYUREA PAVEMENT MARKING MATERIAL - TYPE 2 TYPICAL CERTIFIED MILL TEST REPORT

(1-16-19) SP

Amend the 2018 *Standard Specifications for Roads and Structures* as follows:

Page 10-184, Article 1087-8 Material Certification, in accordance with Article 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.

POLYUREA PAVEMENT MARKING MEDIA AND THICKNESS

(08-27-20)

Amend the 2018 NCDOT *Standard Specifications for Roads and Structure* 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.

SNOWPLOWABLE PAVEMENT MARKERS

(1-16-19) SP

Revise the 2018 *Standard Specifications for Roads and Structures* as follows:

Pages 10-177 and 10-178, Article 1086-3 SNOWPLOWABLE PAVEMENT MARKERS, delete items (A), (B) and (C)(1) and replace with the following:

(A) General

Use snowplowable pavement markers evaluated by NTPEP. The snowplowable pavement marker shall consist of a housing with one or more glass or plastic face lens type reflective lenses to provide the required color designation. Shape the housing to deflect a snowplow blade upward in both directions without being damaged. Plastic lens faces shall use an abrasion resistant coating.

Use recycled snowplowable pavement markers that meet all the requirements of new snowplowable pavement markers except Subarticle 1086-3(B)(1). Recycled snowplowable pavement markers with minimal variation in dimensions are acceptable only when the reflector fits in the housing of the recycled snowplowable pavement marker as originally designed.

(B) Housings

1. Dimensions

   The dimension, slope and minimum area of reflecting surface shall conform to dimensions as shown in the plans developed by the Design-Build Team. The minimum area of each reflecting surface shall be 1.44 square inch.

2. Materials

   Use snowplowable pavement markers that are on the NCDOT Approved Products List.

3. Surface

   The surface of the housing shall be free of scale, dirt, rust, oil, grease or any other contaminant which might reduce its bond to the epoxy adhesive.

4. Identification

   Mark the housing with the manufacturer's name and model number of marker.

(C) Reflectors

1. General

Laminate the reflector to an elastomeric pad and attach with adhesive to the housing. The thickness of the elastomeric pad shall be 0.04 inch.

Pages 12-14, Subarticle 1250-3(C) Removal of Existing Pavement Markers, Lines 19 - 29, delete and replace with the following:

Remove the existing raised pavement markers and / or the snowplowable pavement markers including the housings, before overlaying an existing roadway with pavement. Repair the pavement by filling holes as directed by the Engineer.

When traffic patterns are changed in work zones due to construction or reconstruction, remove all raised pavement markers and / or snowplowable markers including housings that conflict with the new traffic pattern before switching traffic to the new traffic pattern. Lens removal in lieu of total housing removal is not an acceptable practice for snowplowable markers.

Properly dispose of the removed pavement markers.

Pages 12-16 and 12-17, Subarticle 1253-3 CONSTRUCTION METHODS, delete items (A), (B) and (C) and replace with the following:

(A) General

Bond marker housings to the pavement with epoxy adhesive. Mechanically mix and dispense epoxy adhesives as required by the manufacturer's specifications. Place the markers immediately after the adhesive has been mixed and dispensed.

Install snowplowable pavement marker housings into slots sawcut into the pavement. Make slots in the pavement to exactly duplicate the shape of the housing of the snowplowable pavement markers.

Promptly remove all debris resulting from the saw cutting operation from the pavement surface. Install the marker housings within seven calendar days after saw cutting slots in the pavement. Remove and dispose of loose material from the slots by brushing, blow cleaning or vacuuming. Dry the slots before applying the epoxy adhesive. Fill the cleaned slots totally with epoxy adhesive flush with the surface of the existing pavement. Install snowplowable pavement markers according to the manufacturer’s recommendations.

Protect the snowplowable pavement markers until the epoxy has initially cured and is track free.

(B) Reflector Replacement

In the event that a reflector is damaged, replace the damaged reflector by using adhesives and methods recommended by the manufacturer of the markers and approved by the Engineer.

Missing housings shall be replaced. Broken housings shall be removed and replaced. In both cases the slot for the housings shall be properly prepared prior to installing the new housing.

(C) Recycled Snowplowable Pavement Marker Housings

Use properly refurbished snowplowable pavement marker housings as approved by the Engineer such that approved new reflectors can be installed inside the housings.

THERMOPLASTIC PAVEMENT MARKING MATERIAL - COLOR TESTING
(1-16-19) SP

Revise the 2018 *Standard Specifications for Roads and Structures* 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.

EXTRUDED THERMOPLASTIC PAVEMENT MARKING THICKNESS
(1-16-19) SP

Revise the 2018 *Standard Specifications for Roads and Structures* 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 four 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 two 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

ON-THE-JOB TRAINING

(2-24-15) (Rev. 7-20-17) 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 one 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.

STANDARD SPECIAL PROVISION

AVAILABILITY OF FUNDS - TERMINATION OF CONTRACTS

(9-1-11) 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 North Carolina Department of Transportation *Standard Specifications for Roads and Structures*, dated January 2018 and as amended by the Standard Special Provision, Division One found elsewhere in this RFP.

***** STANDARD SPECIAL PROVISIONS *****

NCDOT GENERAL SEED SPECIFICATIONS FOR SEED QUALITY

(5-7-11) 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:

Restricted Noxious Weed	Limitations per Lb. of Seed	Restricted Noxious Weed	Limitations per Lb. of Seed
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)
Kobe Lespedeza
Korean Lespedeza
Weeping Lovegrass
Carpetgrass
Bermudagrass
Browntop Millet
German Millet - Strain R
Clover - Red / White / Crimson

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

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. 12-22-20) Z-4

Revise the 2018 *Standard Specifications for Roads and Structures* as follows:

Division 6

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

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".

***** STANDARD SPECIAL PROVISIONS *****

TITLE VI AND NONDISCRIMINATION

(6-28-77) (Rev 5-2-18) Z-6

Revise the 2018 *Standard Specifications for Roads and Structures* as follows:

Replace Subarticle 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 Nondiscrimination 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) shall be responsible for

complying with NCDOT's Title VI Program. Contractors are not required to prepare or submit Title VI Programs. To comply with this section, the prime contractor shall:

1. Post NCDOT's Notice of Nondiscrimination and the Contractor's own Equal Employment Opportunity (EEO) Policy in conspicuous locations accessible to all employees, applicants and subcontractors on the jobsite.

2. Physically incorporate the required Title VI clauses into all subcontracts on federally-assisted and state-funded NCDOT projects, and ensure inclusion by subcontractors into all lower-tier subcontracts.

3. Required Solicitation Language. The Contractor shall include the following notification in all solicitations for bids and requests for work or material, regardless of funding source:

   "The North Carolina Department of Transportation, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 US.C. §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award. In accordance with other related nondiscrimination authorities, bidders and contractors will also not be discriminated against on the grounds of sex, age, disability, low-income level, creed / religion, or limited English proficiency in consideration for an award."

4. Physically incorporate the FHWA-1273, in its entirety, into all subcontracts and subsequent lower tier subcontracts on Federal-aid highway construction contracts only.

5. Provide language assistance services (i.e., written translation and oral interpretation), free of charge, to LEP employees and applicants. Contact NCDOT OCR for further assistance, if needed.

6. For assistance with these Title VI requirements, contact the NCDOT Title VI Nondiscrimination Program at 1-800-522-0453.

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

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

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

1. Applicability

   Title VI and related laws protect participants and beneficiaries (e.g., members of the public and contractors) from discrimination by NCDOT employees, subrecipients and contractors, regardless of funding source.

2. Eligibility

   Any person, or class of persons, who believes he / she has been subjected to discrimination based on race, color, national origin, Limited English Proficiency (LEP), sex, age, or disability (and religion in the context of employment, aviation, or transit) may file a written complaint. The law also prohibits intimidation or retaliation of any sort.

3. Time Limits and Filing Options

   Complaints may be filed by the affected individual(s) or a representative and must be filed no later than 180 calendar days after the following:

   (i) The date of the alleged act of discrimination; or

   (ii) The date when the person(s) became aware of the alleged discrimination; or

   (iii) Where there has been a continuing course of conduct, the date on which that conduct was discontinued or the latest instance of the conduct.

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

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

4. Format for Complaints

   Complaints must be in writing and signed by the complainant(s) or a representative, and include the complainant's name, address, and telephone number. Complaints received by fax or e-mail will be acknowledged and processed. Allegations received by telephone will be reduced to writing and provided to the complainant for confirmation or revision before processing. Complaints will be accepted in other languages, including Braille.

5. Discrimination Complaint Form

   Contact NCDOT Civil Rights to receive a full copy of the Discrimination Complaint Form and procedures.

6. Complaint Basis

   Allegations must be based on issues involving race, color, national origin (LEP), sex, age, disability, or religion (in the context of employment, aviation or transit). "Basis" refers to the complainant's membership in a protected group category.

TABLE 103-1
COMPLAINT BASIS

Protected Categories	Definition	Examples	Applicable Nondiscrimination Authorities
Race and Ethnicity	An individual belonging to one of the accepted racial groups; or the perception, based usually on physical characteristics that a person is a member of a racial group	Black / African American, Hispanic / Latino, Asian, American Indian / Alaska Native, Native Hawaiian / Pacific Islander, White	Title VI of the Civil Rights Act of 1964; 49 CFR Part 21; 23 CFR 200; 49 U.S.C. 5332(b); 49 U.S.C. 47123. *(Executive Order 13166)*
Color	Color of skin, including shade of skin within a racial group	Black, White, Brown, Yellow, etc.	
National Origin *(Limited English Proficiency)*	Place of birth. Citizenship is not a factor. (*Discrimination based on language or a person's accent is also covered)*	Mexican, Cuban, Japanese, Vietnamese, Chinese	
Sex	Gender. The sex of an individual. *Note:* Sex under this program does not include sexual orientation.	Women and Men	1973 Federal-Aid Highway Act; 49 U.S.C. 5332(b); 49 U.S.C. 47123.
Age	Persons of any age	21-year-old person	Age Discrimination Act of 1975 49 U.S.C. 5332(b); 49 U.S.C. 47123.
Disability	Physical or mental impairment, permanent or temporary, or perceived.	Blind, alcoholic, para-amputee, epileptic, diabetic, arthritic	Section 504 of the Rehabilitation Act of 1973; Americans with Disabilities Act of 1990
Religion (in the context of employment) *(Religion / Creed in all aspects of any aviation or transit-related construction)*	An individual belonging to a religious group; or the perception, based on distinguishable characteristics that a person is a member of a religious group. In practice, actions taken as a result of the moral and ethical beliefs as to what is right and wrong, which are sincerely held with the strength of traditional religious views. ***Note:*** Does not have to be associated with a recognized religious group or church; if an individual sincerely holds to the belief, it is a protected religious practice.	Muslim, Christian, Sikh, Hindu, etc.	Title VII of the Civil Rights Act of 1964; 23 CFR 230; FHWA-1273 Required Contract Provisions. *(49 U.S.C. 5332(b);* *49 U.S.C. 47123)*

(3) **Pertinent Nondiscrimination Authorities**

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

- 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

- 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)

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

- 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

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

- 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 shall 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 shall 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 shall 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 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) 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 Nondiscrimination 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 PROVISIONS *****

MINORITY AND FEMALE EMPLOYMENT REQUIREMENTS

(12-18-07) Z-7

NOTICE OF REQUIREMENTS FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (*EXECUTIVE NUMBER 11246*)

1. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, see as shown on the attached sheet entitled "Employment Goals for Minority and Female Participation".

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its federally involved and nonfederally involved construction.

The Contractor's compliance with the Executive Order and the regulations in *41 CFR Part 60-4* shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in *41 CFR 60-4.3(a)*, and its effort to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project or the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the executive Order and the regulations in *41 CFR Part 60-4*. Compliance with the goals will be measured against the total work hours performed.

2. As used in this Notice and in the contract resulting from this solicitation, the "covered area" is the county or counties shown on the cover sheet of the proposal form and contract.

EMPLOYMENT GOALS FOR MINORITY AND FEMALE PARTICIPATION

Economic Areas

Area 023 29.7%
Bertie County
Camden County
Chowan County
Gates County
Hertford County
Pasquotank County
Perquimans County

Area 024 31.7%
Beaufort County
Carteret County
Craven County
Dare County
Edgecombe County
Green County
Halifax County
Hyde County
Jones County
Lenoir County
Martin County
Nash County
Northampton County
Pamlico County
Pitt County
Tyrrell County
Washington County
Wayne County
Wilson County

Area 025 23.5%
Columbus County
Duplin County
Onslow County
Pender County

Area 026 33.5%
Bladen County
Hoke County
Richmond County
Robeson County
Sampson County
Scotland County

Area 027 24.7%
Chatham County
Franklin County
Granville County
Harnett County
Johnston County
Lee County
Person County
Vance County
Warren County

Area 028 15.5%
Alleghany County
Ashe County
Caswell County
Davie County
Montgomery County
Moore County
Rockingham County
Surry County
Watauga County
Wilkes County

Area 029 15.7%
Alexander County
Anson County
Burke County
Cabarrus County
Caldwell County
Catawba County
Cleveland County
Iredell County
Lincoln County
Polk County
Rowan County
Rutherford County
Stanly County

Area 0480 8.5%
Buncombe County
Madison County

Area 030 6.3%
Avery County
Cherokee County
Clay County
Graham County
Haywood County
Henderson County
Jackson County
McDowell County
Macon County
Mitchell County
Swain County
Transylvania County
Yancey County

SMSA Areas

Area 5720 26.6%
Currituck County

Area 9200 20.7%
Brunswick County
New Hanover County

Area 2560 24.2%
Cumberland County

Area 6640 22.8%
Durham County
Orange County
Wake County

Area 1300 16.2%
Alamance County

Area 3120 16.4%
Davidson County
Forsyth County
Guilford County
Randolph County
Stokes County
Yadkin County

Area 1520 18.3%
Gaston County
Mecklenburg County
Union County

Goals for Female

Participation in Each Trade

(Statewide) 6.9%

STANDARD SPECIAL PROVISION

REQUIRED CONTRACT PROVISIONS FEDERAL - AID CONSTRUCTION CONTRACTS

FHWA - 1273 Electronic Version - May 1, 2012 Z-8

I. General
II. Nondiscrimination
III. Nonsegregated Facilities
IV. Davis-Bacon and Related Act Provisions
V. Contract Work Hours and Safety Standards Act Provisions
VI. Subletting or Assigning the Contract
VII. Safety: Accident Prevention
VIII. False Statements Concerning Highway Projects
IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
X. Compliance with Governmentwide Suspension and Debarment Requirements
XI. Certification Regarding Use of Contract Funds for Lobbying

ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).

   The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

   Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

   Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).
2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.
3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.
4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

II. NONDISCRIMINATION

The provisions of this section related to 23 CFR Part 230 are applicable to all Federal-aid construction contracts and to all related construction subcontracts of $10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding $10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. **Equal Employment Opportunity:** Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.
b. The contractor will accept as its operating policy the following statement:
"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. **EEO Officer:** The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.
3. **Dissemination of Policy:** All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:
   a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.
   b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.
   c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.
   d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.
   e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.
4. **Recruitment:** When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.
   a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.
   b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.
   c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.
5. **Personnel Actions:** Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:
   a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.
   b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.
   c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.
   d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.
6. **Training and Promotion:**
   a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.
   b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).
   c The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.
   d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.
7. **Unions:** If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:
   a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.
c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.
d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. **Reasonable Accommodation for Applicants / Employees with Disabilities:** The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.
9. **Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:** The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.
   a. The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.
   b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.
10. **Assurance Required by 49 CFR 26.13(b):**
   a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.
   b. The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.
11. **Records and Reports:** The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.
   a. The records kept by the contractor shall document the following:
      (1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;
      (2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and
      (3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;
   b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of $10,000 or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding $2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 "Contract provisions and related matters" with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. **Minimum wages**
   a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

      Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs

which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH–1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b. (1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:
   (i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
   (ii) The classification is utilized in the area by the construction industry; and
   (iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.
   (2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.
   (3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.
   (4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. **Withholding.** The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. **Payrolls and basic records**

a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

b. (1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g. the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH–347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/esa/whd/forms/ wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a

subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency.

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH–347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.

(4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. **Apprentices and trainees**

a. Apprentices (programs of the USDOL). Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

b. Trainees (programs of the USDOL). Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

d. Apprentices and Trainees (programs of the U.S. DOT). Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

5. **Compliance with Copeland Act requirements.** The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

6. **Subcontracts.** The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.
7. **Contract termination:** debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.
8. **Compliance with Davis-Bacon and Related Act requirements.** All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.
9. **Disputes concerning labor standards.** Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.
10. **Certification of eligibility.**
    a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
    b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
    c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

The following clauses apply to any Federal-aid construction contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

1. **Overtime requirements.** No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
2. **Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.
3. **Withholding for unpaid wages and liquidated damages.** The FHWA or the contacting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.
4. **Subcontracts.** The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).
    a. The term “perform work with its own organization” refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:
    (1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;
    (2) the prime contractor remains responsible for the quality of the work of the leased employees;
    (3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and
    (4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.
    b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.
2. The contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.
3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and

(b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.
5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.
2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).
3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.
2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost $25,000 or more - as defined in 2 CFR Parts 180 and 1200.

1. **Instructions for Certification – First Tier Participants:**
   a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.
   b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default.
d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. “First Tier Covered Transactions” refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). “Lower Tier Covered Transactions” refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). “First Tier Participant” refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). “Lower Tier Participant” refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).
f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.
g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the $25,000 threshold.
h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website **(https://www.epls.gov/)**, which is compiled by the General Services Administration.
i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

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2. **Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:**
   a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:
      (1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;
      (2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
      (3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification; and
      (4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.
   b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.
2. **Instructions for Certification - Lower Tier Participants:**
   (Applicable to all subcontracts, purchase orders and other lower tier transactions requiring prior FHWA approval or estimated to cost $25,000 or more - 2 CFR Parts 180 and 1200)
   a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.
   b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.
   c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.
   d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. “First Tier Covered Transactions” refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). “Lower Tier Covered Transactions” refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). “First Tier Participant” refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). “Lower Tier Participant” refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the $25,000 threshold.
g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (https://www.epls.gov/), which is compiled by the General Services Administration.
h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

* * * * *

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.
2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

* * * * *

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed $100,000 (49 CFR 20).

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:
   a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
   b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.
3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed $100,000 and that all such recipients shall certify and disclose accordingly.

STANDARD SPECIAL PROVISION
MINIMUM WAGES
GENERAL DECISION NC20210088 01/01/2021 NC88

Z-088

Date: January 1, 2021

General Decision Number: NC20210088 01/01/2021 NC88

Superseded General Decision Numbers: NC20200088

State: North Carolina

Construction Type: HIGHWAY

COUNTIES

Alamance	Forsyth	Randolph
Anson	Gaston	Rockingham
Cabarrus	Guilford	Stokes
Chatham	Mecklenburg	Union
Davie	Orange	Yadkin
Durham	Person	

HIGHWAY CONSTRUCTION PROJECTS (excluding tunnels, building structures in rest area projects & railroad construction; bascule, suspension & spandrel arch bridges designed for commercial navigation, bridges involving marine construction; and other major bridges).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.95 for calendar year 2021 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.95 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract for calendar year 2021. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the Design-Build Team must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR 5.5(a)(1)(ii) (or the EO minimum wage rate, if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2) – (60). Additional information on contractor requirements and worker protections under the EO is available at **www.dol.gov/whd/govcontracts**.

Modification Number	**Publication Date**
0	01/01/2021

SUNC2014-003 11/14/2014

	Rates	Fringes
BLASTER	18.64	
CARPENTER	13.68	.05
CEMENT MASON / CONCRETE FINISHER	13.93	
ELECTRICIAN		
Electrician	18.79	2.72
Telecommunications Technician	15.19	1.25
IRONWORKER	13.30	
LABORER		
Asphalt Raker and Spreader	12.78	
Asphalt Screed / Jackman	14.50	
Carpenter Tender	12.51	.27
Cement Mason / Concrete Finisher Tender	11.04	
Common or General	10.40	.01
Guardrail / Fence Installer	13.22	
Pipelayer	12.43	
Traffic Signal / Lighting Installer	15.65	.24
PAINTER		
Bridge	23.77	
POWER EQUIPMENT OPERATORS		
Asphalt Broom Tractor	10.00	
Bulldozer Fine	16.13	
Bulldozer Rough	14.36	
Concrete Grinder / Groover	17.92	
Crane Boom Trucks	18.19	
Crane Other	19.83	
Crane Rough / All-Terrain	19.10	
Drill Operator Rock	14.28	
Drill Operator Structure	20.89	
Excavator Fine	16.95	
Excavator Rough	13.63	
Grader / Blade Fine	19.84	
Grader / Blade Rough	15.47	
Loader 2 Cubic Yards or Less	13.31	
Loader Greater Than 2 Cubic Yards	16.19	
Material Transfer Vehicle (Shuttle Buggy)	15.44	
Mechanic	17.51	
Milling Machine	15.22	
Off-Road Hauler / Water Tanker	11.83	
Oiler / Greaser	14.16	
Pavement Marking Equipment	12.05	
Paver Asphalt	15.97	
Paver Concrete	18.20	
Roller Asphalt Breakdown	12.79	
Roller Asphalt Finish	13.76	
Roller Other	12.08	
Scraper Finish	12.65	
Scraper Rough	11.50	
Slip Form Machine	19.60	
Tack Truck / Distributor Operator	14.82	

	Rates	Fringes
TRUCK DRIVER		
GVWR of 26,000 Lbs or Less	11.45	
GVWR of 26,000 Lbs or Greater	13.57	.03

Welders - Receive rate prescribed for craft performing operation to which welding is incidental.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at **www.dol.gov/whd/govcontracts**.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a)(1)(ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four-letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate

based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated / CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U. S. Department of Labor
200 Constitution Avenue, N.W.
Washington, D.C. 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, D.C. 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, D.C. 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

***** STANDARD SPECIAL PROVISIONS *****

(10-23-17)

DIVISION ONE OF STANDARD SPECIFICATIONS

Division One of the 2018 NCDOT *Standard Specifications for Roads and Structures* (*Standard Specifications*) shall apply except as follows:

Definitions: Throughout Division One of the 2018 *Standard Specifications for Roads and Structures*, the term "Contractor" is replaced with "Design-Build Team", the term "Bidder" is replaced with "Proposer," the term "Bid" is replaced with "Price Proposal," and the phrase "lowest Responsible Bidder" is replaced with "responsible Proposer with the lowest adjusted price." The replacement of "Contractor" with "Design-Build Team" does not apply to Article 102-2. The replacement of the above terms also does not apply when the terms are part of a phrase (e.g. bid bond, prime contractor, total amount bid, etc.)

Deletions: Articles 102-3(B), 102-4, 102-8(B), 102-9(C)(2), 103-2(B), and 103-4(C) of the 2018 *Standard Specifications for Roads and Structures* are deleted from Design-Build Contracts.

Modifications: The remainder of this Standard Special Provision includes modifications to Division One of the 2018 *Standard Specifications for Roads and Structures*.

SECTION 101
DEFINITION OF TERMS

Page 1-3, Article 101-3, replace and add certain definitions as follows:

ADDITIONAL WORK

Additional work is that which results from a change or alteration to the contract and for which there are contract unit prices in the original contract or an executed supplemental agreement.

ADVERTISEMENT

The public advertisement inviting Statements of Qualifications for the design and construction of specific projects.

AWARD

The decision of the Department of Transportation to accept the Technical and Price Proposals of the selected Design-Build Team for work which is subject to the furnishing of payment and performance bonds, and such other conditions as may be otherwise provided by law, the Request for Proposals, and the 2018 *Standard Specifications for Roads and Structures*.

CONTRACT

The executed agreement between the Department and the successful Proposer, covering the performance of, and compensation for, the work. The term contract is all inclusive with reference to all written agreements affecting a contractual relationship and all documents referred to therein. The contract shall include, but not be limited to, the Request for Proposals, the Technical Proposal, the Price Proposal, the printed contract form and attachments, contract bonds, plans and associated special provisions prepared by the Design-Build Team, standard specifications and supplemental specifications, standard special provisions and project special provisions contained in the Request for Proposals or as developed by the Design-Build Team and accepted by the Department, and all executed supplemental agreements. The contract shall constitute one instrument.

DATE OF AVAILABILITY

That date, established as set forth in the Request for Proposals, by which it is anticipated that the Contract will be executed and sufficient design efforts or work sites within the project limits will be available for the Design-Build Team to begin the controlling operations or design.

DESIGN-BUILD

A form of contracting in which the successful Proposer undertakes responsibility for both the design and construction of a project.

DESIGN-BUILD TEAM

An individual, partnership, joint venture, corporation or other legal entity that furnishes the necessary design and construction services, whether by itself or through subcontracts.

DESIGN-BUILD PROPOSAL

A proposal to contract consisting of a separately sealed Technical Proposal and a separately sealed Price Proposal submitted in response to a Request for Proposals on a Design-Build project.

PLANS

The project plans, Standard Drawings, working drawings and supplemental drawings, or reproductions thereof, accepted by the Engineer, which show the location, character, dimensions and details of the work to be performed. Unless noted otherwise within the Request for Proposals, the term “plans” refers to plans as developed by the Design-Build Team and accepted by the Department.

(A) Standard Drawings

Drawings approved for repetitive use, showing details to be used where appropriate. All Standard Drawings approved by the Department plus subsequent revisions and additions. Standard Drawings are available for purchase from:

State Contract Officer
1591 Mail Service Center
Raleigh, NC 27699-1591

(B) Preliminary Plans

Department-furnished drawings distributed in concert with a Request for Proposals, or as developed by the Design-Build Team.

(C) Project Plans

Construction drawings prepared, sealed and completed by the Design-Build Team, or as provided by the Department, that contain specific details and dimensions peculiar to the work.

(D) Working Drawings and Supplemental Drawings

Supplemental design sheets, shop drawings, or similar data which the Design-Build Team is required to submit to the Engineer.

(E) As-Constructed Drawings

Red-lined mark-up of the latest Released for Construction (RFC) Plans containing the information listed under As-Constructed Plans in the Records and Reports Section of the NCDOT Construction Manual.

(F) As-Built Plans

Coordinately correct plans documenting the details, dimensions and locations of the completed work.

PRICE PROPOSAL

The offer of a Proposer, submitted on the prescribed forms, to perform the work and furnish the labor and materials at the price quoted.

PROPOSER

An individual, partnership, firm, corporation, LLC, or joint venture formally submitting a Technical Proposal and Price Proposal in response to a Request for Proposals.

REQUEST FOR PROPOSALS

The paper document provided by the Department that the Proposer uses to develop his paper offer to perform the work at designated bid prices.

RIGHT OF WAY

The land area shown on the plans as right of way within which the project is to be constructed.

SCHEDULE OF VALUES

A schedule of work items necessary to complete work, along with the progress of each work item, primarily for the purpose of partial payments.

TABLE OF QUANTITIES

A listing of work items (corresponding to the items in the Trns*port pay item list) that contributes to a project completion. The table shall include estimated quantities for each work item.

TECHNICAL PROPOSAL

A submittal from a Proposer, in accordance with the Request for Proposals requirements, for the purpose of final selection. The Technical Proposal is defined to also include any supplemental information requested by the Department from a Proposer prior to opening bids.

SECTION 102
PROPOSAL REQUIREMENTS AND CONDITIONS

Page 1-9, delete Article 102-1 and replace with the following:

102-1 INVITATION TO BID

After the advertisement has been made, an Invitation to Bid will be made available to known prequalified contractors and any other contracting firms, material suppliers and other interested parties who have requested they be placed on the Invitation to Bid mailing list, informing them that Statements of Qualifications and Design-Build Proposals will be received for the design and construction of specific projects. Such invitation will indicate the contract identification number, length, locations and descriptions; a general summary of the scope of work to be performed; and information on how to receive a Request for Qualifications.

All projects will be advertised in daily newspapers throughout the state before the Price Proposal opening.

Page 1-12, delete Article 102-3 and replace with the following:

102-3 CONTENTS OF REQUEST FOR PROPOSALS

A Request for Proposals will be furnished by the Department to the selected Proposers from among the respondents to the Request for Qualifications. Each Request for Proposals will be marked on the front cover by the Department with an identifier of the Proposer to whom it is being furnished. This Request for Proposals will state the location of the project and will show a schedule of contract items for which Technical and Price Proposals are invited. It will set forth the dates and times Technical and Price Proposals are to be submitted and when the Price Proposals will be opened. The Request for Proposals will also include special provisions or requirements that vary from or are not contained in any preliminary design information or standard specifications.

The Request for Proposals will also include the printed contract forms and signature sheets for execution by both parties to the contract. In the event the Proposer is awarded the contract, execution of the Request for Proposals by the Proposer is considered the same as execution of the contract.

Standard specifications, sealed plans specifically identified as the Department's responsibility and other documents designated in the Request for Proposals shall be considered a part of the Request for Proposals whether or not they are attached thereto. All papers bound to the Request for Proposals are necessary parts thereof and shall not be detached, taken apart, or altered.

The names and identity of each prospective Proposer that receives a copy of the Request for Qualifications for the purposes of submitting a Statement of Qualifications shall be made public, except that a potential Proposer who obtains a Request for Qualifications may, at the time of ordering, request that his name remain confidential.

One copy of the Final Request for Proposals will be furnished to each prospective Proposer. Additional copies may be purchased for the sum of $25 each. The copy of the Final Request for Proposals marked with the Proposer's name and prequalification number shall be returned to the Department as the Proposer's Price Proposal.

Page 1-14, Article 102-7, 4th paragraph, delete the first two sentences and replace with the following:

Details shown in the subsurface investigation report are preliminary only. The subsurface investigation and subsurface report, if provided, is done so for information purposes only.

Pages 1-14, delete Article 102-8 and replace with the following:

102-8 PREPARATION AND SUBMISSION OF BIDS

All Price Proposals shall be prepared and submitted in accordance with the following requirements:

1. The Request for Proposals provided by the Department shall be used and shall not be taken apart or altered. The Price Proposal shall be submitted on the same form, which has been furnished to the Proposer by the Department as identified by the Proposer's name marked on the front cover by the Department.

2. All entries including signatures shall be written in ink.

3. The Proposer shall submit a lump sum or unit price for every item in the Request for Proposals. The lump sum or unit prices bid for the various contract items shall be written in figures.

4. An amount bid shall be entered in the Request for Proposals for every item and the price shall be written in figures in the "Amount Bid" column in the Request for Proposals.

5. An amount bid shall be entered in the Request for Proposals for every item on which a unit price has been submitted. The amount bid for each item other than lump sum items shall be determined by multiplying each unit bid price by the quantity for that item and shall be written in figures in the Amount Bid column in the Request for Proposals.

6. The total amount bid shall be written in figures in the proper place in the Request for Proposals. The total amount bid shall be determined by adding the amounts bid for each lump sum item.

7. Changes in any entry shall be made by marking through the entry in ink and making the correct entry adjacent thereto in ink. A representative of the Proposer shall initial the change in ink.

8. The Price Proposal shall be properly executed. To constitute proper execution, the Price Proposal shall be executed in strict compliance with the following:

    a. If a Price Proposal is by an individual, it shall show the name of the individual and shall be signed by the individual with the word "Individually" appearing under the signature. If the individual operates under a firm name, the Price Proposal shall be signed in the name of the individual doing business under the firm name.

    b. If the Price Proposal is by a corporation, it shall be executed in the name of the corporation by the President, Vice President, or Assistant Vice President. It shall be attested by the Secretary or Assistant Secretary. The seal of the corporation shall be affixed. If the Price Proposal is executed on behalf of a corporation in any other manner than as above, a certified copy of the minutes of the Board of Directors of said corporation authorizing the manner and style of execution and the authority of the person executing shall be attached to the Price Proposal or shall be on file with the Department.

c. If the Price Proposal is made by a partnership, it shall be executed in the name of the partnership by one of the general partners.

d. If the Price Proposal is made by a limited liability company, it shall be signed by the manager, member, or authorized agent.

e. If the Price Proposal is made by a joint venture, it shall be executed by each of the joint venturers in the appropriate manner set out above. In addition, the execution by the joint venturers shall appear below their names.

9. The Price Proposal shall not contain any unauthorized additions, deletions, or conditional bids.

10. The Proposer shall not add any provision reserving the right to accept or reject an award or to enter into a contract pursuant to an award.

11. The Price Proposal shall be accompanied by a bid bond on the form furnished by the Department or by a bid deposit. The bid bond shall be completely and properly executed in accordance with the requirements of Article 102-10 and as modified herein. The bid deposit shall be a certified check or cashier check in accordance with Article 102-10 and as modified herein.

12. The Price Proposal shall be placed in a sealed package and shall have been delivered to, and received by, the Department prior to the time specified in the Request for Proposals.

Page 1-17, Article 102-10, 3rd paragraph, delete the fifth sentence and replace with the following:

The condition of the bid bond or bid deposit is: the Principal shall not withdraw its bid within 75 days after the submittal of the same, and if the Department shall award a contract to the Principal, the Principal shall, within 14 calendar days after the written notice of award is received by him, give payment and performance bonds with good and sufficient surety as required for the faithful performance of the contract and for the protection of all persons supplying labor and materials in the prosecution of the work.

Page 1-18, Article 102-10, delete the end of the Article beginning with, and inclusive of, the 6th paragraph.

Pages 1-18, delete Article 102-12 and replace with the following:

102-12 WITHDRAWAL OR REVISION OF BIDS

A Design-Build Team will not be permitted to withdraw its Technical Proposal and / or Price Proposal after they have been submitted to the Department, unless allowed under Article 103-3 or unless otherwise approved by the Chief Engineer.

Page 1-19, delete Article 102-13 and replace with the following:

102-13 RECEIPT AND OPENING OF BIDS

Price Proposals from short-listed Proposers will be opened and read publicly on the date and time indicated in the Request for Proposals. The Technical Scores of the previously conducted evaluation of the Technical Proposals will also be read publicly in accordance with the procedures outlined in the Request for Proposals. Proposers, their authorized agents, and other interested parties are invited to be present.

Page 1-19, Article 102-14, replace the 1st paragraph with the following:

102-14 REJECTION OF BIDS

Any Price Proposal submitted which fails to comply with any of the requirements of Articles 102-8, 102-9 or 102-10, or with the requirements of the project scope and specifications shall be considered irregular and may be rejected. A Price Proposal that does not contain costs for all items in the Request for Proposals shall be considered irregular and may be rejected.

SECTION 103
AWARD AND EXECUTION OF CONTRACT

Page 1-21, delete Article 103-1 and replace with the following:

103-1 CONSIDERATION OF PRICE PROPOSALS

After the Price Proposals are opened and read, they will be tabulated. The Price Proposal and Technical Score of the Technical Proposal will be made available in accordance with procedures outlined in the Request for Proposals. In the event of errors, omissions, or discrepancies in the Price Proposal, corrections to the Price Proposal will be made in accordance with the provisions of Article 103-2. Such corrected bid prices will be used to determine the lowest adjusted price.

After the reading of the Price Proposals and Technical Scores, the Department will calculate the lowest adjusted price as described in the Request for Proposals.

The right is reserved to reject any or all Price Proposals, to waive technicalities, to request the Proposer with the lowest adjusted price to submit an up-to-date financial and operating statement, to advertise for new Price Proposals, or to proceed to do the work otherwise, if in the judgment of the Department, the best interests of the State will be promoted thereby.

Page 1-21, Subarticle 103-2(A), add items (6) and (7) as follows:

(6) Discrepancy in the "Total Amount Bid" and the addition of the "Amount Bid" for each line Item

In the case of the Total Amount Bid does not equal the summation of each Amount Bid for the line items, the summation of each Amount Bid for the line items shall be deemed to be the correct Total Amount Bid for the entire project.

(7) Omitted Total Amount Bid –Amount Bid Completed

If the Total Amount Bid is not completed and the Amount Bid for all line items is completed the Total Amount Bid shall be the summation of the Amount Bid for all the line items.

Page 1-23, Subarticle 103-4(A), first paragraph, replace the 3rd and 4th sentences with the following:

Where award is to be made, the notice of award will be issued within 75 days after the submittal of Price Proposals, except with the consent of the responsible Proposer with the lowest adjusted price the decision to award the contract to such bidder may be delayed for as long a time as may be agreed upon by the Department and such Proposer. In the absence of such agreement, the Proposer may withdraw his Price Proposal at the expiration of the 75 days without penalty if no notice of award has been issued.

Page 1-29, Article 103-6, delete the 1st and 2nd paragraphs and replace with the following:

Checks that have been furnished as a bid deposit will be retained until after the contract bonds have been furnished by the successful Proposer, at which time the checks that were furnished as a bid deposit will be returned.

SECTION 104
SCOPE OF WORK

Page 1-30, delete Article 104-1 and replace with the following:

104-1 INTENT OF CONTRACT

The intent of the contract is to prescribe the work or improvements that the Design-Build Team undertakes to perform, in full compliance with the contract documents. In case the method of construction or character of any part of the work is not covered by the contract, this section shall apply. The Design-Build Team shall perform all work in accordance with the contract or as may be modified by written orders, and shall do such additional, extra, and incidental work as may be considered necessary to complete the work to the full intent of the contract. Unless otherwise provided elsewhere in the contract, the Design-Build Team shall furnish all implements,

machinery, equipment, tools, materials, supplies, transportation, and labor necessary for the design, prosecution and completion of the work.

Page 1-30, Article 104-3, replace "plans or details of construction" with "contract" in all instances within this Article.

Page 1-39, delete Article 104-10 and replace with the following:

104-10 MAINTENANCE OF THE PROJECT

The Design-Build Team shall maintain the project from the date of beginning construction on the project until the project is finally accepted. For sections of facilities impacted by utility construction / relocation performed by the Design-Build Team prior to beginning construction on the roadway project, maintenance of the impacted sections of facilities shall be performed by the Design-Build Team beginning concurrently with the impact. This maintenance shall be continuous and effective and shall be prosecuted with adequate equipment and forces to the end that all work covered by the contract is kept in satisfactory and acceptable conditions at all times.

All existing and constructed guardrail / guiderail within the project limits shall be included in this maintenance. The Design-Build Team shall perform weekly inspections of all 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 seven consecutive calendar days of such inspection report.

The Design-Build Team shall maintain all existing drainage facilities, except where the work consists of resurfacing only, such that they are in the same condition upon acceptance of the project as they were when the project was made available to the Design-Build Team. In the event that the Design-Build Team's work is suspended for any reason, the Design-Build Team shall maintain the work covered by the contract, as provided herein. When a portion of the project is accepted as provided in Article 105-17, immediately after such acceptance, the Design-Build Team will not be required to maintain the accepted portion. Should latent defects be discovered or become evident in an accepted portion of the project, the Design-Build Team shall repair or replace the defective work at no cost to the Department.

Where an observation period(s) is required that extends beyond the final acceptance date, the Design-Build Team shall perform any work required by the observation period until satisfactory completion of the observation period.

With the exception of the maintenance of existing and constructed guardrail / guiderail, the Design-Build Team will not be directly compensated for any maintenance operations. The Design-Build Team will not be compensated for the performance of weekly inspections of guardrail / guiderail, and the damage reports required as described above. Authorized maintenance activities for existing and constructed guardrail / guiderail within the project limits will be paid for as extra work in accordance with Articles 104-7 and 104-8 of the NCDOT *Standard Specifications for Roads and Structures*.

SECTION 105
CONTROL OF WORK

Pages 1-44, delete Article 105-2 and replace with the following:

105-2 PLANS AND WORKING DRAWINGS

All plans shall be supplemented by such approved working drawings as are necessary to adequately control the work. Working drawings furnished by the Design-Build Team and approved by the Engineer shall consist of such detailed drawings as may be required to adequately control the work. They may include stress sheets, shop drawings, erection drawings, falsework drawings, cofferdam drawings, bending diagrams for reinforcing steel, catalog cuts, or any other supplementary drawings or similar data required of the Design-Build Team. When working drawings are approved by the Engineer, such approval shall not operate to relieve the Design-Build Team of any of his responsibility under the contract for the successful completion of the work.

Changes on shop drawings after approval and / or distribution shall be subject to the approval of the Engineer and he shall be furnished a record of such changes.

Page 1-45, Article 105-3, add the following after the 3rd paragraph:

The Design-Build Team shall bear all the costs of providing the burden of proof that the nonconforming work is reasonable and adequately addresses the design purpose. The Design-Build Team shall bear all risk for continuing with nonconforming work in question until it is accepted.

The Engineer may impose conditions for acceptance of the nonconforming work. The Design-Build Team shall bear all costs for fulfilling the conditions.

The decisions whether the product satisfies the design purpose, whether the nonconforming work is reasonably acceptable and the conditions for acceptance are at the sole discretion of the Engineer.

Pages 1-45, delete Article 105-4 and replace with the following:

105-4 COORDINATION OF PLANS, SPECIFICATIONS, SUPPLEMENTAL SPECIFICATIONS, AND SPECIAL PROVISIONS

The Request for Proposals, all construction Plans, the Standard Specifications, Supplemental Specifications and Special Provisions and all supplementary documents are essential parts of the contract and a requirement occurring in one is as binding as though occurring in all. They are complementary and describe and provide the complete contract.

In case of discrepancy or conflict, the order in which they govern shall be as follows:

(A) Request for Proposals, in which Project Special Provisions govern Standard Special Provisions

(B) Technical Proposal from the Design-Build Team

(C) Accepted Plans and Details from the Design-Build Team, or sealed plans provided by the Department, as applicable

(D) Standard Drawings

(E) Standard Specifications

Where dimensions on the plans are given or can be computed from other given dimensions they shall govern over scaled dimensions.

The Design-Build Team shall take no advantage of any error or omission in the plans, estimated quantities, or specifications. In the event the Design-Build Team discovers an error or omission, he shall immediately notify the Engineer.

Page 1-48, delete Article 105-9 and replace with the following:

105-9 CONTRUCTION STAKES, LINES, AND GRADES

The Design-Build Team shall be responsible for all surveying, construction staking and layout required in the performance of the work. The Design-Build Team shall be responsible for the accuracy of lines, slopes, grades and other engineering work which the Design-Build Team provides under this contract.

SECTION 106
CONTROL OF MATERIAL

Page 1-53, Article 106-2, add the following after the second paragraph:

Prior to beginning construction, the Design-Build Team shall provide a Table of Quantities as described in Article 101-3 of these specifications.

The Table of Quantities Work Items shall correspond to Pay Items as defined in the Standard Specifications. These Work Items have associated Materials and Conversion Factors. For non-standard Work Items, a Generic Work Item with the correct Unit of Measure and in an appropriate category will be used. For example, “GENERIC TRAFFIC CONTROL ITEM - EA” or “GENERIC RETAINING WALL ITEM - LF”. For these Generic Work Items, Materials must be defined and appropriate conversion factors submitted.

An initial Table of Quantities shall be submitted no later than 30 calendar days after the date of award. The Table of Quantities shall be updated and resubmitted within 14 days of when a set of Plans is sealed as Release for Construction (RFC) Plans, and whenever there are substantial changes to the Quantities on previously incorporated RFC Plans.

A Certified Table of Quantities shall be submitted with each pay request. All Certified Tables of Quantities shall indicate that the information accurately represents the materials used for the work performed for which payment is requested, and be notarized by a Design-Build Team representative.

Page 1-55, Article 106-6, add the following after the last paragraph:

For items normally pretested by the Department, the Design-Build Team shall provide a minimum of 30 days notice prior to the beginning of production of the items for this project along with final approved shop drawings.

SECTION 107
LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

Page 1-65, delete Article 107-18 and replace with the following:

107-18 FURNISHING RIGHT OF WAY

The responsibility for coordinating the securing of all necessary rights of way is as outlined in the Request for Proposals.

SECTION 108
PROSECUTION AND PROGRESS

Page 1-68, Article 108-2, replace the 2nd paragraph with the following:

The Design-Build Team shall submit a Progress Schedule for review within thirty (30) calendar days of receiving Notice of Award. The Department will review the Progress Schedule within twenty-one (21) calendar days of receipt. The Design-Build Team shall make any necessary corrections and adjustments to the Progress Schedule as necessitated by the Department's review within seven (7) calendar days. The Department will review the revised Progress Schedule within seven (7) calendar days of receipt.

Page 1-68, Subarticle 108-2(A)(1), add the following:

(k) Utility relocation and construction

Page 1-69, Subarticle 108-2(A)(2), add the following:

(h) Critical design submittal dates

(i) Critical permitting dates

(j) Completion of right of way acquisition

(k) Completion of utility relocation and construction

Page 1-69, Article 108-2, add the following:

(D) The Design-Build Team shall provide a written narrative each month detailing the work and percentage of work completed, anticipated sequence of upcoming work (two-month forecast), controlling operation(s), intermediate completion dates, and milestones. If any milestones are exceeded or will not be achieved, the Design-Build Team shall provide in the written narrative details of the delay; controlling operation affected, impacts to other operations, revisions to future intermediate completion dates and milestones, and remedial action necessary to get the project back to the original completion date.

Page 1-69, delete Article 108-3 and replace with the following:

108-3 PRECONSTRUCTION AND PRE-DESIGN CONFERENCES

The selected Design-Build Team shall meet with the Engineer for a pre-design conference concerning the design phase of the work. This conference shall be held prior to the commencement of work, as it is determined according to Article 108-1, and will be scheduled by the Engineer. At the predesign conference, the Design-Build Team shall furnish authorized signature forms and a list of all proposed subcontractors associated with the project design.

A preconstruction conference shall be held at least ten working days before construction activity begins. This second conference, concerning the construction phase, shall also be scheduled by the Engineer. The Design-Build Team shall give the Engineer a minimum of 45 days written notice before the Design-Build Team plans to begin construction activities. This will allow the Engineer time for any environmental agency representatives involved in the permitting process, as well as any other pertinent entities, to be scheduled to attend the preconstruction conference. If the Design-Build Team is responsible for utilities in accordance with Article 105-8 and the Request for Proposals, the Design-Build Team shall be responsible for coordinating with the Engineer in scheduling the utility owners attendance and for notifying the utility owners. The Design-Build Team shall also be responsible for coordinating with the Engineer in scheduling the attendance of subcontractors and others deemed appropriate, and for notifying them.

At the preconstruction conference, a list of any proposed subcontractors and major material suppliers associated with the construction of the project will be submitted.

If the contract has a DBE or WBE / MBE requirement, the Design-Build Team shall submit copies of completed and signed DBE or WBE / MBE subcontracts, purchase orders, or invoices to the Department.

In accordance with Article 1101-1 and the Request for Proposals, the Design-Build Team shall submit Transportation Management Plans, including but not limited to Temporary Traffic Control Plans. The Design-Build Team shall designate an employee who is competent and experienced in transportation management to implement and monitor the Transportation Management Plans. The qualifications of the designated employee must be satisfactory to the Engineer.

The Design-Build Team shall submit a Safety Plan and designate an employee as the Safety Supervisor.

Both plans shall be submitted at the preconstruction conference and must be satisfactory to the Engineer. Should the design plan include activities that would place personnel on the work site, Temporary Traffic Control Plans and a Safety Plan for those activities shall be submitted at the predesign conference.

During the preconstruction conference, the Engineer will designate a Department employee or employees who will be responsible to see that the Transportation Management Plans, including but not limited to the Temporary Traffic Control Plans, and any alterations thereto are implemented and monitored to the end that traffic is carried through the work in an effective manner. If approved by the Engineer, the Design-Build Team may designate one employee to be responsible for both the Temporary Traffic Control Plans and the Safety Plan. The Design-Build Team shall not designate its superintendent as the responsible person for either the Temporary Traffic Control Plans or the Safety Plan, unless approved by the Engineer.

If the project requires the Design-Build Team or State personnel work from falsework, within shoring, or in any other hazardous area, the Design-Build Team shall submit, as part of the Design-Build Team's Safety Plan, specific measures that will be used to ensure worker safety.

The Design-Build Team shall also submit a program for erosion control and pollution prevention on all projects involving clearing and grubbing, earthwork, structural work, or other construction, when such work is likely to create erosion or pollution problems.

If the Design-Build Team fails to provide the required submissions, the Engineer may order the preconstruction conference suspended until such time as they are furnished. Work shall not begin until the preconstruction conference has been concluded and the Safety Plan has been approved, unless authorized by the Engineer. The Design-Build Team shall not be entitled to additional compensation or an extension of contract time resulting from any delays due to such a suspension.

The Design-Build Team shall designate a qualified employee as Quality Control Manager. The Quality Control Manager shall be responsible for implementing and monitoring the quality control requirements of the project.

Page 1-69, Article 108-4, add the following sentence to the end of this article:

The Design-Build Team shall record the proceedings of these conferences and distribute the final minutes of the conferences to all attendees.

Page 1-70, Article 108-6, replace "40%" with "30%" in the 1st paragraph.

Page 1-71, Article 108-6, replace "35%" with "25%" in the 2nd paragraph.

Pages 1-72, delete Article 108-8 and replace with the following:

108-8 FAILURE TO MAINTAIN SATISFACTORY PROGRESS

The Engineer will check the Design-Build Team's progress at the time each partial pay request is received. The Design-Build Team's progress may be considered as unsatisfactory if, according to the Progress Schedule, the projected finish date for all work exceeds the scheduled finish date by more than 10%.

When the Design-Build Team's progress is found to be unsatisfactory as described above, the Engineer may make written demand of the Design-Build Team to state in writing the reason for the unsatisfactory progress and produce such supporting data as the Engineer may require or the Design-Build Team may desire to submit. The Engineer will consider the justifications submitted by the Design-Build Team and extensions of the completion date that have or may be allowed in accordance with Subarticle 108-10(B) and as modified herein.

When the Design-Build Team cannot satisfactorily justify the unsatisfactory progress the Engineer may invoke one or more of the following sanctions:

1. Withhold anticipated liquidated damages from amounts currently due or which become due.

2. Remove the Design-Build Team and individual managing firms of the Design-Build Team and / or prequalified design firms from the Department's Prequalified Bidders List.

When any of the above sanctions have been invoked, they shall remain in effect until rescinded by the Engineer.

Page 1-75, Subarticle 108-10(B), add the following as the first paragraph:

Only delays to activities which affect the completion date or intermediate contract date will be considered for an extension of contract time. No extensions will be granted until a delay occurs which impacts the project's critical path and extends the work beyond the contract completion date or intermediate completion date. Any extension to the completion date or intermediate contract date will be based on the number of calendar days the completion date or intermediate completion date is impacted as determined by the Engineer's analysis.

Pages 1-75, delete Subarticle 108-10(B)(1) in its entirety.

Page 1-78, delete Subarticle 108-13(D)(2) in its entirety.

SECTION 109
MEASUREMENT AND PAYMENT

Page 1-80, Article 109-2, delete the last sentence of the 1st paragraph and replace with the following:

Payment to the Design-Build Team will be made only for the work completed, certified and accepted in accordance with the terms of the contract.

Pages 1-85, delete Subarticle 109-4(A) and replace with the following:

109-4 PARTIAL PAYMENTS

(A) General

Partial payments will be based upon progress estimates prepared by the Engineer at least once each month on the date established by the Engineer. Partial payments may be made twice each month if in the judgment of the Engineer the amount of work performed is sufficient to warrant such payment. No partial payment will be made when the total value of work performed since the last partial payment amounts to less than $10,000.00. Partial payments will be approximate only and will be subject to correction in the final estimate and payment.

When the contract includes one lump sum price for the entire work required by the contract, partial payments for the lump sum Design-Build price shall be based on a certified Schedule of Values submitted by the successful Design-Build Team and approved by the Engineer. The certification shall indicate the Design-Build Team has reviewed the information submitted and the information accurately represents the work performed for which payment is requested. The certified Schedule of Values shall be submitted no later than 30 calendar days after the date of award. Each item on the certified Schedule of Values shall be assigned a cost and quantity and shall be identified as an activity on the Progress Schedule. A revised certified Schedule of Values shall be submitted with each update of the Progress Schedule as described in Article 108-2, and as modified herein, or when requested by the Engineer. A certified copy of the Table of Quantities shall also be submitted with each payment request. The certification of the Table of Quantities shall indicate the Design-Build Team has reviewed the information submitted and the information accurately represents the materials for the work performed for which payment is requested.

When the contract includes lump sum items for portions of the work required by the contract, and the applicable section of the Specifications or Request for Proposals specify the means by which the total amount bid be included in the partial pay estimates, the

Engineer will determine amounts due on the partial pay estimate in accordance with the applicable portion of the Specifications or Request for Proposals.

The Engineer will withhold an amount sufficient to cover anticipated liquidated damages as determined by the Engineer.

Page 1-86, Subarticle 109-5(D), delete the 4th and 5th paragraphs and replace with the following:

Partial payments will not be made on seed or any living or perishable plant materials.

Partial payment requests shall not be submitted by the Design-Build Team until those items requested have corresponding signed and sealed RFC Plans accepted by the Department.

Pages 1-88, Article 109-10, add the following as bullets (E) and (F) under the 1st paragraph.

(E) As-Constructed Drawings, As-Built Plans and other documents required elsewhere in this RFP.

(F) Documents or guarantees to support any warranty provided by the Design Build Team.

County : Durham, Orange

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
			ROADWAY ITEMS			
0001	0000996000-N	SP	DESIGN AND CONSTRUCTION	Lump Sum	L.S.	

1231/Mar18/Q1.0/D996000/E1 **Total Amount Of Bid For Entire Project :**

FUEL USAGE FACTOR CHART AND ESTIMATE OF QUANTITIES

Description of Work	Units	Fuel Usage Factor Diesel #2	Estimate of Quantities
Unclassified Excavation	Gal / CY	0.29	_____ CY
Borrow Excavation	Gal / CY	0.29	_____ CY
Class IV Subgrade Stabilization Aggregate Base Course Sub-Ballast Aggregate for Cement Treated Base Course	Gal / Ton	0.55	_____ Tons
Portland Cement for Cement Treated Base Course	Gal / Ton	0.55	_____ Tons
* Asphalt Concrete Base Course	Gal / Ton	_____ 0.90 _____ 2.90	_____ Tons
* Asphalt Concrete Intermediate Course	Gal / Ton	_____ 0.90 _____ 2.90	_____ Tons
* Asphalt Concrete Surface Course	Gal / Ton	_____ 0.90 _____ 2.90	_____ Tons
* Open-Graded Asphalt Friction Course	Gal / Ton	_____ 0.90 _____ 2.90	_____ Tons
* Permeable Asphalt Drainage Course	Gal / Ton	_____ 0.90 _____ 2.90	_____ Tons
* Sand Asphalt Surface Course, Type SA-1	Gal / Ton	_____ 0.90 _____ 2.90	_____ Tons
Portland Cement Concrete Pavement Through Lanes and Shoulders (> 11”) Through Lanes and Shoulders (9” to 11”) Through Lanes and Shoulders (< 9”)	Gal / SY	 0.327 0.272 0.245	 _____ SY _____ SY _____ SY
** Structural Concrete (Cast-in-Place Only)	Gal / CY	0.98	_____ CY

* Select 0.90 **OR** 2.90

** Structural Concrete shall be defined as cast-in-place Class A or Class AA concrete used in the construction of major structures for various work items identified in Division 4 of the 2018 *Standard Specifications for Roads and Structures*.

☐ The above quantities represent a reasonable estimate of the total quantities anticipated, for each item, as pertaining to fuel price adjustments, and is representative of the design proposed in the Technical Proposal submitted under separate cover.

Or

☐ The Design-Build Team elects not to pursue reimbursement for Fuel Price Adjustments on this project.

The information submitted on this sheet is claimed as a “Trade Secret” in accordance with the requirements of G.S. 66-152(3) until such time as the Price Proposal is opened.

_____ _____

Signature, Title Dated

_____

Print Name, Title

(Submit a copy of this sheet in a separate sealed package with the outer wrapping clearly marked “Fuel Price Adjustment” and deliver with the Technical Proposal submittal.)

LISTING OF DBE SUBCONTRACTORS

Sheet _____ of _____

Firm Name and Address	Item No.	Item Description	* Agreed upon Unit Price	** Dollar Volume of Item
Name Address				
Name Address				
Name Address				
Name Address				
Name Address				
Name Address				
Name Address				

This form must be completed in order for the Bid to be considered responsive and be publicly read.
Bidders with no DBE participation must so indicate this on the form by entering the word or number *zero*.

LISTING OF DBE SUBCONTRACTORS

Sheet _____ of _____

Firm Name and Address	Item No.	Item Description	* Agreed upon Unit Price	** Dollar Volume of Item
Name Address				
Name Address				
Name Address				
Name Address				
Name Address				
Name Address				
Name Address				

This form must be completed in order for the Bid to be considered responsive and be publicly read.
Bidders with no DBE participation must so indicate this on the form by entering the word or number *zero*.

LISTING OF DBE SUBCONTRACTORS

Sheet _____ of _____

Firm Name and Address	Item No.	Item Description	* Agreed upon Unit Price	** Dollar Volume of Item
Name Address				
Name Address				
Name Address				
Name Address				
Name Address				
Name Address				
Name Address				

This form must be completed in order for the Bid to be considered responsive and be publicly read.
Bidders with no DBE participation must so indicate this on the form by entering the word or number *zero*.

LISTING OF DBE SUBCONTRACTORS

Sheet _____ of _____

Firm Name and Address	Item No.	Item Description	* Agreed upon Unit Price	** Dollar Volume of Item
Name Address				
Name Address				
Name Address				
Name Address				

COST OF CONSTRUCTION WORK ONLY $ _____

*****The Dollar Volume shown in this column shall be the Actual Price Agreed Upon by the Prime Contractor and the DBE subcontractor, and these prices will be used to determine the percentage of the DBE participation in the contract.

** Dollar Volume of DBE Subcontractor $ _____

Percentage of Total Construction Cost _____ %

(Including Right of Way Acquisition Services)

** - Must have entry even if figure to be entered is zero.

** - *If firm is a Material Supplier Only, show Dollar Volume as 60% of Agreed Upon Amount from Letter of Intent.*
If firm is a Manufacturer, show Dollar Volume as 100% of Agreed Upon Amount from Letter of Intent.

This form must be completed in order for the Bid to be considered responsive and be publicly read.
Bidders with no DBE participation must so indicate this on the form by entering the word or number *zero*.

EXECUTION OF BID
NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN CERTIFICATION

CORPORATION

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the Bidder has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the Bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

N.C.G.S. § 133-32 and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

SIGNATURE OF CONTRACTOR

_____
Full name of Corporation

_____
Address as prequalified

Attest _____ By _____

Secretary / Assistant Secretary
Select appropriate title

President / Vice President / Assistant Vice President
Select appropriate title

_____
Print or type Signer's name

_____
Print or type Signer's name

CORPORATE SEAL

EXECUTION OF BID
NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN CERTIFICATION

PARTNERSHIP

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the bidder has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

N.C.G.S. § 133-32 and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

SIGNATURE OF CONTRACTOR

_____
Full Name of Partnership

_____
Address as Prequalified

_____ By _____
Signature of Witness Signature of Partner

_____ _____
Print or type Signer's name Print or type Signer's name

EXECUTION OF BID
NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN CERTIFICATION

LIMITED LIABILITY COMPANY

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the bidder has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

N.C.G.S. § 133-32 and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

SIGNATURE OF CONTRACTOR

_____
Full Name of Firm

_____
Address as Prequalified

Signature of Witness	Signature of Member / Manager / Authorized Agent *Select appropriate title*
Print or type Signer's name	Print or type Signer's Name

EXECUTION OF BID
NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN CERTIFICATION

JOINT VENTURE (2) or (3)

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the bidder has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the bidder has not been convicted of violating N.C.G.S. § 133-24 within the last three years, and that the Bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

N.C.G.S. § 133-32 and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

SIGNATURE OF CONTRACTORS

Instructions: **2 Joint Venturers** Fill in lines (1), (2) and (3) and execute. **3 Joint Venturers** Fill in lines (1), (2), (3) and (4) and execute. On Line (1), fill in the name of the Joint Venture Company. On Line (2), fill in the name of one of the joint venturers and execute below in the appropriate manner. On Line (3), print or type the name of the other joint venturer and execute below in the appropriate manner. On Line (4), fill in the name of the third joint venturer, if applicable and execute below in the appropriate manner.

(1) _____
Name of Joint Venture

(2) _____
Name of Contractor

_____
Address as prequalified

Signature of Witness or Attest	By	Signature of Contractor
Print or type Signer's name		Print or type Signer's name

If Corporation, affix Corporate Seal and

(3) _____
Name of Contractor

_____
Address as prequalified

Signature of Witness or Attest	By	Signature of Contractor
Print or type Signer's name		Print or type Signer's name

If Corporation, affix Corporate Seal and

(4) _____
Name of Contractor *(for 3 Joint Venture only)*

_____
Address as prequalified

Signature of Witness or Attest	By	Signature of Contractor
Print or type Signer's name		Print or type Signer's name

If Corporation, affix Corporate Seal

EXECUTION OF BID
NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN CERTIFICATION

INDIVIDUAL DOING BUSINESS UNDER A FIRM NAME

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the bidder has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

N.C.G.S. § 133-32 and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

SIGNATURE OF CONTRACTOR

Name of Contractor _____
Individual name

Trading and doing business as _____
Full name of Firm

_____
Address as Prequalified

_____	_____
Signature of Witness	Signature of Contractor, Individually
_____	_____
Print or type Signer's name	Print or type Signer's name

EXECUTION OF BID
NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN CERTIFICATION

INDIVIDUAL DOING BUSINESS IN HIS OWN NAME

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the bidder has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

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SIGNATURE OF CONTRACTOR

Name of Contractor _____
Print or type Individual name

_____
Address as Prequalified

_____
Signature of Contractor, Individually

_____
Print or type Signer's Name

_____
Signature of Witness

_____
Print or type Signer’s name

DEBARMENT CERTIFICATION

Conditions for certification:

1. The prequalified bidder shall provide immediate written notice to the Department if at any time the bidder learns that his certification was erroneous when he submitted his debarment certification or explanation that is file with the Department, or has become erroneous because of changed circumstances.

2. The terms *covered transaction, debarred, suspended, ineligible, lower tier covered transaction, participant, person, primary covered transaction, principal, proposal,* and *voluntarily excluded,* as used in this provision, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549. A copy of the Federal Rules requiring this certification and detailing the definitions and coverages may be obtained from the Contract Officer of the Department.

3. The prequalified bidder agrees by submitting this form, that he will not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in NCDOT contracts, unless authorized by the Department.

4. For Federal Aid projects, the prequalified bidder further agrees that by submitting this form he will include the Federal-Aid Provision titled *Required Contract Provisions Federal-Aid Construction Contract (Form FHWA PR* 1273) provided by the Department, without subsequent modification, in all lower tier covered transactions.

5. The prequalified bidder may rely upon a certification of a participant in a lower tier covered transaction that he is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless he knows that the certification is erroneous. The bidder may decide the method and frequency by which he will determine the eligibility of his subcontractors.

6. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this provision. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

7. Except as authorized in paragraph 6 herein, the Department may terminate any contract if the bidder knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available by the Federal Government.

DEBARMENT CERTIFICATION

The prequalified bidder certifies to the best of his knowledge and belief, that he and his principals:

a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

b. Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records; making false statements; or receiving stolen property;

c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph b. of this certification; and

d. Have not within a three-year period preceding this proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

e. Will submit a revised Debarment Certification immediately if his status changes and will show in his bid proposal an explanation for the change in status.

If the prequalified bidder cannot certify that he is not debarred, he shall provide an explanation with this submittal. An explanation will not necessarily result in denial of participation in a contract.

Failure to submit a non-collusion affidavit and debarment certification will result in the prequalified bidder's bid being considered non-responsive.

☐ Check here if an explanation is attached to this certification.

Contract No.: **C204632**

Counties: **Orange and Durham**

ACCEPTED BY THE
DEPARTMENT OF TRANSPORTATION

Contract Officer

Date

Execution of Contract and Bonds
Approved as to Form:

Attorney General