

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

FIRST INDUSTRY DRAFT REQUEST FOR PROPOSALS
DESIGN-BUILD PROJECT



TIP I-5507 / R-0211EC / U-4714AB

February 15, 2018



VOID FOR BIDDING

DATE AND TIME OF TECHNICAL AND PRICE PROPOSAL SUBMISSION: **June 26, 2018 BY 4:00 PM**

DATE AND TIME OF PRICE PROPOSAL OPENING: **July 17, 2018 AT 2:00 PM**

CONTRACT ID: C203970

WBS ELEMENT NO. 43609.3.2

FEDERAL-AID NO. N/A

COUNTY: Mecklenburg

ROUTE NO. I-485 (Charlotte Outer Loop)

MILES: 16.6

LOCATION: I-485 from I-77 to US 74 (Independence Boulevard); I-485 / Weddington Road Interchange; and I-485 / East John Street – Old Monroe Road Interchange

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. C203970
IN MECKLENBURG COUNTY, 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. C203970; 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. C203970 in Mecklenburg County 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 otherwise noted 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 Standard Specifications.

Although the Department has furnished preliminary designs for this project, unless otherwise noted 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 is to 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 Design-Build 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 shall fail to provide the required payment and performance bonds with the Department of Transportation, under the condition of this proposal, within 14 calendar days after the written notice of award is received by them, as provided in the Standard Specifications; otherwise said deposit will be returned to the Design-Build Team.

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PROPOSAL FORMS - ITEMIZED SHEET, ETC.

Itemized Proposal Sheet

Fuel Usage Factor Chart and Estimate of Quantities

Listing of MBE & WBE 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 August 27, 2018, 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 October 1, 2022.

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 **Five Thousand Dollars (\$ 5000.00)** 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 **One Thousand Five Hundred Dollars (\$ 1500.00)** 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 **Five Thousand Dollars (\$ 5000.00)** per calendar day will be applicable to the early date for substantial completion proposed by the bidder. Liquidated damages of **One Thousand Five Hundred Dollars (\$ 1500.00)** 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.

OTHER LIQUIDATED DAMAGES AND INCENTIVES

(3/22/07) (Rev. 02/14/08)

DB1 G11

Reference the Transportation Management Scope of Work found elsewhere in this RFP for more information on the following time restrictions and liquidated damages:

Liquidated Damages for Intermediate Contract Time #1 for lane narrowing, lane closure, holiday and special event time restrictions for I-485, including all collector distributors, ramps and loops; and US 521 (Johnston Road) are \$2,500.00 per 15-minute period or any portion thereof.

Liquidated Damages for Intermediate Contract Time #2 for lane narrowing, lane closure, holiday and special event time restrictions for Westinghouse Boulevard, Tilley Morris Road, Weddington Road, East John Street / Monroe Road, Elm Lane and Ballantyne Commons Parkway are \$1,500.00 per 15 minute period or any portion thereof.

Liquidated Damages for Intermediate Contract Time #3 for road closure time restrictions for I-485 and I-485 ramps and loops, and US 521 are \$5,000.00 per 15-minute period or any portion thereof.

Liquidated Damages for Intermediate Contract Time #4 for road closure time restrictions for Westinghouse Boulevard, Tilley Morris Road, Weddington Road, Elm Lane, Ballantyne Commons Parkway and East John Street are \$2,500.00 per 15-minute period or any portion thereof.

Refer to the ITS Scope of Work for more information on the following liquidated damages:

Liquidated Damages for Intermediate Contract Time #5 for failure to repair and / or maintain the toll / ITS devices and restore communication, including, but not limited to communications with the Metrolina Transportation Management Center, within the timeframes specified in the ITS Scope of Work found elsewhere in this RFP are \$2,500 per occasion, per toll / ITS device, per 24-hour period or any portion thereof, until corrected. (Note – Liquidated Damages for Intermediate Contract Time #5 shall be calculated separately for the toll and ITS communications cable / conduit.)

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 Liquidated Damages Section.

PAYOUT SCHEDULE

(11-16-09)

DB1 G13

No later than 12:00 o'clock noon on the sixth day after the opening of the Price Proposal, 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 information 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 schedule shall include a monthly percentage breakdown (in terms of the total contract amount percentages) of the work anticipated to be completed. The schedule shall begin with the Date of Availability and end with the Actual Completion Date proposed by the Design-Build Team. If the 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.

Submit updates of the Anticipated Monthly Payout Schedule on March 15, June 15, September 15, and December 15 of each calendar year until project acceptance. Submit all updates to the Resident Engineer with a copy to the State Construction Engineer at 1 South Wilmington St, 1543 Mail Service Center, Raleigh, NC 27699-1543.

MOBILIZATION

(8-28-17)

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 and Price 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 \$ 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 Price Proposal and the copy of the *Fuel Usage Factor Chart and Estimate of Quantities* sheet are submitted.

(E) Failure to Submit

Failure to submit the completed *Fuel Usage Factor Chart and Estimate of Quantities* sheet separately 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 attempt to arrange for a meeting between each individual proposer and the affected utility owners. The Department will attempt to arrange for a meeting between each individual proposer, the Norfolk Southern Railway and CSX Transportation.

After issuance of the First Industry Draft RFP, the Department will attempt to arrange a meeting between each individual proposer and the affected utility owners. After issuance of the Second Industry Draft RFP, the individual proposer may request a second individual meeting with the utility owners (maximum 90-minute time limit). The proposer shall request an additional meeting with the utility owners in writing to the State Contract Officer, providing the Department a minimum of two weeks' notice of the requested date and the utility owners that are requested to be in attendance. The Department will attempt to arrange the requested additional meeting; but makes no assurance that the request will be honored or that all utility owners requested will be in attendance.

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. This meeting may occur at any time after the first Question and Answer Session with the proposers and before two weeks prior to the Technical and Price Proposals submittal date. The proposer shall request this 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.

Additional individual meetings may be permitted in accordance with the *Alternative Technical Concepts and Confidential Questions* Project Special Provision found elsewhere in this RFP.

**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 Technical and 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 Design-Build Proposal.
2. The Proposer shall deliver the Design-Build Proposal to the place indicated, and prior to the time indicated in this Request for Proposals.

3. The Design-Build Proposal documents shall be signed by an authorized employee of the Proposer.
4. The Design-Build Proposal shall be accompanied by Bid surety in the form of a Bid Bond or Bid Deposit, dated the day of Technical and 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 defined as 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 have 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 RFP 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 the issuance of the Final RFP, Confidential Questions may be asked by requesting a meeting with the State Contract Officer. The request shall be in writing and provide sufficient detail to evaluate the magnitude of the request. Questions shall be of such magnitude as to warrant a special meeting. Minor questions will not be acknowledged or answered. After evaluation, the State Contract Officer will respond to the question in writing to the Design-Build Team 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.

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

Alternative Technical Concepts

The Design-Build Team will be allowed to submit a maximum of eight Alternative Technical Concepts. Excluding (1) Formal ATCs that are submitted in response to the Department's favorable review of a Preliminary ATC and (2) ATCs that are deemed to take advantage of an error or omission in the RFP, 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 shall count towards the maximum number of allowable ATCs). Should the Design-Build Team submit a single ATC with multiple concepts, the Department may 1) return the unevaluated ATC to the proposer requiring submittal(s) with an individual concept or 2) consider the ATC multiple ATCs that count towards the maximum number of allowable ATCs.

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 three 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 and Price Proposals.

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. 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 Technical and Price Proposals.

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 Technical and Price Proposals.

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 regard to 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) any obligation that may arise under applicable laws and regulations; and (3) any obligation mandated by the regulatory agencies as a permit condition.

ATC Submittals

Each ATC submittal shall include three individually bound hard copies and an electronic .pdf file of the entire submittal and shall be submitted to the State Contract Officer at the address provided elsewhere in this RFP.

Formal ATCs

Each Formal ATC submittal shall include the following information:

- 1) **Description** - A detailed description and schematic drawings of the configuration of the ATC or other appropriate descriptive information (including, if appropriate, product details [i.e., specifications, construction tolerances, special provisions] 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;
- 5) **Impacts** - Discussion of potential impacts on vehicular traffic, environmental impacts identified, community impact, 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; and
- 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 will result in a disqualification of that ATC.

The Department may request additional information regarding a proposed ATC at any time. 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.

The Department may conduct confidential one-on-one meeting(s) to discuss the Design-Build Team's ATC. 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 ATCs from more than one Design-Build Team 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 ATC is approved.
- 2) The ATC is not approved.
- 3) The 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 ATC (i.e., the concept complies with the baseline requirements of the RFP).
- 5) The submittal does not qualify as an ATC and may not be included in the Design-Build Proposal.
- 6) The 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 ATC will not be considered, and the RFP will be revised to correct the error or omission.
- 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.
- 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. This response could also follow and supersede one of the other previously supplied responses above.
- 9) The ATC contains multiple concepts and the Department did not evaluate any of the concepts. Should the Design-Build Team wish to pursue one or more of the concepts presented in the ATC, a submittal for each individual concept will 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.

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 benefits of said concept. The purpose of allowing such 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 provide written comments that include one of the responses noted below. The Department's response to a Preliminary ATC submittal will be either (1) that the Preliminary ATC is denied; (2) that the Preliminary ATC would be considered as a Formal ATC if the Team so elects to pursue a Formal ATC submission; (3) that an ATC is not required; (4) 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; (5) more than one ATC has been received on the same topic and the Department has elected to exercise its right to revise the RFP; or (6) that the ATC takes advantage of an error or omission in the RFP or other documents incorporated into the contract by reference, in which case the ATC will not be considered and the RFP will be revised to correct the error or omission. 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 a Technical Proposal.

SCHEDULE OF ESTIMATED COMPLETION PROGRESS

(9-1-11) (Rev. 8/31/17)

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, is as follows:

<u>Fiscal Year</u>	<u>Progress (% of Dollar Value)</u>
2019 (07/01/18 – 06/30/19)	14% of Total Amount Bid
2020 (07/01/19 – 06/30/20)	37% of Total Amount Bid
2021 (07/01/20 – 06/30/21)	30% of Total Amount Bid
2022 (07/01/21 – 06/30/22)	16% of Total Amount Bid
2023 (07/01/22 – 06/30/23)	3% of Total Amount Bid

The Design-Build Team shall also furnish its own progress schedule in accordance with Article 108-2 of the 2018 *Standard Specifications for Roads and Structures*. 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.

MINORITY BUSINESS ENTERPRISE AND WOMEN BUSINESS ENTERPRISE

(10-16-07) (Rev. 8-30-17)

102-15(J)

DB1 G66

Description

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

Definitions

Additional MBE / WBE Subcontractors - Any MBE / WBE submitted at the time of bid that will not be used to meet either the MBE or WBE goal. No submittal of a Letter of Intent is required, unless the additional participation is used for banking purposes.

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

Contract Goals Requirement - The approved MBE and WBE participation at time of award, but not greater than the advertised contract goals for each.

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

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

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

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

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

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

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

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

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

Forms and Websites Referenced in this Provision

Payment Tracking System - On-line system in which the Design-Build Team enters the payments made to MBE and WBE subcontractors who have performed work on the project.

<https://apps.dot.state.nc.us/Vendor/PaymentTracking/>

DBE-IS Subcontractor Payment Information - Form for reporting the payments made to all MBE/WBE firms working on the project. This form is for paper bid projects only.

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

RF-1 MBE / WBE Replacement Request Form - Form for replacing a committed MBE or WBE.

<http://connect.ncdot.gov/projects/construction/Construction%20Forms/DBE%20MBE%20WBE%20Replacement%20Request%20Form.pdf>

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

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

JC-1 *Joint Check Notification Form* - Form and procedures for joint check notification. The form acts as a written joint check agreement among the parties providing full and prompt disclosure of the expected use of joint checks.

<http://connect.ncdot.gov/projects/construction/Construction%20Forms/Joint%20Check%20Notification%20Form.pdf>

Letter of Intent - Form signed by the Contractor and the MBE / WBE subcontractor, manufacturer or regular dealer that affirms that a portion of said contract is going to be performed by the signed MBE / WBE for the amount listed at the time of bid.

<http://connect.ncdot.gov/letting/LetCentral/Letter%20of%20Intent%20to%20Perform%20as%20a%20Subcontractor.pdf>

Listing of MBE and WBE Subcontractors Form - Form for entering MBE / WBE subcontractors on a project that will meet this MBE and WBE goals continued elsewhere in the RFP. This form is for paper bids only.

[http://connect.ncdot.gov/municipalities/Bid%20Proposals%20for%20LGA%20Content/09%20MBE-WBE%20Subcontractors%20\(State\).doc](http://connect.ncdot.gov/municipalities/Bid%20Proposals%20for%20LGA%20Content/09%20MBE-WBE%20Subcontractors%20(State).doc)

Subcontractor Quote Comparison Sheet - Spreadsheet for showing all subcontractor quotes in the work areas where MBEs and WBEs quoted on the project. This sheet is submitted with good faith effort packages.

<http://connect.ncdot.gov/business/SmallBusiness/Documents/DBE%20Subcontractor%20Quote%20Comparison%20Example.xls>

MBE and WBE Goal

The following goals for participation by Minority Business Enterprises and Women Business Enterprises are established for this contract:

- (A) Minority Business Enterprises %
- (1) *If the MBE goal is more than zero*, the Design-Build Team shall exercise all necessary and reasonable steps to ensure that MBEs participate in at least the percent of the contract as set forth above as the MBE goal.
 - (2) *If the MBE goal is zero*, the Design-Build Team shall make an effort to recruit and use MBEs during the performance of the contract. Any MBE participation obtained shall be reported to the Department.

(B) Women Business Enterprises %

- (1) *If the WBE goal is more than zero*, the Design-Build Team shall exercise all necessary and reasonable steps to ensure that WBEs participate in at least the percent of the contract as set forth above as the WBE goal.
- (2) *If the WBE goal is zero*, the Design-Build Team shall make an effort to recruit and use WBEs during the performance of the contract. Any WBE participation obtained shall be reported to the Department.

This goal is to be met through utilization of highway construction contractors and / or right of way acquisition firms. Utilization of MBE / WBE 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 MBE and WBE certified shall be used to meet the MBE and WBE goals respectively. The Directory can be found at the following link:

<https://partner.ncdot.gov/VendorDirectory/default.html>

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

Listing of MBE / WBE Subcontractors

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

- (1) *If either the MBE or WBE goal is more than zero*,
 - (a) Proposers, at the time the Price Proposal is submitted, shall submit a listing of MBE / WBE participation, including the names and addresses on *Listing of MBE and WBE Subcontractors* contained elsewhere in the contract documents in order for the Price Proposal to be considered

responsive. Proposers shall indicate the total dollar value of the MBE and WBE participation for the contract.

- (b) If Proposers have no MBE or WBE participation, they shall indicate this on the *Listing of MBE and WBE Subcontractors* by entering the word “None” or the number “0.” This form shall be completed in its entirety. **Blank forms will not be deemed to represent zero participation.** Price Proposals submitted that do not have MBE and WBE participation indicated on the appropriate form will not be read publicly during the opening of 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 MBE / WBE is certified at the time of bid by checking the Directory of Transportation Firms. If the firm is not certified at the time of the opening of the Price Proposals, that MBE’s or WBE’s participation will not count towards achieving the corresponding goal.
- (2) *If either the MBE or WBE goal is zero, entries on the Listing of MBE and WBE Subcontractors are not required for the zero goal, however any MBE or WBE participation that is achieved during the project shall be reported in accordance with requirements contained elsewhere in the special provision.*

MBE or WBE Prime Contractor

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

For example, on a proposed contract, the WBE goal is 10.0%, and the MBE goal is 8.0%. A WBE proposer puts in a bid where they will perform 40.0% of the contract work and have a WBE subcontractor which will perform another 5.0% of the work. Together the two WBE firms submit on the *Listing of MBE and WBE Subcontractors* a value of 45.0% of the contract which fulfills the WBE goal. The 8.0% MBE goal shall be obtained through MBE participation with MBE certified subcontractors or documented through a good faith effort. It should be noted that you cannot combine the two goals to meet an overall value. The two goals shall remain separate.

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

Written Documentation – Letter of Intent

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

The documentation shall be received in the office of the State Contractor Utilization Engineer or at DBE@ncdot.gov no later than 10:00 a.m. 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 MBE and WBE to be used toward the MBE and WBE goals, or if the form is incomplete (i.e. both signatures are not present), the MBE / WBE participation will not count toward meeting the MBE / WBE goal. If the lack of this participation drops the commitment below either the MBE or WBE goal, the Design-Build Team shall submit evidence of good faith efforts for the goal not met, 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 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 either the MBE or the WBE goal, the Proposer with the apparent adjusted low price shall submit to the Department documentation of adequate good faith efforts made to reach that specific goal(s).

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 Price Proposals unless the sixth day falls on an official state holiday. In that situation, it would be due in the office of the State Contractor Utilization Engineer no later than 10:00 a.m. on the next official state business day. If the Design-Build Team cannot send the information electronically, then one complete set and nine copies of this information shall be received under the same time constraints above.

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

Consideration of Good Faith Effort for Projects with MBE / WBE 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 MBE / WBE participation. Adequate good faith efforts also mean that the Proposer actively and aggressively sought MBE / WBE participation. Mere *pro forma* efforts are not considered good faith efforts.

The Department will consider the quality, quantity, and intensity of the different kinds of efforts a 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 goals and are not intended to be exclusive or exhaustive, nor is it intended to be a mandatory checklist.

- (A) Soliciting through all reasonable and available means (e.g. attendance at pre-bid meetings, advertising, written notices, use of verifiable electronic means through the use of the NCDOT Directory of Transportation Firms) the interest of all certified MBEs / WBEs 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 MBEs / WBEs to respond to the solicitation. Solicitation shall provide the opportunity to MBEs / WBEs within the Division and surrounding Divisions where the project is located. The Proposer must determine with certainty if the MBEs / WBEs are interested by taking appropriate steps to follow up initial solicitations.
- (B) Selecting portions of the work to be performed by MBEs / WBEs in order to increase the likelihood that the MBE and WBE goals will be achieved. Where appropriate, break out contract work items into economically feasible units to facilitate MBE / WBE participation, even when the prime contractor might otherwise prefer to perform these work items with its own forces. Negotiate with subcontractors to assume part of the responsibility to meet the contract MBE / WBE goals when the work to be sublet includes potential for MBE / WBE participation (2nd and 3rd tier subcontractors).
- (C) Providing interested certified MBEs / WBEs, that are also prequalified subcontractors, with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.
- (D) (1) Negotiating in good faith with interested MBEs / WBEs. It is the Proposer's responsibility to make a portion of the work available to MBE / WBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available MBE / WBE subcontractors and suppliers, so as to facilitate MBE / WBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of MBEs / WBEs that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional agreements could not be reached for MBEs / WBEs to perform the work.

- (2) A Proposer using good business judgment would consider a number of factors in negotiating with subcontractors, including MBE / WBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using MBEs / WBEs is not in itself sufficient reason for a proposer's failure to meet the contract MBE or WBE goals, 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 MBEs / WBEs if the price difference is excessive or unreasonable.
- (E) Not rejecting MBEs / WBEs as being unqualified without sound reasons based on a thorough investigation of their capabilities. The 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 Price Proposals in the Proposer's efforts to meet the project goal.
- (F) Making efforts to assist interested MBEs / WBEs in obtaining bonding, lines of credit, or insurance as required by the recipient or Proposer.
- (G) Making efforts to assist interested MBEs / WBEs in obtaining necessary equipment, supplies, materials, or related assistance or services.
- (H) Effectively using the services of available minority / women community organizations; minority / women contractors' groups; Federal, State, and local minority / women business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of MBEs / WBEs. Contact within seven days from the opening of the Price Proposals the Business Opportunity and Work Force Development Unit at DBE@ncdot.gov to give notification of the Proposer's inability to get MBE or WBE quotes.
- (I) Any other evidence that the Proposer submits which shows that the Proposer has made reasonable good faith efforts to meet the MBE and WBE 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 MBE and WBE goals.
- (2) The Proposers' past performance in meeting the MBE and WBE goals.
- (3) The performance of other proposers in meeting the MBE and WBE goals. For example, when the Proposer with the apparent adjusted low price fails to meet the goals, 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 goals. If the Proposer with the apparent adjusted low price fails to meet the MBE and WBE goals, but meets or exceeds the average MBE and WBE 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 apparent Proposer with the apparent adjusted low price, the Department reserves the right to award the contract to the Proposer with the next adjusted lowest adjusted price that can satisfy to the Department that the MBE and WBE goals can be met or that an adequate good faith effort has been made to meet the MBE and WBE goals.

Non-Good Faith Appeal

The State Contractual Services 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 Contractual Services 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 MBE / WBE Participation Toward Meeting MBE / WBE Goals

(A) Participation

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

(B) Joint Checks

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

(C) Subcontracts (Non-Trucking)

A MBE / WBE may enter into subcontracts. Work that a MBE subcontracts to another MBE firm may be counted toward the MBE contract goal requirement. The same holds for work that a WBE subcontracts to another WBE firm. Work that a MBE subcontracts to a non-MBE firm does not count toward the MBE contract goal requirement. Again, the same holds true for the work that a WBE subcontracts to a non-WBE firm. If a MBE or

WBE contractor or subcontractor subcontracts a significantly greater portion of the work of the contract than would be expected on the basis of standard industry practices, it shall be presumed that the MBE or WBE is not performing a commercially useful function. The MBE / WBE may present evidence to rebut this presumption to the Department. The Department's decision on the rebuttal of this presumption may be subject to review by the Office of Inspector General, NCDOT.

(D) Joint Venture

When a MBE or WBE 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 MBE or WBE in the joint venture, that portion of the total dollar value being a distinct clearly defined portion of work that the MBE or WBE performs with its forces.

(E) Suppliers

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

(F) Manufacturers and Regular Dealers

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

- (1) The fees or commissions charged by a MBE / WBE firm for providing a *bona fide* service, such as professional, technical, consultant, or managerial services; or for providing bonds or insurance specifically required for the performance of a DOT-assisted contract, provided the fees or commissions are determined to be reasonable and not excessive as compared with fees and commissions customarily allowed for similar services.
- (2) With respect to materials or supplies purchased from a MBE / WBE, which is neither a manufacturer nor a regular dealer, count the entire amount of fees or commissions charged for assistance in the procurement of the materials and supplies, or fees or transportation charges for the delivery of materials or supplies required on a job site (but not the cost of the materials and supplies themselves), provided the fees are determined to be reasonable and not excessive as compared with fees customarily allowed for similar services.

Commercially Useful Function

(A) MBE / WBE Utilization

The Design-Build Team may count toward its contract goal requirement only expenditures to MBEs and WBEs that perform a commercially useful function in the work of a contract. A MBE / WBE performs a commercially useful function when it is responsible for execution of the work of the contract and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. To perform a commercially useful function, the MBE / WBE shall also be responsible with respect to materials and supplies used on the contract, for negotiating price, determining quality and quantity, ordering the material and installing (where applicable) and paying for the material itself. To determine whether a MBE / WBE is performing a commercially useful function, the Department will evaluate the amount of work subcontracted, industry practices, whether the amount the firm is to be paid under the contract is commensurate with the work it is actually performing and the MBE / WBE credit claimed for its performance of the work, and any other relevant factors.

(B) MBE / WBE Utilization in Trucking

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

- (1) The MBE / WBE shall be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract, and there shall not be a contrived arrangement for the purpose of meeting the MBE or WBE goal.
- (2) The MBE / WBE shall itself own and operate at least one fully licensed, insured, and operational truck used on the contract.
- (3) The MBE / WBE receives credit for the total value of the transportation services it provides on the contract using trucks it owns, insures, and operates using drivers it employs.
- (4) The MBE may subcontract the work to another MBE firm, including an owner-operator who is certified as a MBE. The same holds true that a WBE may subcontract the work to another WBE firm, including an owner-operator who is certified as a WBE. When this occurs, the MBE or WBE who subcontracts work receives credit for the total value of the transportation services the subcontracted MBE or WBE provides on the contract. It should be noted that every effort shall be made by MBE and WBE contractors to subcontract to the same certification (i.e., MBEs to MBEs and WBEs to WBEs), in order to fulfill the goal requirement. This, however, may not always be possible due to the limitation of firms in the area. If the MBE or WBE firm shows a good faith effort has been made to reach out to similarly certified transportation service providers

and there is no interest or availability, and they can get assistance from other certified providers, the Engineer will not hold the prime liable for meeting the goal.

- (5) The MBE / WBE may also subcontract the work to a non-MBE / WBE firm, including from an owner-operator. The MBE / WBE who subcontracts the work to a non-MBE / WBE is entitled to credit for the total value of transportation services provided by the non-MBE / WBE subcontractor not to exceed the value of transportation services provided by MBE / WBE-owned trucks on the contract. Additional participation by non-MBE / WBE subcontractors receives credit only for the fee or commission it receives as a result of the subcontract arrangement. The value of services performed under subcontract agreements between the MBE / WBE and the Design-Build Team will not count towards the MBE / WBE contract requirement.
- (6) A MBE / WBE may lease truck(s) from an established equipment leasing business open to the general public. The lease must indicate that the MBE / WBE has exclusive use of and control over the truck. This requirement does not preclude the leased truck from working for others during the term of the lease with the consent of the MBE / WBE, so long as the lease gives the MBE / WBE absolute priority for use of the leased truck. This type of lease may count toward the MBE / WBE's credit as long as the driver is under the MBE / WBE's payroll.
- (7) Subcontracted / leased trucks shall display clearly on the dashboard the name of the MBE / WBE that they are subcontracted / leased to and their own company name if it is not identified on the truck itself. Magnetic door signs are not permitted.

Banking MBE / WBE Credit

If the Price Proposal of the Proposer with the apparent adjusted low price exceeds \$500,000.00 and if the committed MBE / WBE participation submitted by Letter of Intent exceeds the algebraic sum of the MBE or WBE goal by \$1,000.00 or more, the excess will be placed on deposit by the Department for future use by the Proposer. Separate accounts will be maintained for MBE and WBE participation and these may accumulate for a period not to exceed 24 months.

When the Proposer with the apparent adjusted low price fails to submit sufficient participation by MBE firms to meet the contract goal, as part of the good faith effort, the Department will consider allowing the Proposer to withdraw funds to meet the MBE goal as long as there are adequate funds available from the Proposer's MBE bank account.

When the Proposer with the apparent adjusted low price fails to submit sufficient participation by WBE firms to meet the contract goal, as part of the good faith effort, the Department will consider allowing the Proposer to withdraw funds to meet the WBE goal as long as there are adequate funds available from the Proposer's WBE bank account.

MBE / WBE Replacement

When a Design-Build Team has relied on a commitment to a MBE or WBE firm (or an approved substitute MBE or WBE firm) to meet all or part of a contract goal requirement, the Design-Build Team shall not terminate the MBE / WBE 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 MBE / WBE subcontractor, a non-MBE / WBE subcontractor, or with the Design-Build Team's own forces or those of an affiliate. A MBE / WBE may only be terminated after receiving the Engineer's written approval based upon a finding of good cause for the termination. The prime contractor, or other affiliated companies within the Design-Build Team, must give the MBE/WBE firm five calendar days to respond to the prime contractor's, or other affiliated companies within the Design-Build Team, notice of termination and advise the prime contractor, or other affiliated companies within the Design-Build Team, and the Department of the reasons, if any, why the firm objects to the proposed termination of its subcontract and why the Department should not approve the action.

All requests for replacement of a committed MBE / WBE firm shall be submitted to the Engineer for approval on Form RF-1 (*Replacement Request*). If the Design-Build Team fails to follow this procedure, the Prime Contractor or other affiliated companies within the Design-Build Team may be disqualified from further bidding for a period of up to six months.

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

(A) Performance Related Replacement

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

If a replacement MBE / WBE is not found that can perform at least the same amount of work as the terminated MBE / WBE, the 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 MBEs / WBEs that their interest is solicited in contracting the work defaulted by the previous MBE / WBE or in subcontracting other items of work in the contract.
- (2) Efforts to negotiate with MBEs / WBEs for specific subbids including, at a minimum:

- (a) The names, addresses, and telephone numbers of MBEs / WBEs who were contacted.
 - (b) A description of the information provided to MBEs / WBEs regarding the plans and specifications for portions of the work to be performed.
- (3) A list of reasons why MBE / WBE quotes were not accepted.
 - (4) Efforts made to assist the MBEs / WBEs contacted, if needed, in obtaining bonding or insurance required by the Design-Build Team.
- (B) Decertification Replacement
- (1) When a committed MBE / WBE is decertified by the Department after the SAF (*Subcontract Approval Form*) has been received by the Department, the Department will not require the Design-Build Team to solicit replacement MBE / WBE participation equal to the remaining work to be performed by the decertified firm. The participation equal to the remaining work performed by the decertified firm will count toward the contract goal requirement.
 - (2) When a committed MBE / WBE is decertified prior to the Department receiving the SAF (*Subcontract Approval Form*) for the named MBE / WBE firm, the Design-Build Team shall take all necessary and reasonable steps to replace the MBE / WBE subcontractor with another similarly certified MBE / WBE subcontractor to perform at least the same amount of work to meet the MBE / WBE goal requirement. If a MBE / WBE firm is not found to do the same amount of work, a good faith effort must be submitted to NCDOT (see A herein for required documentation).

Changes in the Work

When the Engineer makes changes that result in the reduction or elimination of work to be performed by a committed MBE / WBE, the 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 MBE / WBE based upon the Design-Build Team's commitment, the MBE / WBE shall participate in additional work to the same extent as the MBE / WBE participated in the original contract work.

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

When the Engineer makes changes that result in an alteration of plans or details of construction, and a portion or all of the work had been expected to be performed by a committed MBE / WBE, the Design-Build Team shall seek participation by MBEs / WBEs 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 MBE / WBE, the Design-Build Team shall seek additional participation by MBEs / WBEs equal to the reduced MBE / WBE participation caused by the changes.

Reports and Documentation

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

When using transportation services to meet the contract commitment, the 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 MBE / WBE 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 MBE / WBE credit.

Reporting Minority and Women Business Enterprise Participation

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

- (A) Withholding of money due in the next partial pay estimate; or
- (B) Removal of an approved 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 MBEs / WBEs, it shall be the prime contractor's responsibility to report all monthly and final payment information in the correct reporting manner.

Failure on the part of the 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 and any affiliate companies within the Design-Build Team from being approved for work on future DOT projects until the required information is submitted.

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

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

The Design-Build Team shall report the accounting of payments through the Department's Payment Tracking System.

Failure to Meet Contract Requirements

Failure to meet contract requirements in accordance with Subarticle 102-15(J) of the 2018 *Standard Specifications for Roads and Structures* may be cause to disqualify the Prime Contractor or any other affiliated companies within the Design-Build Team from further bidding for a specified length of time.

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 will be required to sublet such work to a contractor properly licensed in accordance with *Article 2 of Chapter 87 of the General Statutes* (licensing of heating, plumbing, and air conditioning contractors) and *Article 4 of Chapter 87 of the General Statutes* (licensing of electrical contractors).

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

(3-22-07)

DB1 G112D

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*.

- Projects U-4714A and U-4714B are located to the north and south, respectively, of the I-485 / East John Street / Old Monroe Road interchange (Exit 52).
- Project R-3329 / R-2559 connects to the east end of this project with signing work beginning at the I-485 / East John Street / Old Monroe Road interchange (Exit 52). Project R-3329 / R-2559 has an anticipated May 2019 completion 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

(Rev. 07-31-12) (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 10 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 10 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 10 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.

THREE-YEAR GUARANTEE

GENERAL

The performance of remedial work in conjunction with this provision and guarantee is not an obligation of the Design-Build Team's bond required by G.S. 44A-33.

Definitions

Warranty Initiation Date – The date that constitutes the start date for the warranty term and coincides with the Substantial Completion as determined by the Department.

Warranty Bond – A bond issued by a surety which guarantees that the warranty requirements, including any observation periods extending beyond the Substantial Completion Date will be satisfied.

Breach of Warranty – A failure to perform Corrective Work or Immediate Corrective Work in accordance with the provisions contained herein.

Dispute Review Board – The team responsible for resolving disputes between the Department and the Design-Build Team regarding any claim of noncompliance with the warranty requirements, as detailed elsewhere within the Contract Documents.

Corrective Work – Work redone, repaired, corrected or replaced pursuant to the terms of this Warranty Provision. This term is used throughout this provision to collectively mean both Corrective Work and Immediate Corrective Work.

Immediate Corrective Work – Work redone, repaired, corrected or replaced that shall be undertaken immediately as it poses an imminent danger to the users of the facilities constructed under this project. If the Department determines that Immediate Corrective Work is necessary for public safety, the Department or its agent may perform emergency repairs. Prior to such emergency repairs, the Department will document the basis for the emergency action and will preserve evidence of the defective condition.

Project Warranty Term

Excluding water and sewer work, the Warranty Term for each element of the Project shall commence upon Substantial Completion, as determined by the Department, and shall remain in effect for three years thereafter subject to extension under the “Warranty Bond” section of this provision and notwithstanding any warranty term for specific Project elements that may be longer than warranty term set forth herein. The Warranty Term for water and sewer work shall commence once all water and sewer work performed for that owner is accepted and shall remain in effect for three years thereafter subject to extension under the “Warranty Bond” section of this

provision and notwithstanding any warranty term for specific Project elements that may be longer than warranty term set forth herein.

These warranties are binding on the Design-Build Team's successors, transferees, heirs, and assigns. If the Department determines that any of the Work has not met the standards set forth in this Provision at any time within the Warranty Term, then the Design-Build Team shall correct such Work as specified below, even if the performance of such Corrective Work extends beyond the stated Warranty Term.

Warranty Bond

The Design-Build Team shall furnish a single term warranty bond from a firm licensed to do business in the State of North Carolina, in an amount of five percent of the total amount bid for the entire project, as a prerequisite of determination of Substantial Completion. This bond will be applicable to the Project Warranty and any specific Project elements that may be set forth elsewhere in this Contract. The warranty bond will be released at the end of the warranty period to include any extension as provided in the "Warranty of Corrective Work" section below. Should such extensions occur on specific project elements, there may be the opportunity to lower the bond amount for such extension to cover the warranty of the Corrective Work. The Department will supply the Warranty Bond form upon request.

Initial Project Acceptance

The Department and the Design-Build Team shall jointly review all completed Work, or a portion thereof, as determined by the Department. If the work does not meet contract requirements, the Design-Build Team shall make all necessary corrections, at their expense, prior to initial acceptance. Initial acceptance will occur as soon as the Department confirms in writing, that contract requirements have been met and the Design-Build Team has reached Substantial Completion as defined in the Project Special Provision for "Substantial Completion." The date on which Substantial Completion occurs shall coincide with the Warranty Initiation Date. **Once final acceptance of the Project or portions thereof is attained as defined by the Department, routine maintenance of such becomes the responsibility of the Department, excluding any items requiring Warranty Corrective Work as detailed within this Provision.**

The date of Substantial Completion / Warranty Initiation Date will be documented and executed jointly by the Department and the Design-Build Team with a copy of such being sent to the Design-Build Team's warranty bond surety agent.

The Department may accept the work and begin the warranty period, excluding any area needing Corrective Work, to accommodate seasonal limitations or staged construction.

Neither the initial acceptance nor any prior inspection, acceptance or approval by the Department diminishes the Design-Build Team's responsibility under this warranty. Acceptance of material, in penalty, under the Department's quality assurance program will not relieve the Design-Build Team from meeting the material and workmanship warranty requirements for the accepted material.

Annual Review Process

The Department shall employ a private engineering firm to perform an annual review of the pavement and bridge components condition parameters warranted by this Provision. The private engineering firm will perform the appropriate testing, inspections and develop a report with all evaluation data and digital photographic status of the warranted condition parameters. This report will be dated and certified by a Professional Engineer registered in North Carolina. The report will be submitted directly to the Department with copies submitted to the Design-Build Team.

Final Warranty Acceptance

The Department and the Design-Build Team shall jointly conduct an inspection of the Project prior to expiration of the warranty term and shall produce a punch list of those items which require Corrective Work prior to fulfillment of the warranty obligation. If requirements of this Provision are not met, the Design-Build Team shall make all necessary corrections, at their expense, prior to expiration of the warranty term.

The date upon which the warranty terminates, including any extension as included in the “Warranty of Corrective Work” section will be documented and executed jointly by the Department and the Design-Build Team with a copy of such being sent to the Design-Build Team’s warranty bond surety agent.

Corrective Work

Within seven calendar days of the Design-Build Team’s receipt of the Department’s notice specifying a failure of any Work to satisfy Design-Build Team’s Warranties, or any Subcontractor representation, warranty, guarantee or obligation for which the Design-Build Team is responsible to enforce, the Design-Build Team and the Department shall mutually agree when and how the Design-Build Team shall remedy such violation. However, in the case that Immediate Corrective Work is required, as indicated by the Department in its notice, the Design-Build Team and the Department shall agree on a remedy immediately upon notice by the Department of such need for immediate work. **No Corrective Work shall occur without the Department’s knowledge of such activities or operations.**

The Department may elect to have the Corrective Work postponed within the warranty term to minimize traffic disruption provided such Corrective Work poses no safety issues to motorists.

If the Design-Build Team does not use its best efforts to proceed to effectuate such remedy within the agreed time, or if the Design-Build Team and the Department fail to reach such an agreement within such seven calendar day period (or immediately, in the case of Immediate Corrective Work), then the Department, after notice to the Design-Build Team, shall have the right to perform or have performed by third parties the necessary remedy, and all costs thereof shall be borne by the Design-Build Team.

Requirements originally developed and detailed in the Contract Documents shall apply throughout the warranty term and to all Corrective Work, including lane closure time restrictions

and associated liquidated damages. The Design-Build Team shall be responsible for payment, to the Department, of any liquidated damages incurred during the warranty term resulting from lane closures within the restricted times as detailed in the Contract Documents. If lane closures are required during restricted times to perform Immediate Corrective Work, then the associated liquidated damages shall apply.

The Design-Build Team shall be responsible for obtaining any required permits, approvals or other consents in connection with the Corrective Work.

Warranty of Corrective Work

The Warranties as to each redone, repaired, corrected or replaced element of the Work shall extend beyond the original warranty period, if necessary, to provide at least a one-year warranty period following acceptance of such Corrective Work thereof by the Department and acceptance thereof by the appropriate owner.

Subcontractor Warranties

Assignment

Without in any way derogating the Design-Build Team's own representations and warranties and other obligations with respect to all of the Work, the Design-Build Team shall obtain from all Subcontractors and cause to be extended to the Department, appropriate representations, warranties, guarantees and obligations with respect to the design, materials, workmanship, equipment, tools and supplies furnished by such subcontractor. All representations, warranties, guarantees and obligations of subcontractors shall be written so as to survive all the Department and Design-Build Team inspections, tests and approvals, and shall run directly to and be enforceable by the Design-Build Team and / or the Department, including their respective successors and assigns. The Design-Build Team hereby assigns to the Department all of the Design-Build Team's rights and interest in all extended warranties for periods exceeding the applicable three year Warranty Term (including extensions thereof under the section "Warranty of Corrective Work" included in this provision.), which are received by the Design-Build Team from any of its subcontractors, suppliers or manufacturers.

Enforcement

Upon receipt from the Department of notice of a failure, to perform Corrective Work needed to satisfy any subcontractor, supplier or manufacturer warranty, representation, guarantee, or obligation, the Design-Build Team shall enforce or perform any such representation, warranty, guarantee or obligation, in addition to Design-Build Team's other obligations hereunder. The Department's rights under this section, shall commence at the time such representation, warranty, guarantee or obligation is furnished or at the Substantial Completion, whichever is earlier, and shall continue until the expiration of Design-Build Team's relevant warranty term (including extensions thereof under the section "Warranty of Corrective Work" included in this provision). Until such expiration, the Design-Build Team shall be responsible for the cost of any equipment, material, labor (including re-engineering) or shipping, and the Design-Build Team

shall be required to replace or repair defective equipment, material or workmanship furnished by any subcontractor, supplier or manufacturer.

No Limitation of Liability

The foregoing warranties are in addition to all rights and remedies available under the Contract Documents or applicable law, and shall not limit the Design-Build Team's liability or responsibility imposed by the Contract Documents or applicable law with respect to the Work, including liability for design defects, latent construction defects, strict liability, negligence or fraud; provided, however, that, upon expiration of the Warranties, Design-Build Team shall have no further liability to the Department hereunder for latent construction defects.

Warranty Beneficiaries

In addition to benefiting the Department and its successors and assigns, the Warranties and subcontractor warranties provided under the "Initial Project Acceptance" section included in this provision, shall inure to the benefit of, and shall be directly enforceable by the Department and Utility Owners with respect to those portions of the Work owned or controlled by each such owner.

Remedies for Breach of Warranty

It is the Department's intent to reserve the right to recover any and all actual damages, not subject to liquidated damages, resulting from any breach of an express or implied warranty or any defect in the Work.

Disputes

Any disagreement between the Department and the Design-Build Team relating to this warranty provision shall be subject to the Dispute Review Board provisions contained in the Contract Documents and Article 104-8(B) provided that Design-Build Team shall proceed as directed by the Department pending resolution of the dispute.

Should disputed Corrective Work pose a safety issue to the motorist, the Department may (1) direct the Design-Build Team to perform the Corrective Work with costs being documented in accordance with Article 109-3 of the Standard Special Provisions, Division One, included elsewhere in the RFP; or (2) after notice to the Design-Build Team, the Department shall have the right to perform or have performed by third parties the necessary remedy, and all costs thereof shall be borne by responsible party upon resolution of the dispute.

Rights and Responsibilities of the Department

The Department:

- A. Reserves the right to approve the schedule proposed by the Design-Build Team to perform warranty work.

- B. Reserves the right to approve all materials and specifications used in warranty work.
- C. Reserves the right to determine if warranty work performed by the Design-Build Team meets the contract specifications.
- D. Reserves the right to perform, or have performed, routine maintenance during the warranty period, which routine maintenance will not diminish the Design-Build Team's responsibility under the warranty.
- E. Reserves the right, if the Design-Build Team is unable, to perform Immediate Corrective Work to the pavement to prevent an unsafe road condition as determined by the Department. The Department will attempt to notify the Design-Build Team that work is required to address an unsafe condition. However, should the Design-Build Team be unable to comply with this requirement, to the Department's satisfaction and within the time frame required by the Department, the Department will perform, or have performed any Immediate Corrective Work deemed necessary. Any such Immediate Corrective Work undertaken will not relieve the Design-Build Team from meeting the warranty requirements of this Provision. Any costs associated with the Immediate Corrective Work will be paid by the Design-Build Team if it is determined the cause was from defective materials and / or workmanship.
- F. Is responsible for notifying the Design-Build Team, in writing, of any Corrective Work required to meet the warranty requirements.

Rights and Responsibilities of the Design-Build Team.

The Design-Build Team:

- A. Shall warrant to the Department that the warranted work will be free of defects in materials and workmanship. The warranty bond shall be submitted to the Department as a prerequisite of the Department determining the project Substantially Complete.
- B. Shall be responsible for performing all Corrective Work including, but not limited to, maintaining traffic and restoring all associated pavement features, at the Design-Build Team's expense. Liquidated Damages established in the Contract Documents will be in effect if the proposed traffic plan for Corrective Work requires lane closures during restricted times.
- C. Shall be responsible for performing all Corrective Work resulting from being in non-compliance with the warranty requirements, using the Department approved materials and methods.
- D. Shall be responsible for performing Corrective Work upon the Department specifying a failure of any Work to satisfy Design-Build Team's Warranties, unless otherwise directed.

- E. Shall notify the Department and submit a written course of action for performing the needed Corrective Work a minimum of seven calendar days prior to commencement of Corrective Work, except in the case of Immediate Corrective Work as detailed in this special provision. The submittal must propose a schedule for performing the Corrective Work and the materials and methods to be used.
- F. Shall submit a traffic control plan and have said plan approved by the Department prior to performing Corrective Work and shall adhere to that plan while performing the work.
- G. Shall complete all Corrective Work prior to conclusion of the warranty period, or as otherwise agreed to by the Department.
- H. Shall be liable during the warranty period in the same manner as Design-Build Teams are currently liable for their construction related activities with the Department pursuant to the NCDOT 2018 *Standard Specification for Roads and Structures* and the Standard Special Provisions, Division One, as included elsewhere in the RFP. This liability shall arise and continue only during the period when the Design-Build Team is performing Corrective Work. This liability is in addition to the Design-Build Team performing and / or paying for any required Corrective Work, and shall include liability for injuries and / or damages and any expenses resulting therefrom which are not attributable to normal wear and tear of traffic and weather, but are due to non-compliant materials, faulty workmanship, and to the operations of the Design-Build Team.

Non-Extension of Contract

This Provision shall not be construed as extending or otherwise affecting the claim process and statute of limitation applicable to this Contract.

Measurement and Payment

All costs associated with this warranty provision, regardless of when such costs are incurred throughout the warranty term of any extensions as provided in the “Warranty of Corrective Work” section included in this provision, shall be included in the lump sum price bid for the project. These costs include but are not limited to, all bonding, engineering, Corrective Work, traffic control, additional testing and inspections, materials, labor and equipment and incidentals necessary to complete and fulfill the requirements herein of this Contract.

The Design-Build Team shall reimburse the Department for any expenses made necessary by any Corrective Work. Payment shall be provided within 10 Days after the Design-Build Team’s receipt of invoice, therefore.

PROJECT WARRANTY

Design-Build Team warrants that:

- A. the Work, as completed for the Project, meets all of the requirements of the Contract Documents;
- B. the Plans, details and / or drawings selected or prepared for use during construction are appropriate for their intended use;
- C. all Plans furnished pursuant to the Contract Documents conform to all professional engineering principles generally accepted as standards of the industry in North Carolina;
- D. all Work is performed in accordance with the Released for Construction plans;
- E. all Work is in reasonably close conformity with the lines, grades, cross sections, dimensions, and material requirements, including tolerances shown in the contract, unless otherwise documented in a mutually agreeable executed agreement between the Department and the Design-Build Team which details the acceptance of the Work in accordance with Article 105-3 of the Standard Special Provisions, Division One, included elsewhere in this RFP.

No price adjustment or payment made in connection with acceptance of materials or Work pursuant to the Contract Documents or any agreement between the Design-Build Team and Department to accept Work, which is not in close conformity, shall in any manner, excuse, waive, impair or negate the warranties described herein or the Design Build Team's obligation or responsibility for such warranties.

This warranty provision shall in no way relieve the requirement for the initial Work to meet the requirements of the Contract Documents prior to final acceptance.

- F. all materials and equipment furnished under the Contract Documents are of good quality and, when installed, are new;
- G. all materials, as installed, are suitable for their intended use with appropriate testing conducted to ensure the materials meets or exceeds requirements of the design as approved by the Engineer of Record, provided all requirements of the Contract are met.

MATERIALS & WORKMANSHIP PAVEMENT WARRANTY**Description.**

The materials and workmanship pavement warranty shall consist of the warranty bond contained in the "Warranty Bond" section and the terms of this Provision. The warranty criteria presented herein contain information unique to each pavement type and appropriate fix.

Materials & Workmanship Warranty

The Design-Build Team shall be responsible for correcting defects in the pavement caused by elements within the Design-Build Team's control (i.e., the materials supplied and the workmanship), during the warranty term. Since the Department will be responsible for the pavement design, the Design-Build Team assumes no responsibility for defects that are design related. If a defect is attributable to both, the materials and / or workmanship and the design, responsibility for correcting the defect shall be shared by the Department and the Design-Build Team; the Design-Build Team shall be responsible for the percentage of fault attributable to the materials and / or workmanship and the Department will be responsible for the percentage of fault attributable to the design.

During the warranty period, the Design-Build Team will not be held responsible for pavement distresses that are caused by factors unrelated to materials and workmanship. These include, but are not limited to: chemical and fuel spills, vehicle fires, snow plowing, and quality assurance testing such as coring. Other factors considered to be beyond the control of the Design-Build Team which may contribute to pavement distress will be considered by the Engineer on a case by case basis upon receipt of a written request from the Design-Build Team.

Evaluation Method.

Pavement evaluations shall be conducted by dividing the project into segments. Each individual Travel Lane will be divided into segments of 528 feet (1/10mile) in length for measuring and quantifying the condition parameters.

Travel Lane(s) – The delineated pavement surface used by traffic. The Travel Lanes shall be the portion of the pavement considered warranted work. Each of the following is considered a separate driving lane:

1. Each individual mainline or Y-line lane, for each direction of travel.
2. The sum of all ramps, loops, and the associated acceleration / deceleration lanes are considered a separate driving lane.
3. The sum of all auxiliary lanes, such as passing and turn lanes is considered a separate driving lane.

Approaches, driveways, shoulders and adjoining transition tapers between various types of pavement are not considered driving lanes or addressed under this Section; however, shall be warranted under the "Project Warranty" section, included in this provision.

The beginning point of the initial segment layout will be the Point of Beginning (POB) of the project or construction limits for -Y- lines. Segments will be laid out consecutively to the Point of Ending (POE) of the project. The original segmentation of the project will be used for all successive reviews throughout the warranty period.

Warranty Requirements.

Corrective Work will be required when the threshold limit for any condition parameter, as detailed in the sections below, is exceeded as a result of a defect in materials and / or workmanship.

To determine whether the failure to meet the warranty requirements is a result of defects in materials and / or workmanship, a joint field investigation by the Department and the Design-Build Team will be conducted. The Department or Design-Build Team may elect to have a forensic investigation conducted. The decision to undertake a forensic investigation, the scope of it, and the selection of the party to conduct it will be agreed to by the Department and the Design-Build Team. The forensic investigation will be conducted by a qualified entity and at an AASHTO certified laboratory with the results being final and binding. If agreement cannot be reached, a Dispute Review Board (DRB) may be convened in accordance with the Contract Documents. The DRB will then decide the need for a forensic investigation, its scope and the party to conduct the investigation. All costs related to the forensic investigation will be shared proportionately between the Design-Build Team and the Department based on the determined cause of the pavement problem.

WARRANTY CRITERIA FOR NEW HOT MIX ASPHALT PAVEMENT

Application

This section applies to all components of a multiple lift Hot Mix Asphalt (HMA) pavement structure placed on stabilized soil or aggregate base course. This section excludes any resurfacing, permeable base course, or partial width (less than 10 feet in width) widening of existing facilities; however, the section “Project Warranty” detailed above shall apply to such asphalt pavement.

Limits of Warranted Work

The warranted work includes all components of a multiple lift hot mix asphalt pavement placed for travel lanes within the project limits, including Y-lines.

Condition Parameters and Threshold Limit

Condition parameters are used to measure the performance of the HMA pavement during the warranty term. Each condition parameter has a threshold limit applied at which time Corrective Work is required.

- A. Transverse Crack** – A crack, at least five feet in length that is oriented primarily in the transverse direction versus the longitudinal direction. That is, the angle between the overall crack line and the transverse line is less than 45 degrees. It can be either straight or irregular.
- B. Longitudinal Crack / Open Joint** – A crack or open joint, at least five feet in length that is oriented primarily in the longitudinal direction versus the transverse direction. That is, the

angle between the overall crack line and the centerline is less than 45 degrees. It can exist anywhere in the driving lane; i.e., at the pavement centerline joint, wheel path, center of lane, or lane / shoulder joint.

- C. De-bonding** – A physical separation of two HMA layers. De-bonding will be visually identified as shoving, or the loss of the new surface course. Surface potholes, regardless of depth, will be classified as de-bonding.
- D. Raveling** – Surface disintegration, due to the loss of coarse or fine aggregate material, that occurs over an area or in a continuous longitudinal strip.
- E. Flushing** – The accumulation of excess asphalt binder on the pavement surface that creates a shiny, reflective condition and becomes tacky to the touch at high temperatures.
- F. Rutting** – A longitudinal surface depression in the wheel path. It may have associated transverse displacement or bulging.
- G. Alligator Cracking** – Parallel longitudinal cracks with transverse tears between them exhibiting a pattern similar to an alligator hide. An Alligator Crack typically starts in a wheel path and may extend to other lane locations.
- H. Block Cracking** – Transverse and longitudinal cracking that has progressed to a pattern that the pavement is broken into blocks of size less than 12" by 12". The shape of each block may be irregular.
- I. Popout** – A small piece of pavement, aggregate, or debris greater than 0.25 inch in diameter that has broken loose from the surface.
- J. Ride Quality / Pavement Smoothness** – Measurement of pavement roughness to establish appropriate ride comfort levels for the motorist on the facility.
- K. Skid Resistance** – The force developed when a tire that is prevented from rotating slides along the pavement surface as tested in accordance with ASTM E274-90.

Warranty Criteria and Recommended Corrective Work

The table below lists the allowable threshold limit for each condition parameter at which time Corrective Work is required, unless otherwise directed.

The Corrective Work detailed is recommended to outline typical acceptable treatments for the various condition parameters. The Department will accept the listed Corrective Work if the work addresses the cause of the condition parameter. The Design-Build Team may use an alternative action subject to Department approval. The limits of the Corrective Work shall be approved by the Department and may include areas that are immediately adjacent to the pavement defect; however, not currently demonstrating defects or the condition parameters detailed above. Any

hot mix asphalt requiring removal / replacement to correct deficiencies, for any condition parameter, shall be replaced full-width across the lane.

HOT MIX ASPHALT WARRANTY REQUIREMENTS		
CONDITION PARAMETER	THRESHOLD LIMIT PER SEGMENT ⁽¹⁾ (Length = 528 feet Width = 12 feet)	RECOMMENDED CORRECTIVE WORK
Transverse Cracking	Any transverse crack measuring ≥ 6 feet	Cut and seal
Longitudinal Cracking / Open Joint	Any longitudinal crack measuring ≥ 25 feet	Cut and seal
Alligator Cracking ⁷ (Minor)	0 to 4% of segment area	Saw and patch or mill and Resurface affected courses
Alligator Cracking (Major)	$\geq 4\%$ of segment area	Mill and resurface affected courses to included subgrade or base repair
Block Cracking ⁽⁷⁾ (Minor)	0 to 4% of segment area	Saw and patch or mill and resurface affected courses
Block Cracking (Major)	$\geq 4\%$ of segment area	Mill and resurface affected courses to included subgrade or base repair
De-bonding ⁽⁷⁾ (Minor)	0 to 2% of segment area	Saw and patch or mill and resurface affected courses
De-bonding (Major)	$\geq 2\%$ of segment area	Mill and Resurface affected courses
Raveling	$\geq 8\%$ of segment area	Mill and Resurface affected courses
Flushing	$\geq 4\%$ of segment area	Mill and Resurface affected courses
Rutting ⁽³⁾	25% of segment length having an avg. rut depth $\geq 3/8$ inch ⁽²⁾	Microsurface or Mill and Resurface ⁽⁶⁾
Popout	25 individual popouts in segment	Mill and Resurface affected courses
Ride Quality (IRI)	≥ 75 ⁽⁴⁾	Mill, grind, overlay or replace to bring back to within threshold limit
Skid Resistance	≥ 37 ⁽⁵⁾	Microsurface or Mill and Resurface ⁽⁶⁾ to bring back within threshold limit.
<p>(1) Warranty Corrective Work is required upon documentation of the threshold limit being met or exceeded</p> <p>(2) The rut depth threshold applies to each wheel path independently.</p> <p>(3) The pavement surface will be evaluated for the presence of rutting on each driving lane</p>		

throughout the warranty period. Measurement will be made using a high-speed electronic profilometer. These measurements may be confirmed using a straight rigid device that is a minimum of 7 feet long and of sufficient stiffness that it will not deflect from its own weight.

- (4) The pavement surface will be evaluated for ride quality in each wheel path. IRI measurement will be an average of the left and right wheel paths.
- (5) Skid Number as measured with a locked wheel tester
- (6) Recommended action is dependent on the depth of the rut susceptible material.
- (7) All alligator cracking, block cracking and debonding are symptomatic of premature pavement failure and require Corrective Work.

WARRANTY CRITERIA FOR BRIDGE COMPONENTS

Application

This section applies to the Bridge Deck Surface, Bridge Deck Joints, Bearings, Approach Slab Transitions, and the individual components of such items used in the construction of the Project.

Limits of Warranted Work

The warranted work includes all bridges constructed as part of this Project.

Bridge Deck

Condition Parameters and Threshold Limit

Condition parameters are used to measure the performance of the bridge components during the warranty term. Each condition parameter has a Threshold Limit applied at which time Corrective Work is required

- A. Spalling** – Broken or missing piece of concrete with a surface area exceeding two square inches.
- B. Scaling** – The concrete surface has a visible, exposed, rough texture from a loss of either aggregate or mortar.
- C. Crack** – A visible fissure or surface discontinuity that may or may not extend through the entire slab. Cracks may be singular or in multiple patterns. A map crack is defined as interconnecting, variable spaced cracks in a random orientation and pattern.
- D. Skid Resistance** – The force developed when a tire that is prevented from rotating slides along the pavement surface

Warranty Criteria and Recommended Corrective Work

The table below lists the allowable threshold limit for each condition parameter at which time Corrective Work is required, unless otherwise directed.

The Corrective Work detailed is recommended to outline typical acceptable treatments for the various condition parameters. The Department will accept the listed Corrective Work if the work addresses the cause of the condition parameter. The Design-Build Team may use an alternative action subject to Department approval. The limits of the Corrective Work shall be approved by the Department and may include areas that are immediately adjacent to the pavement defect; however, not currently demonstrating defects or the condition parameters detailed above. Concrete Pavement requiring removal / replacement to correct deficiencies, for any condition parameter, may require the pavement to be replaced full-width across the lane and minimum length of 6 feet to ensure long term durability. The Department will determine if such full width removal is necessary; however a patch greater than 4 feet in length is typically the maximum allowed prior to patching full width.

Listed are the parameters when bridge components are considered defective within the warranty term.

BRIDGE DECK WARRANTY REQUIREMENTS		
CONDITION PARAMETER	THRESHOLD LIMITS (PER INDIVIDUAL BRIDGE) ⁽¹⁾	RECOMMENDED CORRECTIVE WORK ⁽²⁾⁽³⁾
Deck Scaling (Less than 1/4" deep but greater than 1/8" deep)	≥ 20% of the individual bridge deck surface area	Grind defective area; saw cut transverse grooves; seal surface with an approved sealing agent
Deck Scaling (Greater than 1/4")	≥ 20% of the individual bridge deck surface area	Diamond saw the perimeter and remove a minimum of 1 inch deep or to sound concrete and patch with a latex modified concrete
Spalling (Minor)	Repair spalling ≤ 1/2" deep or ≤ 1 square foot	Diamond saw the perimeter and remove a minimum 1 inch deep or to sound concrete; patch with conventional concrete mix or elastomeric concrete
Spalling (Major)	Repair spalling > 1/2" deep or > 1 square foot	Mill or Hydro demolition a minimum 1" deep or to sound concrete; repair with latex modified concrete
Cracking (Map cracking)	0% to 20% of deck surface	Seal surface with an approved sealing agent
Cracking	Greater than 20% of deck	Mill or Hydro demolition a

(Map cracking)		minimum 1" deep or to sound concrete; repair with latex modified concrete
<p>(1) Warranty Corrective Work is required upon documentation of the threshold limit being met or exceeded</p> <p>(2) Repairs are dependent upon size, depth and cause; therefore, all corrective work shall be approved by the Department</p> <p>(3) If amount of deck repair exceeds 40% of deck surface area, then corrective work shall be performed to entire deck area, unless otherwise directed.</p>		

Bridge Deck Joints

Bridge Deck Joints shall include all components of the joint and joint system to include any protective armoring. Bridge deck joints will be considered defective if any of the following conditions are discovered within the warranty term and shall require Corrective Work.

- A. Water leakage through the joint;
- B. Separation of the seal from the steel or concrete substrate;
- C. Failure of bridge deck joint;
- D. Sagging of elastomeric seal;
- E. Spalling or delamination of the deck concrete within two feet, either side of the joint.

Corrective Work Required – Defective bridge deck joints shall be restored to a “new condition”, meeting the original contract and design requirements, in a manner approved by the Department.

Bridge Bearings

Bearings shall be considered defective if any of the following conditions are discovered within the warranty term.

- A. There is evidence of failure of any of the components of the bearing assembly;
- B. The protective coating of the bearing cracks, checks or peels or rusting is present; or
- C. The bearing freezes or otherwise fails to allow the bridge to move as designed.

Corrective Work Required – Bearings shall be removed and either replaced or restored to “new condition,” meeting the original contract and design requirements, in a manner approved by the Department.

Bridge Approach Transition

Bridge Approach Transitions shall be defined as the transition from the roadway pavement onto the bridge approach slab, as shall include the bridge approach slab and adjacent roadway pavement. The Bridge Approach Transition shall be considered defective when the distance as measured with a 10 foot straightedge deviates from a planar surface by more than ½ inch.

Corrective Work Required- Diamond grind, overlay*, grout, or remove and replace the pavement and or the bridge approach slab, as approved by the Department, to bring the bridge approach transition back to within the ½ inch tolerance.

* only allowed for Hot Mix Asphalt Pavements

OUTSOURCING OUTSIDE THE USA

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

DB1 G150

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

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

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

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. 9-20-16)

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 7 calendar days, and within 24 hours after a rainfall event of 0.5 inch, or greater, 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-B Certified Designer on the erosion and sediment control / stormwater component of all reclamation plans and if applicable, the certification number of the Level III-A 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 Installers 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 Designer 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 will be considered an indication of possible adverse impacts on wetland use.

The Engineer will perform independent turbidity tests on a random basis. These results will be maintained in a log within the project records. Records will include, at a minimum, turbidity test results, time, date and name of sampler. Should the Department's test results exceed those of the 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:

http://www.ncdot.gov/doh/operations/dp_chief_eng/roadside/fieldops/downloads/Files/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

With the exception of areas with Permanent Utility Easements, perform clearing on this project to the limits established by Method “III” shown on Roadway Standard Drawing No. 200.03. In areas with Permanent Utility Easements, clearing shall extend to the right of way limits.

BURNING RESTRICTIONS

(7-1-95)

DB2 R05

Open burning shall not be permitted on any portion of the right of way limits established for this project. The Design-Build Team shall not burn the clearing, grubbing or demolition debris designated for disposal and generated from the project at locations within the project limits, off the project limits or at any waste or borrow sites in Mecklenburg County. The Design-Build Team shall dispose of the clearing, grubbing and demolition debris by means other than burning and in accordance with state and local rules and regulations.

BUILDING AND APPURTENANCE REMOVAL / DEMOLITION

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

DB2 R12A

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.

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, 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 appropriate Reinforced Concrete Pipe class and the appropriate gage thickness for 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).
- 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.

CEMENT AND LIME STABILIZATION OF SUB-GRADE SOILS

(5-20-13) (Rev. 9-8-17)

DB5 R21

General

The Design-Build Team shall be responsible for the following:

1. Performing all laboratory tests in a laboratory certified by the AMRL / NCDOT Laboratory Proficiency Program
2. Sampling Sub-grade soils
3. Conducting Laboratory tests to determine:
 - a. Soil classifications
 - b. Moisture-density relationships
 - c. Quantity of lime or cement required to achieve specified strengths
4. Designating areas to be stabilized by either lime or cement and the required rates of application
5. Conducting field tests to determine unconfined compressive strength

Sampling

The Design-Build Team shall take soil samples, after the project has been graded to within two inches of final sub-grade elevation. The Design-Build Team shall sample the top eight inches at a minimum frequency of one sample per 1,000 feet, per each lane, for classification tests; and one sample per 3,000 feet, per each lane, for moisture density tests and lime or cement mix design tests. For the aforementioned tests, a lane shall be considered 28 feet wide in one direction for sampling purposes. Additional samples shall be taken to ensure that all the predominant soil types, limits of distribution of these soils and different site conditions have been represented.

Classification Tests

The Design-Build Team shall perform the following tests to determine AASHTO classifications of different soils in accordance with AASHTO specifications as modified by NCDOT. Copies of these modified procedures can be obtained from Materials and Test Unit's Soils Laboratory.

TABLE 1

<u>TEST</u>	<u>AASHTO DESIGNATION</u>
Dry Preparation of Disturbed Soils	T-87
Particle Size Analysis of Soils	T-88
Determining the Liquid Limit of Soils	T-89
Determining the Plastic Limit and Plasticity Index of Soils	T-90

Moisture Density Test

Based on the criteria set in Table 2, below, the Design-Build Team shall perform the Moisture Density Tests, using either lime or cement. The Design-Build Team shall use 10% cement by weight in soil cement and 4% lime by weight, in soil-lime mixtures. The Design-Build Team shall conduct the tests in accordance with AASHTO T-99, and T-134 for soil-lime and soil-cement mixtures, respectively. In each case, The Design-Build Team shall determine the maximum dry density and optimum moisture content.

TABLE 2

<u>CRITERIA FOR SELECTING LIME OR CEMENT</u>		
PROPERTY	A	B
Percent passing #200 Sieve	35 Max	36 Min
Liquid Limit	40 Max	41 Min
Plasticity Index	10 Max	25 Min

The Design-Build Team shall use cement for all soils meeting criteria in Column A and lime for all soils meeting criteria in Column B. The Design-Build Team may choose either lime or cement for all soils not meeting all criteria in either Column A or B.

DETERMINING THE APPLICATION RATES FOR SOIL-CEMENT AND SOIL-LIME MIXTURES

Soil-Cement Mixtures

For soil-cement mixtures, the Design-Build Team shall be required to do the following:

- Make specimens at optimum moisture content using a quantity of cement in the range of 5 to 12 percent by weight.
- Compact the specimens to a minimum density of 95% of maximum dry density obtained using AASHTO T 134.
- Make a minimum of two specimens for each selected cement rate.
- Cure the specimens for seven days in a moist room maintained at a temperature of 73° F \pm 2.7° and a humidity of 100%. At the end of the curing period, immerse the specimens in water for four hours.
- After immersion, test the specimens in unconfined compression in accordance with ASTM D 1633.
- Report the maximum strength obtained and the corresponding percent strain.
- Select the rate of cement that provides a minimum unconfined compressive strength of 200 psi and a maximum of 400 psi.

SOIL-LIME MIXTURES

For soil-lime mixtures, the Design-Build Team shall be required to do the following:

- Make specimens at optimum moisture content using a quantity of lime in the range of 3.5 to 6.5 percent by weight.
- Compact specimens to a minimum density of 95% of maximum dry density obtained by AASHTO T99.
- Make a minimum of two specimens for each selected lime rate.
- Cure the specimens in sealed plastic bags for 48 hours in an oven at a temperature of 118° F. Do not immerse the specimens in water at the end of the curing period.

- Test the specimens in unconfined compression in accordance with AASHTO T 208. Report the maximum strength obtained and the corresponding percent strain.
- Select the rate of lime that provides a minimum unconfined compressive strength of 60 psi.

Submittals for Review and Approval Prior to Construction

The Design-Build Team shall adhere to the following submittal guidelines:

- Submit all laboratory test results for review.
- Submit a sketch in plan view showing areas of the project to be stabilized by either lime or cement and application rates for each stabilizer.
- Submit any other documentation that supports the Design-Build Team's recommendations.

Construction of Lime Treated Subgrade

The Design-Build Team shall construct the lime treated sub-grade as specified in Section 501 of the North Carolina Department of Transportation 2018 *Standard Specifications for Roads and Structures* with the following exceptions:

Subsection 501-4 Equipment

Contractor's equipment will not require engineer's approval.

Subsection 501-8 (A) General

Paragraph #1 is not applicable to this project.

Subsection 501-9 (B) Preliminary Curing

Amend as follows: Allow a minimum of two days and a maximum of four days for preliminary curing.

Subsection 501-10 Compacting, Shaping, and Finishing

Last paragraph is not applicable.

Subsection 501-11 Thickness

Last two paragraphs are not applicable.

Construction of Cement Treated Subgrade

The Design-Build Team shall construct the soil cement sub-grade as specified in Section 542 of the 2018 *Standard Specifications for Roads and Structures*, with the following exceptions:

Subsection 542-4 Equipment

Contractor's equipment will not require Engineer's approval.

Subsection 542-7 Application of Cement

First paragraph is not applicable.

Subsection 542-11 Thickness

Paragraphs 2 and 3 are not applicable.

Unconfined Compressive Strength

The lime-stabilized subgrades shall be tested using Dynamic Cone Penetrometer (DCP) and / or by making field specimens. DCP testing shall be in accordance with *Quality Assurance Testing of Lime-Treated Soils Utilizing the Dynamic Cone Penetrometer*, Test Method #1-2005. The Design-Build Team shall adhere to the testing equipment requirements and procedures as outlined in *Dynamic Cone Penetrometer Testing for Subgrade Stability* except that the minimum penetration depth shall be eight inches. Upon request, a copy of the aforementioned documents can be obtained from the NCDOT Geotechnical Engineering Unit. The required unconfined compressive strength for lime shall be 60 psi, which corresponds to a penetration per blow of approximately 0.5 inches of the Dynamic Cone Penetrometer. If field specimens are made, cure them for seven days and test them in the laboratory. The minimum required unconfined compressive strength for lime-stabilized subgrade shall be 60 psi.

For cement-stabilized subgrades, the Design-Build Team shall make field specimens, cure them for seven days and test them in the laboratory. The minimum and maximum required unconfined compressive strength for soil cement shall be 200 psi and 400 psi, respectively.

For both lime and cement stabilized subgrades, one test shall be required for every 400 feet per lane width at random locations selected using random number tables.

Submittals for Review During Construction

The Design-Build Team shall submit the unconfined compressive strength and dynamic cone penetrometer test results for review and acceptance.

CEMENT TREATED BASE COURSE

(7-22-13) (Rev. 9-8-17)

DB5 R21A

General

The Design-Build Team shall be responsible for the following:

1. Performing all laboratory tests in a laboratory certified by the AMRL / NCDOT Laboratory Proficiency Program
2. Sampling Aggregate
3. Conducting Laboratory tests to determine:
 - a. Job Mix Formula
 - b. Quantity of cement required to achieve specified strengths

4. Designating areas to be stabilized by cement treated base course and the required rates of application
5. Conducting field tests to determine unconfined compressive strength

Sampling Aggregate

Aggregate shall be sampled from the proposed aggregate pile at the quarry. An AASHTO classification test with unit weight and optimum moisture determination shall be completed on the sample. The aggregate shall meet the Acceptance Criteria in Column B of Table 1010-4 of the NCDOT Aggregate Sampling Manual.

Job Mix Formula

A job mix formula shall be established for the accepted aggregate three weeks prior to proposed production. During production, the aggregate shall meet the tolerances specified in Table 540-1 of the 2018 *Standard Specifications for Roads and Structures*.

Determine Required Portland Cement Rate

The quantity of Portland cement required shall be 3.0 – 4.0 percent by weight of the aggregate. Mix 3.5% and 4.0% Portland cement, aggregate and water at 1.5% over optimum and cure for seven days. Select rate of cement that provides a minimum and maximum unconfined compressive strength of 500 psi and 800 psi at seven days, respectively.

Submittals for Review and Approval Prior to Construction

The Design-Build Team shall adhere to the following submittal guidelines:

- Submit all laboratory test results for review and approval
- Submit a sketch in plan view showing areas of the project to be stabilized by Cement Treated Base Course and application rates
- Submit any other documentation that supports the Design-Build Team's recommendations

Construction of Cement Treated Base Course

The Design-Build Team shall construct the Cement Treated Base Course as specified in Section 540 of the North Carolina Department of Transportation 2018 *Standard Specifications for Roads and Structures* except that Articles 540-5, 540-7 and 540-13 do not apply.

Unconfined Compressive Strength

For Cement Treated Base Course, the Design-Build Team shall make field specimens, cure them for seven days and test them in the laboratory. The minimum and maximum acceptable unconfined compressive strength for soil cement shall be 450 psi and 850 psi, respectively. One test shall be required for every 400 feet per lane width at random locations selected using random number tables.

Submittals for Review During Construction

The Design-Build Team shall submit the unconfined compressive strength test results for review and acceptance.

PRICE ADJUSTMENTS FOR ASPHALT BINDER

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

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*.

When it is determined that the monthly selling price of asphalt binder on the first business day of the calendar month during which the last day of the partial payment period occurs varies either upward or downward from the Base Price Index, the partial payment for that period will be adjusted. The partial payment will be adjusted by adding the difference (+ or -) of the base price index subtracted from the monthly selling price multiplied by the total theoretical quantity of asphalt binder authorized for use in the plant mix placed during the partial payment period involved.

The base price index for asphalt binder for plant mix is \$ **PRICE TO BE INCLUDED IN THE FINAL RFP** per ton.

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

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. 8-3-15)

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 will 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 the floor-to-ceiling height that is at least 7 feet 6 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:

<u>Number</u>	<u>Item</u>
4	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 by 36 inch drawings with 6 plan clamps
1	Printing calculator
2	2-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 of the light fixtures that shall be a fluorescent light situated 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 1 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.

UNDERGROUND CONDUIT

(1-27-16)

(A) MATERIALS

1. General

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department's QPL, however, for HDPE and accessories, adhere to "Submittal 'Requirements'" in the Intelligent Transportation Systems (ITS) Scope of Work found elsewhere in the RFP.

Refer to the following Articles of the *2018 Standard Specifications for Roads and Structures*:

- Backfill 1018-2
- Graded Stone 545-2 and 545-3

Furnish non-detectable underground marker tape with the wording "WARNING – Fiber-Optic Cable" in all trenches containing one or more conduits that will house fiber-optic communications cable.

Comply with Article 1091-3 of the *2018 Standard Specifications for Roads and Structures*, with additional requirements detailed below.

Conduit Types

Use moldable sealing putty in occupied conduit and conduit risers.

2. Mechanical Couplings for HDPE Conduit

Provide mechanical couplings that are both watertight and airtight for joining two segments of HDPE conduit of like diameter in trenched locations. Do not use mechanical couplings for directionally drilled installations. Provide couplings designed to accommodate pneumatic methods of cable installation. Provide couplings suitable for burial underground and that meet the following requirements:

- The coupling shall not fail by leakage when subjected to sustained internal pressure testing as noted in ASTM F 2176
- The coupling shall not fail by leakage when subjected to sustained external pressure testing as noted in ASTM F 2176
- The coupling assemblies tested shall be able to comply with the tensile loading requirements as specified in ASTM F 2176
- As specified in ASTM F 2176, the coupling shall not fail when conditioned at low temperature conditions of 10 degrees F and tested by an impact with a force of 20 ft-lb using Type "B" as described in Test Method ASTM D 2444

Delineator Markers

The Design-Build Team shall furnish and install delineator markers with all necessary hardware in accordance with the provisions of Section 1098-13 and 1733 of the 2018 *Standard Specifications for Roads and Structures*.

(B) CONSTRUCTION METHODS

1. General

Comply with Article 1715-3 of the 2018 *Standard Specifications for Roads and Structures*.

Install four 1.25" conduits (blue, white, black and orange) for all underground routes that are designated to convey 72-fiber communications cables. Install a minimum of one 2" conduit for underground routes that are designated to convey 6-fiber communications cable.

Install a minimum of two 1.25" conduits for conveying communication cables, exclusive of conduit needed for power service, for all directional drill installations beneath roadways, or streams.

Do not exceed 1,500 feet between junction boxes in any underground conduit route that conveys communications cable without the prior approval of NCTA. Do not exceed 150 feet between junction boxes in any underground conduit route that conveys electrical cable without the prior approval of NCTA.

2. Trenching

Clean existing underground conduit to be incorporated into a new system by drawing a mandrel through the conduit followed by a swab. Clear obstructions or blockages in an existing underground conduit designated for reuse by using compressed air, water jetting, rod and mandrel or other method as approved by the Engineer. Once obstruction / blockage has been cleared, perform aforementioned cleaning procedure to clean out any remaining materials that may cause cable abrasions.

Install non-detectable marker tape longitudinally in the trench 6 to 12 inches below the unpaved ground surface or below the underside of the paved surface.

3. Maximum Length of Directional Drill

The length of a directional drill shall not exceed 1,000 feet measured horizontally along the route of the directionally drilled conduit(s), unless otherwise approved by the Engineer. On or before the 1,000-foot mark, transition from directional drill to trenching to continue the route up to the maximum spacing of 1,500 feet between junction boxes. Alternatively, continue the route by beginning a successive directional drill and installing an over-sized heavy-duty junction box where the two directionally drilled conduit runs meet.

4. Bore and Jack

Comply with Article 1715-3(E) of the 2018 *Standard Specifications for Roads and Structures*.

5. Delineator Markers

Place delineator markers at every splice and junction box location.

Provide text, including the division contact number that is hot stamped in black on a yellow background material that will not fade or deteriorate over time. Provide delineator markers with a nominal message height of 15 inches and that contain the following text visible from all directions approaching the assembly:

WARNING
NCDOT FIBER OPTIC CABLE
BEFORE EXCAVATING OR
IN AN EMERGENCY
CALL: (xxx) yyy-zzzz

Install delineator markers using a method that securely anchors the delineator marker in the ground to prohibit twisting and easy removal.

JUNCTION BOXES

(1-27-16)

(A) MATERIALS**1. General**

Comply with Article 1095-2 of the 2018 *Standard Specifications for Roads and Structures*, except as follows:

Provide junction box covers with standard NCDOT logos, pull slots and stainless steel pins. Do not provide sealant compound between junction boxes and covers. Material, equipment, and hardware furnished in this special provision must be pre-approved on the Department's QPL by the date of equipment installation; however, for special-sized heavy-duty junction boxes, loop and any custom junction boxes, adhere to "Submittal Requirements" found elsewhere in the RFP.

Provide an 18" reinforced concrete collar on all junction boxes, unless boxes are on slopes of 3:1 or worse. Avoid placing junction on such slopes wherever possible.

Provide box drains as shown in the AET Standard Drawings dated March 29, 2016.

2. Standard Sized Junction Boxes

Provide standard sized junction boxes with minimum inside dimensions of 16"(l) x 10"(w) x 10"(d) that meet or exceed the Tier 15 requirements of ANSI/SCTE 77. Provide certification that testing methods are compliant with ANSI/SCTE 77. Vertical extensions of 6" to 12" shall be available from the junction box manufacturer.

Oversized Heavy-Duty Junction Boxes

Provide oversized heavy-duty junction boxes and covers with minimum inside dimensions of 30"(l) x 15"(w) x 24"(d) that meet or exceed the Tier 15 requirements of ANSI/SCTE 77. Provide certification that testing methods are compliant with ANSI/SCTE 77.

3. Special-sized, Heavy-Duty Junction Boxes

Provide special-sized heavy-duty junction boxes and covers with minimum inside dimensions of 36"(l) x 24"(w) x 24"(d) that meet or exceed the Tier 15 requirements of ANSI/SCTE 77. Provide certification that testing methods are compliant with ANSI/SCTE 77.

Install a special-sized, heavy-duty junction box at each detection site shown in the Concept Plans, for connection to the device by others.

4. Loop Splice Boxes

Provide loop splice boxes and covers with minimum inside dimensions of 36"(l) x 18"(w) x 30"(d) that meet or exceed the Tier 15 requirements of

ANSI/SCTE 77. Provide certification that testing methods are compliant with ANSI/SCTE 77.

(B) CONSTRUCTION METHODS

Comply with Article 1411-3 of the 2018 *Standard Specifications for Roads and Structures*, except as follows:

Install junction boxes flush with finished grade. Do not install sealant compound between junction boxes and covers.

Install junction boxes where underground splicing of electrical cable is necessary and where transitioning from below ground to above ground installation or vice-versa.

Install oversized heavy-duty junction boxes in underground fiber-optic communications cable runs at maximum intervals of 1500 feet for boxes containing fiber-optic cable except those with splice enclosures.

Install special-sized, heavy-duty junction boxes at all underground fiber-optic splice enclosure locations.

Install loop splice boxes in AET Toll Zones as shown in the AET Standard Drawings March 29, 2016.

Route the black and orange conduits into the ITS junction box. Route the white and blue conduit into the Tolls junction box.

Mark the “Tolls” junction box with a blue plastic disc similarly in size and material to those used at other such boxes on NCTA facilities.

FIBER-OPTIC CABLE

(1-27-16)

(A) MATERIALS

1. SMFO Communications Cable

Furnish single-mode fiber-optic communications cable that is pre-approved on the Department’s QPL.

Comply with Article 1098-10 of the 2018 *Standard Specifications for Roads and Structures*.

2. Drop Cable

Comply with Article 1098-10 (A) of the 2018 *Standard Specifications for Roads and Structures*.

Furnish drop cable to provide communications links between splice enclosures and Ethernet edge switches mounted in cabinets. Provide drop cable that is factory pre-assembled and factory pre-tested with the necessary drop cable length. Furnish a drop a cable comprised of the designated length of fiber-optic cable that has been factory pre-terminated on a factory pre-connectorized patch panel with six connectors matching the Ethernet edge and hub switches to form an integral

pre-assembled unit. Furnish a drop-cable that requires no field assembly, connectorization, or termination other than splicing the free end of the drop cable into the fiber-optic trunk cable in a splice enclosure external to the cabinet.

Provide a drop cable assembly with a patch panel in a compact, modular housing or a patch panel housed in low profile, rack-mountable interconnect center. The compact modular patch panel shall have a rugged, durable, non-metallic housing that can be surface-mounted vertically to the face of the 19-inch equipment rack rail inside a cabinet or mounted horizontally within the equipment rack occupying no more than one standard rack unit (1 RU) of space. The dimensions of the patch panel shall not exceed 1.75" (h) x 16.5"(w) x 13.5" (d). The low-profile interconnect center that houses the patch panel shall be a powder-coated aluminum enclosure designed for mounting horizontally in the 19-inch equipment rack inside a device cabinet and shall occupy no more than one standard rack unit (1 RU) of space.

Provide outdoor-rated, non-armored, riser-rated cable. Provide UV rated cable.

Use single-mode fiber-optic cable that does not exceed attenuation of 0.30 dB/km at 1550 nm and 0.40 dB/km at 1310 nm. Ensure attenuation loss for complete drop cable assembly does not exceed a mean value of 1.5 dB.

Provide metal connector housing, ceramic ferrules and coupler inserts. Provide a connector attenuation of 0.20 dB and a reflectance of <-55 dB UPC. Use heat-cured epoxy material.

Provide length markings in sequential feet and within one percent of actual cable length. Ensure character height of markings is approximately 0.10".

Furnish SMFO jumpers that are a minimum of three feet in length with factory-assembled connectors matching the Ethernet edge and hub switches on each end for connecting Ethernet edge and hub switches to the fiber-optic patch panels on the drop cable assemblies. The Design-Build Team shall provide SMFO jumpers of sufficient length to not strain the fibers within when installed in the final position. The minimum length for all jumpers shall be three feet in field. Ensure SMFO jumpers meet the operating characteristics of the SMFO cable with which they are to be coupled.

3. Communications Cable Identification Markers

Comply with Subarticle 1098-10(C) of the 2018 *Standard Specifications for Roads and Structures*.

(B) CONSTRUCTION METHODS

1. General

Comply with Subarticle 1730-3(A) of the 2018 *Standard Specifications for Roads and Structures*.

2. Underground Installation

Comply with Subarticle 1730-3(C) of the 2018 *Standard Specifications for Roads and Structures*.

Where more than one fiber-optic cable is being installed in a multiple conduit underground run, ensure that at least one conduit remains empty for future use by installing more than one cable in a conduit as needed, unless directed otherwise by the Engineer.

Use a breakaway swivel so as not to exceed 80% of the maximum allowable pulling tension specified by the cable's manufacturer if cable is pulled by mechanical means.

Store 50 feet of each fiber-optic cable in oversized heavy-duty junction boxes on all cable runs that are continuous without splices. Obtain approval for spare cable storage locations.

If a blockage is encountered when attempting to install a communications cable inside an existing conduit in accordance with the Plans developed by the Design-Build Team, use compressed air, water jetting, rod and mandrel or other Engineer-approved method to clear the obstruction or blockage in the existing underground conduit. Once obstruction/blockage has been substantially cleared, draw a mandrel through the conduit followed by a swab to clean out any remaining materials which may cause cable abrasions. Use a mandrel constructed of aluminum or stainless steel that is at least 6 inches in length and has an outer diameter that is approximately 1/2 inch less than the inside diameter of the conduit being cleared.

3. Installation of Drop Cable

Verify the length of fiber-optic drop cable needed, including slack, to reach from termination point to termination point.

At below ground splice enclosures, coil 50 feet of slack cable for each cable entering and exiting the splice enclosure in the junction box where enclosure is located except where the Plans developed by the Design-Build Team call for greater storage (i.e., at project termini). Coil and store any fiber-optic drop cable in excess of what is needed for storage in the junction box in the base of the equipment cabinet. Where fiber-optic cables are installed but not immediately spliced, store 100 feet of drop cable and 100 feet of fiber-optic trunk cable inside the manhole or junction box to facilitate subsequent splicing in the splice enclosure. Cap and seal ends of cables that have yet to be spliced or terminated with a waterproof heat-shrink cap/seal as approved by the Engineer.

At the equipment cabinet end of fiber-optic drop cable, terminate all fibers by splicing them to factory-assembled SMFO pigtailed with LC connectors and connecting the pigtailed to the connector panel in the rack-mounted interconnect center. Label all connectors, pigtailed and the connector panel. At the aerial or underground splice location, cap off all unused fibers and label to correspond with the connector panel. After termination, coil and store in the base of the equipment cabinet 20 feet of drop cable plus any additional drop cable in excess of what is needed for overhead storage.

Where the Plans developed by the Design-Build Team call for a fiber-optic drop cable to be installed in an existing riser, remove all existing cables from the riser and remove the existing weatherhead, sealing bushing or heat shrink tubing. Install the new fiber-optic drop cable in the existing riser and install new heat shrink tubing at the top of the existing riser using a heat shrink tubing retrofit kit. If the riser contains existing fiber-optic communications cable, carefully remove the fiber-optic cable from the riser so as not violate its minimum bending radius or otherwise damage the cable. Temporarily coil and store the existing fiber-optic cable overhead in a manner approved by the Engineer until the new drop cable can be spliced into the existing cable in an aerial splice enclosure. Once splicing has been completed, furnish and install fiber-optic cable storage guides and permanently store all remaining spare cable.

Mount the patch panel of the drop cable assembly vertically to the surface the rack frame or horizontally within 19-inch equipment rack using the screws, mounting brackets and hardware provided with the drop cable assembly. Mount the patch panel in a location convenient to the Ethernet switch to facilitate installation of SMFO jumpers between them. Secure drop cable in cabinet using cable ties and cable management hardware.

Install SMFO jumpers between the appropriate connectors on the patch panel of the drop cable assembly and the Ethernet edge switch.

Label all connectors, pigtails, and the connector panel.

Using an OTDR, test the end-to-end connectivity of the drop cable assembly from patch panel installed inside the ITS cabinet to its respective communications hub. Comply with the OTDR testing and reporting requirements of the *Testing and Acceptance* Project Special Provision found elsewhere in this RFP when testing drop cable.

FIBER-OPTIC SPLICE CENTERS

(1-27-16)

(A) MATERIALS

Material, equipment, and hardware furnished in this provision shall be pre-approved on the Department's QPL. Ensure patch panel connectors match connectors for associated switches.

1. Interconnect Center

Furnish compact, modular interconnect centers designed for rack mounting in hub cabinets. Design and size interconnect centers to accommodate all fibers (used and unused) entering the hub cabinets.

Provide splice trays that hold, protect, organize optical fibers, and secure fibers inside splice tray. Design and size the splice trays to be dielectric, to accommodate all fibers entering splice tray, and to provide sufficient space to prevent microbending of optical fibers. Provide connector panels with LC-type connectors.

Furnish SMFO pigtails with each interconnect center. Provide pigtails that are a maximum of 6 feet in length with factory-assembled LC connectors on one end. Ensure SMFO pigtails meet the operating characteristics of the SMFO cable with which it is to be coupled.

For connecting Ethernet edge switches to the interconnect center patch panels, furnish SMFO jumpers that are a minimum of 3 feet in length with factory-assembled LC connectors on one end (i.e., the interconnect center end) and, on the other end, factory-assembled connectors of the same type provided on the Ethernet edge switch. Ensure SMFO jumpers meet the operating characteristics of the SMFO cable with which it is to be coupled.

Comply with Subarticle 1098-11 (A) of the 2018 *Standard Specifications for Roads and Structures*.

2. Splice Enclosure

Comply with Subarticle 1098-11 (B) of the 2018 *Standard Specifications for Roads and Structures*.

(B) CONSTRUCTION METHODS

1. General

Comply with Article 1731-3 of the 2018 *Standard Specifications for Roads and Structures*.

2. Termination and Splicing within Interconnect Center

Install one rack-mounted interconnect center for hub cabinet locations (shown on the ITS Concept Plans dated January 11, 2017) with an Ethernet Hub Switch.

Fiber strands shall be either expressed through an interconnect center or terminated on patch panels. For all fibers designated to pass through an interconnect center, neatly coil and express the fibers without cutting. Neatly coil excess tubing inside interconnect center.

Install SMFO jumpers between the appropriate connectors on the interconnect center and the hub switch.

3. Splice Enclosure

Comply with Subarticle 1731-3(E) of the 2018 *Standard Specifications for Roads and Structures*.

The Design-Build Team shall develop a cable-splicing plan to maximize cable performance and minimize the quantity of cable.

Install underground enclosures with 50 feet of slack cable from each trunk cable entering the enclosure to allow enclosure to be taken out of the special sized heavy-duty junction boxes and extended into a splicing vehicle.

For underground, special-sized heavy duty and junction box facility installations, place the enclosure along with required spare cables in the facility in a neat and workmanship like manner. Neatly coil the spare cable in the special-sized heavy-

duty junction boxes. In the hub cabinets, neatly coil the spare cable and secure with tie wraps to the communications rack or cable trays.

Install a splice enclosure at each detection site shown in the Concept Plans, for connection to the device by others.

ELECTRICAL SERVICE

(1-27-16)

(A) MATERIALS

Material, equipment, and hardware furnished in this provision must be pre-approved on the Department's QPL by the date of equipment installation. . Comply with the National Electrical Code (NEC), the National Electrical Safety Code (NESC), the Standard Specifications, the Project Special Provisions, and all local ordinances.

Provide UL-listed 1-inch Schedule 80 conduit for underground runs. If electrical conduit shares a trench with fiber-optic conduit, use conduit color other than black, orange, blue or white.

Provide all materials necessary to form a complete electrical service assembly as shown in 2018 *Roadway Standard Drawing* No. 1700.01, "Electrical Service Options".

Provide an external electrical service disconnect at each new ITS device cabinet location. Furnish external electrical service disconnects with a minimum of a double pole 50 ampere circuit breaker with a minimum of 10,000 RMS symmetrical amperes short circuit current rating in a lockable NEMA 3R enclosure. Ensure service disconnects are listed as meeting UL Standard UL-489 and marked as being suitable for use as service equipment. 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. Provide ground bus and neutral bus with a minimum of four terminals with minimum wire capacity range of number 14 AWG through number 4 AWG.

Furnish NEMA Type 3R meter base rated 100A minimum for overhead service and 200A minimum for underground service and that meets 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. With each meter base, provide a blank meter socket cover made from UV stabilized polycarbonate or metal and that is either clear or gray in color to prevent access to interior of meter base until meter is installed by the local power company. Furnish four 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-414
- Overhead or underground service entrance as shown on the Plans developed by the Design-Build Team.

Ensure meter bases have electrostatically applied dry powder paint finish, light gray in color, with minimum thickness of 2.4 mils. Furnish 1" watertight hub for threaded rigid conduit with meter base. For all new ground-mounted electrical service assemblies for underground electrical service, provide a combination panel with pedestal extension. Ensure combination meter and disconnect mounted in a pedestal for underground service is listed as meeting UL Standard UL-231. Do not provide wood posts, steel U-channel posts, square tube sign posts, metal framing, or any method other than an underground service pedestal to mount meter bases and disconnects for new underground electrical service.

At the main service disconnect, furnish, and install UL-approved lightning arresters 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

As indicated below, provide the following:

CCTV Camera Cabinet:

- 1 single-pole 15A breaker
- 3 spare slots/spaces for a total of four (4) breaker slots/spaces
- 3-wire stranded #12 AWG copper feeder conductors with THWN rating

DMS Cabinet:

- 1 double-pole 50A breaker
- 3 slots/spaces for a total of four (4) breaker slots/spaces
- 4-wire stranded #8 AWG copper feeder conductors with THWN rating

Shared DMS and CCTV Cabinet:

- 1 double-pole 70A breaker
- 3 slots/spaces for a total of four (4) breaker slots/spaces

- 4-wire stranded #8 AWG copper feeder conductors with THWN rating

Furnish 2" rigid galvanized conduit between disconnect and the equipment cabinets as required. For underground runs greater than 10 feet in length, the Contractor may transition from rigid galvanized conduit to PVC conduit for the remainder of the underground run beyond the initial 10 feet. Furnish Schedule 40 PVC female adapters to connect the PVC conduit to the threaded end of the rigid galvanized conduit. The interior surface of one end of the PVC female adapter shall be compatibly threaded to connect it to the threaded end of the rigid metallic riser without the aid of additional fittings, hardware, or adhesives. The opposite end of the adapter shall be non-threaded to permit a slip fit, glued connection to the underground PVC conduit.

Provide a grounding electrode system at all new electrical services. Provide marker tape for underground installation above ground grounding electrodes and buried ground wire. Provide all grounding electrodes and ground wire necessary to ensure that grounding system, whether existing or new.

1. 10KVA Single Phase General Purpose Transformer

Furnish a double-wound, dry type general purpose transformer to isolate the line side voltages from the load side voltages as shown in the Plans developed by the Design-Build Team. Provide the transformer with the following specifications:

- Primary Volts: 120/240 with 83/41 Amps Max. 60Hz.
- Secondary Volts: 120/240 with 83/41 Amps Max. 60Hz.
- 10kVA power rating.
- Electrostatic shielding between primary and secondary windings.
- Epoxy-silica encapsulated core and coil.
- Copper windings and copper lead wire terminations.
- Multiple front and bottom knockout for conduit entry/exit.
- Ground studs for conduit bonding.

Provide the transformer in a lockable NEMA 3R enclosure suitable for mounting on a metal pole.

2. Equipment Cabinet Disconnect

Provide new equipment cabinet disconnects. 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 equipment cabinet disconnects are listed as meeting 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 must be powder coated steel. Provide ground bus and neutral bus with a minimum of four terminals and a minimum wire capacity range of number 14 through number 1/0 AWG.

3. 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-83
- Meets ASTM B-3 and B-8 or B-787 standards.

4. 3-Wire Copper Feeder Conductors

Furnish 3-wire stranded copper feeder conductors with THWN rating for supplying power to CCTV camera equipment cabinets and hub cabinets. Provide conductors with black, white, and green insulation that are intended for power circuits at 600 Volts or less and comply with the following:

- Listed as meeting UL-83
- Meets ASTM B-3 and B-8 or B-787 standards.

5. 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, Standard Specifications, and these Project Special Provisions.

(B) CONSTRUCTION METHODS**1. General**

All work involving electrical service shall be coordinated with the appropriate electric utility company. Coordinate with the utility company to ascertain the feasibility of installing electrical service at each location before performing any work. Coordinate with the local power company concerning the location of the electric power service relative to the equipment cabinet and whether or not service will be provided underground or overhead. Obtain all required local permits before beginning work.

Run feeder conductors separately from all other conductors in a 2-inch rigid galvanized conduit. Do not allow feeder conductors to share conduits with any other conductors or cables. Do not route unfused electrical feeder conductors inside of metal poles. Permanently label conductors at all access points using nylon tags labeled with permanent ink. Ensure each conductor has a unique identifier. Label conductors immediately upon installation. Use component name and labeling scheme approved by the Engineer.

Use rigid galvanized conduit for all underground conduit runs 10 feet or less in length. For underground runs greater than 10 feet in length, the Design-Build Team may transition from rigid galvanized conduit to PVC conduit for the remainder of the run beyond the initial 10 feet using an approved PVC female adapter. Apply thread seal tape to the threads of the rigid galvanized conduit

before screwing the PVC adapter onto the threaded male end of the conduit. Connect the threaded female end of the PVC adapter to the threaded end of the rigid galvanized conduit, then connect the not threaded end of the adapter to the PVC conduit using a slip fit, glued connection.

Upon completion of electrical service installation and backfilling of all excavations, restore the disturbed ground to its original condition as determined and approved by the Engineer. For paved areas, replace removed or damaged pavement with in kind materials, matching the elevation, color, texture/finish, and general appearance of the surrounding pavement. For unpaved areas, backfill excavations with removed material, tamp the backfilled material and rake smooth the top 1½ inches. Finish unpaved areas flush with surrounding natural ground and to match the original contour of the ground. Seed with same type of grass as surrounding area and mulch the newly seeded area. If unpaved area was not grassed, replace the original ground cover in kind as directed by the Engineer.

Provide all necessary stainless steel banding hardware and clamps for securely attaching service disconnects, combination panels and service conduits and risers to metal poles.

2. New Electrical Service for ITS and Tolls Devices

Install new electrical service for a device cabinet in accordance with the details. Install a new electrical service comprised of an external service disconnect and a meter base housed in a combination panel. If more than one cabinet is fed from the same utility company service point, a common meter may be utilized with individual breakers at the meter service and disconnects at each device cabinet. The cost of running electrical service to all cabinets will include any transformers required.

Locate all secondary power service points outside the controlled access right of way. Locate combination panels as shown on the ITS Standard Details dated February 1, 2018. After installation of the meter base, the local power company will install a new meter and make any necessary connections to the power lines.

Have the power company route the service drop underground to the service entrance equipment, even where source power lines are overhead; wood poles on NCTA right-of-way for power service are generally not permissible with the exception of bringing power just inside the right-of-way.

Place durable vinyl identification number sticker (with 2" letters) on meter base. Utilize stickers that match the appearance of those used elsewhere on NCTA projects. Submit proposed sticker to NCTA for approval.

3. 10KVA Single Phase General Purpose Transformer

As shown on the Plans developed by the Design-Build Team, install a single-phase general-purpose transformer in a NEMA 3R enclosure. Route the conductors from the transformer secondary to the DMS equipment cabinet or equipment cabinet disconnect in rigid galvanized conduit. Bond the equipment cabinet disconnect in accordance with the NEC. Provide all mounting hardware

and other parts and labor necessary to install successfully the transformer on a wood pole or on a 6"x6" treated wood post.

4. Equipment Cabinet Disconnect

Install equipment cabinet disconnects and circuit breakers. Install THWN stranded copper feeder conductors, as shown in the Plans developed by the Design-Build Team, between the general-purpose transformer 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 Standard Specifications, Standard Drawings, and the Concept Plans.

5. 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 Standard Specifications and Standard Drawings and all applicable electrical codes.

6. 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 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 Standard Specifications and Standard Drawings and all applicable electrical codes.

7. Grounding System

In addition to NEC requirements, test grounding electrode resistance for a maximum of 20 ohms. Install additional ground rods to grounding electrode system as necessary to meet test requirements. Furnish 5/8" x 10' copper clad steel grounding electrode system (ground rods), #4 AWG solid bare copper conductors, and exothermic welding kits for grounding system installations. Comply with NEC, the Standard Specifications, these Project Special Provisions, and the ITS Concept Plans dated January 11, 2017.

Where a grounding electrode system is connected to the electrical service in accordance with the NEC, test grounding electrode resistance for a maximum of 20 ohms. Grounding electrode resistance test must be verified or witnessed by the Engineer or the Engineer's designated representative. Furnish and install additional ground rods to grounding electrode system as necessary to meet the requirements of these Project Special Provisions and test requirements.

Follow test equipment's procedures for measuring grounding electrode resistance. When using clamp-type ground resistance meters, readings of less than 1 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. The form is located on the Department's website at:

<https://connect.ncdot.gov/resources/safety/Pages/ITS-and-Signals.aspx>

Install a length of marker tape 6 to 12 inches below finished grade directly over grounding electrodes and conductors.

8. New Underground Electrical Service

Install new electrical service for a device cabinet in accordance with the NCTA ITS Standard Details. Install a new electrical service comprised of an external service disconnect and a meter base housed in a combination panel. If more than one cabinet is fed from the same utility company service point, a common meter may be utilized with individual disconnects at each device cabinet. The cost of running electrical service to all cabinets will include any transformers required.

Locate all secondary power service points outside the controlled access right of way. Locate combination panels as shown on the ITS Standard Details. After installation of the meter base, the local power company will install a new meter and make any necessary connections to the power lines.

Have the power company route the service drop underground to the service entrance equipment, even where source power lines are overhead; wood poles on right-of-way for power service are generally not permissible with the exception of bringing power just inside the right-of-way.

Where the feeder conductors are routed to the equipment cabinet through underground conduit, use 2-inch short risers to extend underground conduit vertically into the bottom of pole-mounted equipment cabinets. Attach the short riser to pole. Do not install "freestanding" short risers that are offset from the pole and run straight up from the ground into the cabinet bottom. Connect the 2-inch short risers to the bottom of the pole-mounted cabinet using standard conduit outlet bodies between the top of short riser attached to the pole and the bottom of the cabinet.

HIGH DEFINITION CCTV METAL POLE AND FIELD EQUIPMENT

(06-17-15) (Rev. 9-8-17)

DB 08-04a

1. HIGH DEFINITION CCTV FIELD EQUIPMENT DESCRIPTION

The Design-Build Team shall provide and install High Definition (1080p) CCTV field equipment described in these Project Special Provisions. Ensure equipment is fully compatible with all features of the existing *VideoPro* video management software currently in use by NCDOT in this Region.

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

1.2 MATERIAL**General**

The Design-Build Team shall provide and install new CCTV camera assemblies at the locations approved by the Engineer that consist of the following:

1. Dome CCTV camera that contains in a single enclosed unit the following:
 - a. CCTV color digital signal processing camera unit with zoom lens, filter, control circuit, and accessories
 - b. Motorized pan, tilt, and zoom
 - c. Pole-mount camera attachment assembly.
 - d. All necessary cable, connectors and incidental hardware to make a complete and operable system
2. Lightning arrestors installed in-line between the CCTV camera and the equipment cabinet components.
3. A NEMA Type 4 enclosure constructed of aluminum with a clear acrylic dome or approved equal camera unit housing.

Camera and Lens

The Design-Build Team shall provide new ¼-inch charged-coupled device (CCD) color day/night cameras. The Design-Build Team shall provide cameras with automatic gain control (AGC) for clear images in varying light levels. The camera shall meet the following minimum requirements:

- Video signal format: NTSC compatible resolution, user selectable up to a maximum of 1920 x 1080 (1080p),
- Image sensor resolution: 768 horizontal pixels by 752 vertical pixels,

- Automatic gain control (AGC): 0-20 dB, peak-average adjustable,
- White balance: Automatic through the lens with manual override,
- Electronic-shutter: Dip-switch selectable NTSC electronic shutter with speed range from 1/2 of a second (off) to 1/30,000 of a second (NTSC),
- Overexposure protection: Built-in circuitry or a protection device to prevent any damage to the camera when pointed at strong light sources, including the sun,
- Gain control: Automatic and manual,
- Sensitivity: 1.5 lux at 90% scene reflectance,
- Sync system: Internal AC line lock, phase adjustable using remote control, V-sync,
- Signal to noise ratio: Greater than 50 dB,
- Video output connection: 1-volt peak to peak, 75 ohms terminated, BNC connector, and
- Primary voltage: 120 VAC,
- Camera voltage: 24 VAC or 24 VDC, and
- Camera power: 73 VA with heater at 24 VAC or 3A at 24 VDC.

Zoom Lens

The Design-Build Team shall provide each camera with a motorized zoom lens with automatic iris control with manual override and neutral density spot filter. The Design-Build Team shall provide lenses that meet the following optical specifications:

- Automatic focus: Automatic with manual override,
- Horizontal angle of view: 55.4 degrees at 3.6 mm wide zoom and 2.9 degrees at 82 mm telephoto zoom,
- Focal length: 3.6 mm to 124 mm, 30X optical zoom, 12X electronic zoom,
- Zoom Speed: 2.9, 4.2 and 5.8 seconds,
- Lens aperture: Minimum of f/1.6,

- Maximum Sensitivity at 30 IRE: .07 lux at ½ second color, .2 lux at 1/60 second black and white, .015 lux at ½ sec. black and white,
- 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. The Design-Build Team shall provide mechanical or electrical means 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.

Camera Housing

The Design-Build Team shall provide new dome style enclosures for the CCTV assemblies. Equip housing with mounting assemblies for attachment to the pole mount. 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 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 dome shall have an auto flip dome rotation to rotate and reposition camera for viewing objects passing below camera. The Design-Build Team shall provide electronic image stabilization. The pan and tilt units shall meet or exceed the following specifications:

- Pan: Continuous 360 degrees
- Tilt: +2 to -92 degrees minimum
- Presets: Minimum of 128 presets
- Preset accuracy: .1 degree
- Preset pan speed: .1 degrees / second to 200 degrees / second
- Preset tilt speed: .1 degrees / second to 400 degrees / second
- Privacy zones: Minimum of eight user configurable shapes
- Input voltage: 24 VDC or 24 VAC
- Motors: Two-phase induction type, continuous duty, instantaneous reversing

- Preset Positioning: 64 PTZ presets per camera

Control Receiver / Driver

The Design-Build Team shall 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, 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 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.

CCTV Camera Attachment to Pole

The Design-Build Team shall provide 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.

The Design-Build Team shall provide a CCTV camera attachment assembly that is able to withstand wind loading at the maximum wind speed and gust factor called for in these Special Provisions and can support a minimum camera unit dead load of 45 pounds (20.4 kg).

Surge Suppression

Protect all equipment with metal oxide varistors connecting each power conductor to ground.

Protect coaxial cable from each camera by a surge protector at each end of the cable.

1.3 CONSTRUCTION METHODS

General

Mount CCTV camera units at or near the top of the pole as directed by the Engineer. Position the camera to enable viewing traffic in all directions on the mainline and as approved by the Engineer.

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

Electrical and Mechanical Requirements

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. House the protectors in a small, ventilated weatherproof cabinet attached near the CCTV attachment point in a manner approved by the Engineer.

2. CCTV EQUIPMENT CABINET DESCRIPTION

The Design-Build Team shall provide 336 pole mounted cabinets to house CCTV control and communications 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.

The Design-Build Team shall provide terminal blocks for power for cabinet CCTV and communications devices as needed to accommodate the number of devices in the cabinet.

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.

The Design-Build Team shall provide all conduits, shelving, mounting adapters, and other equipment as necessary to route cabling, mount equipment, and terminate conduit in equipment cabinet.

2.2 MATERIAL

Shelf Drawer

The Design-Build Team shall provide a pull out, hinged-top drawer, having sliding tracks, with lockout and quick disconnect feature in the equipment cabinet. The Design-Build Team shall provide 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 1 inch high, 13 inches deep, and 16 inches wide. The Design-Build Team

shall provide drawers capable of supporting a 40-pound device or component when fully extended.

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.

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 lightning 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 and to the 24V power supply.

Ground Bus

The Design-Build Team shall 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)

The Design-Build Team shall provide 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

2.3 Construction Methods

For each equipment cabinet installation, use stainless steel banding or other method approved by the Engineer to fasten cabinet to pole. Install equipment cabinets so that the height to the middle of the enclosure is 4 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 water proof connections and seals.

Install a UPS in each cabinet and power all CCTV cameras from the UPS.

Install a level concrete technician pad measuring a minimum 4 inches thick, 24 inches wide and 36 inches long at the front door of the CCTV equipment cabinet.

3.0 CCTV METAL POLES

3.1 Description

A. CCTV Metal Poles

The Design-Build Team shall provide and install CCTV metal poles, grounding systems, and all necessary hardware. The work covered by this special provision includes requirements for the design, fabrication, and installation of custom designed CCTV metal poles and associated foundations.

The Design-Build Team shall provide designs of completed assemblies with hardware that equals or exceeds AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, 6th Edition, 2013, including the latest interim specifications and latest interim revisions. The Design-Build Team shall provide assemblies with a round or near-round (18 sides or more) cross-section, or a multi sided cross section with no less than six sides. The sides may be straight, convex, or concave.

B. Drilled Pier Foundations

Design, furnish and install foundations for CCTV metal poles with all necessary hardware in accordance with the plans and specifications.

Design all CCTV pole foundations using actual soil conditions at each pole location. Perform soil test in accordance with sub-section (1) Soil Test of this special provision.

Any additional costs associated with a non-standard site-specific foundation including additional materials, labor and equipment will be considered incidental to the lump sum bid for the entire project. All costs for the non-standard foundation design will also be considered incidental to lump sum bid for the entire project.

Analysis procedures and formulas shall be based on AASHTO, ACI code and per FHWA manuals. Design methods based on engineering publications or research papers needs to have prior approval from NCDOT. The Department reserves the right to accept or disapprove any method used for the analysis.

Use a Factor of Safety of 1.33 for torsion and 2.0 for bending for the foundation design.

Foundation design for lateral load shall not exceed 1" lateral deflection at top of foundation.

Design all custom foundations to carry the maximum capacity of each metal pole.

When poor soil conditions are encountered which could create an excessively large foundation design, consideration may be given to allowing an exemption to the maximum capacity design. The Design-Build Team shall gain approval from the engineer before reducing a foundation's capacity. On projects where poor soil is known to be present, it is advisable that the Design-Build Team consider getting foundations approved before releasing poles for fabrication

Soil Test

- (a) General

Drilled piers are reinforced concrete sections, cast in place against in situ, undisturbed material. Drilled piers are of straight shaft type and vertical.

Some standard drilled piers for supporting poles with mast arms may require wing walls to resist torsional rotation. Based upon this provision and the results of the required soil test, a drilled pier length and wing wall requirement may be determined and constructed in accordance with the plans developed by the Design-Build Team.

For non-standard site-specific poles, the Design-Build Team-selected pole fabricator will determine if the addition of wing walls is necessary for the supporting foundations.

(b) Soil Test Procedure

Perform a soil test at each proposed metal pole location. Complete all required fill placement and excavation at each signal pole location to finished grade before drilling each boring. Soil tests performed that are not in compliance with this requirement may be rejected and will not be paid. Drill one boring to a depth of 26 feet within a 25 foot radius of each proposed foundation.

Perform standard penetration tests (SPT) in accordance with ASTM D 1586 at depths of 1, 2.5, 5, 7.5, 10, 15, 20 and 26 feet. Discontinue the boring if one of the following occurs:

A total of 100 blows have been applied in any 2 consecutive 6-inch intervals,

A total of 50 blows have been applied with < 3-inch penetration.

Describe each CCTV pole location along the project corridor in a manner that is easily discernible to both the Design-Build Team's designer and NCDOT reviewers. If a CCTV pole is at an intersection, label the boring the "Intersection of (Route or SR #), (Street Name) and (Route or SR #), (Street Name), _____ County, Signal Inventory No. _____". Label borings with "B- N, S, E, W, NE, NW, SE or SW" corresponding to the quadrant location within the intersection.

If the CCTV pole location is located between intersections, The Design-Build Team shall provide a coordinate location and offset, or milepost number and offset. Pole numbers should be made available to the geotechnical drilling Contractor. Include pole numbers in the boring label if they are available. If they are not available, ensure the boring labels can be cross-referenced to corresponding pole numbers or pole locations. For each boring, submit a legible (hand written or typed) boring log signed and sealed by a licensed Geologist or Professional Engineer registered in North Carolina. Include on each boring the SPT blow counts and N-values at each depth, depth of the boring, and a general description of the soil types encountered.

Borings that can't be easily related to their specific pole location will be returned to the Design-Build Team for clarification, or if approved by the engineer, the foundation may be designed using the worst case soil condition obtained as part of this project.

Standard Foundation Determination:

Use the following method for determining the Design N-value:

$$N_{AVG} = \frac{(N@1' + N@2.5' + \dots + N@Deepest \text{ Boring Depth})}{\text{Total Number of N-values}}$$

$$Y = (N@1')^2 + (N@2.5')^2 + \dots + (N@Deepest \text{ Boring Depth})^2$$

$$Z = (N@1' + N@2.5' + \dots + N@Deepest \text{ Boring Depth})$$

$$N_{STD \text{ DEV}} = \left(\frac{(\text{Total Number of N-values} \times Y) - Z^2}{(\text{Total Number of N-values}) \times (\text{Total Number of N-values} - 1)} \right)^{0.5}$$

Design N-value equals lesser of the following two conditions:

$$N_{AVG} - (N_{STD \text{ DEV}} \times 0.45)$$

Or

$$\text{Average of First Four N-Values} = \frac{(N@1' + N@2.5' + N@5' + N@7.5')}{4}$$

Note: If less than 4 N-values are obtained because of criteria listed in Section 2 above, use average of N-values collected for second condition. Do not include the N-value at the deepest boring depth for above calculations if the boring is discontinued at or before the required boring depth because of criteria listed in Section 2 above. Use N-value of zero for weight of hammer or weight of rod. If N-value is greater than 50, reduce N-value to 50 for calculations.

Submit completed boring logs collected in accordance with sub-section (1) Soil Test above along with pole loading diagrams to the Design-Build Team-selected pole fabricator to assist in the pole and foundation design.

If one of the following occurs, the Standard Foundations Chart shown on the plans developed by the Design-Build Team may not be used and a non-standard foundation may be required. In such case, contact the Engineer.

The Design N-value is less than 4,

The drilled pier length, "L", determined from the Standard Foundations Chart, is greater than the depth of the corresponding boring.

In the case where a standard foundation cannot be used, the Design-Build Team shall be responsible for all additional design and construction costs associated with the non-standard foundation.

Foundation designs shall be based on level ground around the traffic signal pole. If the slope around the edge of the drilled pier is steeper than 8:1 (H:V) or the proposed

foundation will be less than 10 feet from the top of an embankment slope, the Design-Build Team shall be responsible for providing slope information to the foundation designer and to the Engineer so it can be considered in the design and review, respectively.

The “Metal Pole Standard Foundation Selection Form” may be found at:

https://connect.ncdot.gov/resources/Geological/Geotech%20Forms/2012_METAL%20POLES%20-%20Standard%20Foundation%20Selection.pdf

If assistance is needed, contact the Engineer.

Non-Standard Foundation Design:

Design non-standard foundations based upon site-specific soil test information collected in accordance with sub-section (1) Soil Test above. 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 5.0 or later manufactured by Ensoft, Inc. to analyze drilled piers. Use the computer software gINT version 8.0 or later manufactured by Bentley Systems, Inc. with the current NCDOT gINT library and data template to produce SPT boring logs. The Design-Build Team shall provide a drilled pier foundation for each pole with a length and diameter that result in a horizontal lateral movement of less than 1 inch at the top of the pier and a horizontal rotational movement of less than 1 inch at the edge of the pier. Submit any non-standard foundation designs including drawings, calculations, and soil boring logs to the Engineer for review and approval before construction. Foundations installed without prior approval may be rejected.

3.2 MATERIALS

CCTV Metal Poles

The Design-Build Team shall provide CCTV poles that are a minimum of 50 feet tall.

Fabricate CCTV metal pole from coil or plate steel to meet the requirements of ASTM A 595 Grade A tubes. For structural steel shapes, plates and bars use A572 Gr 50 min or ASTM A709 Gr 50 min. The Design-Build Team shall provide poles that are round in cross section or multisided tubular shapes and have a uniform linear taper of 0.14 in/ft. Construct shafts from one piece of single ply plate or coil so there are no circumferential weld splices. Galvanize in accordance with AASHTO M 111 and / or ASTM A 123 or an approved equivalent.

Ensure that allowable pole deflection does not exceed that allowed per *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, 6th Edition, 2013, including the latest interim specifications and latest interim revisions. Ensure that maximum deflection at the top of the pole does not exceed 2.5 percent of the pole height.

Use the submerged arc process or other NCDOT previously approved process suitable for poles to continuously weld pole shafts along their entire length. The longitudinal seam weld will be finished flush to the outside contour of the base metal. Ensure shafts have no circumferential welds except at the lower end joining the shaft to the pole base. In the event that a circumferential weld is necessary, prior approval is required from the Engineer and NCDOT Materials and Test Unit. The Design-Build Team shall provide welding that

conforms to Article 1072-20 of the 2018 *Standard Specifications for Roads and Structures*, except that no field welding on any part of the pole will be permitted unless approved by a qualified engineer. Refer to Metal Pole Standard Drawing Sheets M2 through M5 for fabrication details. Fabricate anchor bases from plate steel meeting, as a minimum, the requirements of ASTM A 36M or cast steel meeting the requirements of ASTM A 27M Grade 485-250, AASHTO M270 Gr 36 or an approved equivalent. Conform to the applicable bolt pattern and orientation as shown on Metal Pole Standard Drawing Sheet M2.

Ensure all hardware is galvanized steel or stainless steel. The Design-Build Team shall be responsible for ensuring that the designer / fabricator specifies connecting hardware and / or materials that do not create a dissimilar metal corrosive reaction.

Unless otherwise required by the design, ensure each anchor rod is 2" diameter and 60" length. The Design-Build Team shall provide 10" minimum thread projection at the top of the rod, and 8" minimum at the bottom of the rod. Use anchor rod assembly and drilled pier foundation materials that meet the *Foundations and Anchor Rod Assemblies for Metal Poles* Project Special Provision found elsewhere in this RFP.

For each structural bolt and other steel hardware, hot dip galvanizing shall conform to the requirements of AASHTO M 232 (ASTM A 153). Ensure end caps for poles are constructed of cast aluminum conforming to Aluminum Alloy 356.0F.

The Design-Build Team shall provide a circular anchor bolt lock plate that will be secured to the anchor bolts at the embedded end with 2 washers and 2 nuts. The Design-Build Team shall provide a base plate template that matches the bolt circle diameter of the anchor bolt lock plate. Construct plates and templates from 1/4" minimum thick steel with a minimum width of 4". Galvanizing is not required.

The Design-Build Team shall provide 4 heavy hex nuts and 4 flat washers for each anchor bolt. For nuts, use AASHTO M291 grade 2H, DH, or DH3 or equivalent material. For flat washers, use AASHTO M293 or equivalent material.

The Design-Build Team shall provide a 2-inch hole equipped with an associated coupling and weatherhead approximately 5 feet below the top of the pole to accommodate passage of CCTV cables from inside the pole to the CCTV camera.

The Design-Build Team shall provide a 2-inch hole equipped with an associated coupling and conduit fittings/bodies approximately 18 inches above the base of the pole accommodate passage of CCTV cables from the CCTV cabinet to the inside of the pole. Refer to Metal Pole Standard Drawing Sheet M3 for fabrication details.

The Design-Build Team shall provide a hand hole access with a watertight cover and have poles permanently stamped above the base hand hole with the identification tag details as shown on Metal Pole Standard Drawing Sheet M2.

For each pole, The Design-Build Team shall provide a 1/2 inch minimum thread diameter, coarse thread stud and nut for grounding which will accommodate #4 AWG ground wire. Ensure that the lug is electrically bonded to the pole and is conveniently located inside the pole at the hand hole.

The Design-Build Team shall provide a removable pole cap with stainless steel attachment screws for the top of each pole. Ensure that the cap is cast aluminum conforming to Aluminum Association Alloy 356.0F. Furnish cap attached to the pole with a sturdy chain or cable approved by the Engineer. Ensure that the chain or cable is long enough to permit the cap to hang clear of the pole-top opening when the cap is removed.

After fabrication, have steel poles, required mast arms, and all parts used in the assembly hot-dip galvanized per section 1076. Design structural assemblies with weep holes large enough and properly located to drain molten zinc during galvanization process. The Design-Build Team shall provide hot-dip galvanizing on structures that meets or exceeds ASTM Standard A-123. The Design-Build Team shall provide galvanizing on hardware that meets or exceeds ASTM Standard A-153. Ensure that threaded material is brushed and retapped as necessary after galvanizing. Perform repair of damaged galvanizing that complies with the following:

Repair of Galvanizing.....Article 1076-7

Standard Drawings for Metal Poles are available that supplement these project special provisions. These drawings are located on the Department’s website:

<http://www.ncdot.gov/doh/preconstruct/traffic/ITSS/ws/mpoles/poles.html>

Comply with article 1098-1B “General Requirements” of the 2018 *Standard Specifications for Roads and Structures* for submittal requirements. The Design-Build Team shall provide shop drawings for approval. The Design-Build Team shall provide the copies of detailed shop drawings for each type of structure as summarized below. Ensure that shop drawings include material specifications for each component and identify welds by type and size on the drawing details, not in table format. Do not release structures for fabrication until shop drawings have been approved by NCDOT. The Design-Build Team shall provide an itemized bill of materials for all structural components and associated connecting hardware on the drawings.

Comply with article 1098-1A “General Requirements” of the 2018 *Standard Specifications for Roads and Structures* for Qualified Products List (QPL) submittals. All shop drawings shall include project location description, CCTV inventory number(s), and a project number or work order number on the drawings.

Summary of information required for metal pole review submittal:

Item	Hardcopy Submittal	Electronic Submittal	Comments / Special Instructions
Sealed, Approved ITS Plan / Loading Diagram	1	1	All structure design information needs to reflect the latest approved ITS plans.
Custom Pole Shop Drawings	4 sets	1 set	Submit drawings on 11” x 17” format media. Show NCDOT project number and CCTV camera number in or above the title block.
Standard Pole Shop Drawings (from the QPL)	4 sets	1 set	Submit drawings on 11” x 17” format media. Show NCDOT project number and CCTV camera number in or above the title block.

Structure Calculations	1 set	1 set	Submit calculations on 8½" x 11" format media. Show NCDOT project number and CCTV camera number in the upper right corner of each page.
Standard Pole Foundation Drawings	1 set	1 set	Submit drawings on 11" x 17" format media. Submit a completed Standard Foundation Selection form for each pole using foundation table on Metal Pole Drawing M-8.
Custom Foundation Drawings	4 sets	1 set	Submit drawings on 11" x 17" format media. Show NCDOT project number and CCTV camera number in or above the title block.
Foundation Calculations	1	1	Submit calculations on 8½" x 11" format media. Show NCDOT project number and CCTV camera number in the upper right corner of each page.
Soil Boring Logs and Report	1	1	Report should include a location plan and a soil classification report including soil capacity, water level, hammer efficiency, soil bearing pressure, soil density, etc. for each pole.

NOTE – All shop drawings and custom foundation design drawings shall be sealed by a professional Engineer licensed in the state of North Carolina. All geotechnical information shall be sealed by either a Professional Engineer or geologist licensed in the state of North Carolina. Include a title block and revision block on the shop drawings and foundation designs showing the NCDOT inventory number.

Shop drawings and foundation drawings may be submitted together or separately for approval. However, shop drawings shall be approved before foundations can be reviewed. Foundation designs will be returned without review if the associated shop drawing has not been approved. Incomplete submittals will be returned without review.

3.3 CONSTRUCTION METHODS

CCTV Metal Poles

Install anchor rod assemblies in accordance with the *Foundations and Anchor Rod Assemblies for Metal Poles* Project Special Provision found elsewhere in this RFP.

Erect CCTV metal poles only after concrete has attained a minimum allowable compressive strength of 3,000 psi. For further construction methods, see construction methods for Metal Strain Pole.

Connect poles to grounding electrodes and bond them to the electrical service grounding electrodes.

For holes in the poles used to accommodate cables, install grommets before wiring pole or arm. Do not cut or split grommets.

Attach the hand hole covers to the pole by a sturdy chain or cable. Ensure the chain or cable is long enough to permit the cover to hang clear of the opening when the cover is removed, and is strong enough to prevent vandalism. Ensure the chain or cable will not interfere with service to the cables in the pole.

Attach cap to pole with a sturdy chain or cable. Ensure the chain or cable is long enough to permit the cap to hang clear of the opening when the cap is removed.

Perform repair of damaged galvanizing that complies with the 2018 *Standard Specifications for Roads and Structures*, Article 1076-7 “Repair of Galvanizing.”

Install galvanized wire mesh around the perimeter of the base plate to cover the gap between the base plate and top of foundation for debris and pest control.

Install a ¼ inch thick plate for concrete foundation tag to include: concrete grade, depth, diameter, and reinforcement sizes of the installed foundation.

Install CCTV metal poles, hardware, and fittings as shown on the manufacturer’s installation drawings. Install poles so that when the pole is fully loaded it is within 2 degrees of vertical.

Drilled Pier Foundations

Construct drilled pier foundations in accordance with the *Foundations and Anchor Rod Assemblies for Metal Poles* Project Special Provision found elsewhere in this RFP.

2070 CONTROLLERS AND CABINETS

(A) MATERIALS

This section details the requirements for 2070E controllers, cabinets and associated cabinet hardware to support traffic data collection, wrong way detection, and reversible lane control gates. Furnish and install controllers with cabinets and all necessary hardware. Furnish all foundation mounting hardware, detector sensor cards, one Corbin Number 2 cabinet key, conflict monitors, surge protection, grounding systems, AC/DC isolator cards, auxiliary files (where required) and all necessary hardware. Install updates of local controller and operating system software.

1. General

Furnish material, equipment, and hardware under this section that is pre-approved on the ITS and Signals QPL.

Conform to CALTRANS *Transportation Electrical Equipment Specifications* (TEES) (dated March 12, 2009, plus Errata 1 dated January 21, 2010) except as required herein.

2. Controllers

Standards

The 2070E controller shall comply with the following standards:

- NTCIP 1201 Global Object (GO) Definitions – version 02, v02.32

- NTCIP 1209 Data Element Definitions for Transportation Sensor Systems, v02.10
- NTCIP 2104 Ethernet Subnetwork Profile, v01.11
- NTCIP 2202 Internet (TCP/IP and UDP/IP) Transport Profile, v01.15
- NTCIP 2301 Simple Transportation Management Framework Application Profile, v01.08
- NTCIP AB3418b Standard Communications Protocol for Traffic Signals in California, Specification and Implementation Requirements
- Caltrans TEES 2009

Operating System

Provide an open architecture with the latest version of embedded OS/9 operating system. Provide all updates to the OS9 operating system software released up through final acceptance of the project at no additional cost to the Department.

Hardware

Provide the 2070E controller with the following modules and boards:

- Chassis
- Host board
- 2070-1E CPU Module, single board, with 3.3 volt 8MB datakey (blue in color)
- 2070-2A or approved 2070-2E field input/output module
- 2070-3B 8 line x 40 character front panel display
- 2070-4A power supply, 10 amperes
- 2070-7A async. communications module

Provide the 2070E controller host board with:

- 2070-1E CPU board
- Freescale MC86EN360 microprocessor
- 8 MB DRAM
- 8 MB Flash Memory
- 1 MB SRAM

Provide the 2070E controller with the following I/O ports:

- Datakey, removable, 8 Mbs
- Three Ethernet ports
- C50J serial port
- Keyboards: 3 x 4 navigation and 4 x 4 data entry keypads
- Two SLDC

Provide a controller power supply meeting the following requirements:

- + 5 VDC source
- + 12 VDC isolated source

- +/- 12 VDC source
- Power condition indicators
- Input power switch

Type 332 Cabinet

General

The standard cabinet size shall be the Type 332.

Each cabinet shall include the following components:

- Enclosure – single rack cabinet
- Door gaskets
- Doors
- Latches/Locks with Number 2 lock and keys
- Ventilation and air filtration
- Lighting
- Hinges and door catches
- Assembly supports and mounting

Furnish unpainted, natural, aluminum cabinet shells for all locations. Ensure that all non-aluminum hardware on the cabinet is stainless steel or a Department approved non-corrosive alternate.

Ensure the lifting eyes, gasket channels, police panel, and all supports welded to the enclosure and doors are fabricated from 0.125-inch minimum thickness aluminum sheet and meet the same standards as the cabinet and doors.

Provide front and rear doors with latching handles that allow padlocking in the closed position. Furnish 0.75-inch minimum diameter stainless steel handles with a minimum 0.5-inch shank. Place the padlocking attachment at 4.0 inches from the handle shank center to clear the lock and key. Provide an additional 4.0 inches minimum gripping length.

Provide Corbin #2 locks on the front and rear doors. Provide one (1) Corbin #2 and one (1) police master key with each cabinet. Ensure main door locks allow removal of keys in the locked position only.

Provide electrical isolation within the circuit of any device, module, or Printed Circuit Board (PCB), between DC logic ground, equipment ground and the AC-conductor. They shall be electrically isolated from each other by 500 Megaohms, minimum, when tested at the input terminals with 500 VDC.

Provide permanent labels that indicate the slot and the pins connected to each terminal that may be viewed from the rear cabinet door. Label and orient terminals so that each pair of inputs is next to each other. Indicate on the labeling the input file, the slot number and the terminal pins of the input slots.

Provide a minimum 14 x 16 inch pull out, hinged top shelf located immediately below controller mounting section of the cabinet. Ensure the shelf is designed to

fully expose the table surface outside the controller at a height approximately even with the bottom of the controller. Ensure the shelf has a storage bin interior, which is a minimum of 1 inch deep and approximately the same dimensions as the shelf. Provide an access to the storage area by lifting the hinged top of the shelf. Fabricate the shelf and slide from aluminum or stainless steel and ensure the assembly can support the controller plus 15 pounds of additional weight. Ensure shelf has a locking mechanism to secure it in the fully extended position and does not inhibit the removal of the controller or removal of cards inside the controller when fully extended. Provide a locking mechanism that is easily released when the shelf is to be returned to its non-use position directly under the controller.

Cabinet Standards

The Type 332 cabinet for a 2070E controller shall comply with following standards:

- Caltrans TEES 2009
- City of Los Angeles' Specification No. 54-053-08, Traffic Signal Cabinet Assembly Specification
- NTCIP 1201 Global Object (GO) Definitions – version 02, v02.32
- NTCIP 2301 Simple Transportation Management Framework Application Profile, v01.08
- Provide a Type 332 cabinet for a 2070E application that is pre-approved on the ITS and Signals QPL. Conform to the City of Los Angeles' Specification No. 54-053-08, *Traffic Signal Cabinet Assembly Specification* (dated July 2008), except as required herein.

Configuration

Furnish model 332 base mounted cabinets configured as shown in the Concept Plans for traffic data collection, wrong way detection, and reversible lane control gate applications. When overlaps are required, provide auxiliary output files for the overlaps.

The Type 332 cabinet shall include the following assemblies:

- Controller unit interface
- Power distribution assemblies
- Input assembly
- Output assembly
- Field input termination assembly
- Field output termination assembly
- Power service assembly
- Clean power bus assembly

Furnish Type 332 base mounted cabinets for configured for a minimum of:

- Type 200 load switches

- Type 204 flasher
- Model 205 transfer relay unit
- Type 206L 24v VDC power supply unit
- Type 208 conflict monitor
- Type 222 loop detector units
- Model 242 or 252 isolator units
- And other equipment as necessary to provide a complete and functional cabinet

Provide a moisture resistant coating on all circuit boards.

Provide one 20 mm diameter radial lead UL-recognized metal oxide varistor (MOV) between each load switch field terminal and equipment ground. Electrical performance is outlined below.

PROPERTIES OF MOV SURGE PROTECTOR	
Maximum Continuous Applied Voltage at 185° F	150 VAC (RMS) 200 VDC
Maximum Peak 8x20µs Current at 185° F	6500 A
Maximum Energy Rating at 185° F	80 J
Voltage Range 1 mA DC Test at 77° F	212-268 V
Max. Clamping Voltage 8x20µs, 100A at 77° F	395 V
Typical Capacitance (1 MHz) at 77° F	1600 pF

Provide a power line surge protector that is a two-stage device that will allow connection of the radio frequency interference filter between the stages of the device. Ensure that a maximum continuous current is at least 10A at 120V. Ensure that the device can withstand a minimum of 20 peak surge current occurrences at 20,000A for an 8x20 microsecond waveform. Provide a maximum clamp voltage of 395V at 20,000A with a nominal series inductance of 200µh. Ensure that the voltage does not exceed 395V. Provide devices that comply with the following:

Frequency (Hz)	Minimum Insertion Loss (dB)
60	0
10,000	30
50,000	55
100,000	50
500,000	50
2,000,000	60
5,000,000	40
10,000,000	20
20,000,000	25

Electrical Requirements

Provide a cabinet assembly designed to ensure that upon leaving any cabinet switch or conflict monitor initiated flashing operation, the controller starts up in the programmed start up phases and start up interval.

Furnish two sets of non-fading cabinet wiring diagrams and schematics in a paper envelope or container and placed in the cabinet drawer.

All AC+ power is subject to radio frequency signal suppression.

Provide surge suppression in the cabinet for each type of cabinet device. Provide surge protection for the full capacity of the cabinet input file. Provide surge suppression devices that operate properly over a temperature range of -40° F to +185° F. Ensure the surge suppression devices provide both common and differential modes of protection.

Provide a pluggable power line surge protector that is installed on the back of the PDA (power distribution assembly) chassis to filter and absorb power line noise and switching transients. Ensure the device incorporates LEDs for failure indication and provides a dry relay contact closure for the purpose of remote sensing. Ensure the device meets the following specifications:

- Peak Surge Current (Single pulse, 8x20µs).....20,000A
- Occurrences (8x20µs waveform).....10 minimum @ 20,000A
- Maximum Clamp Voltage395VAC
- Operating Current.....15 amps
- Response Time.....< 5 nanoseconds

Provide a loop surge suppressor for each set of loop terminals in the cabinet. Ensure the device meets the following specifications:

- Peak Surge Current (6 times, 8x20 μ s)
- (Differential Mode).....400A
- (Common Mode).....1,000A
- Occurrences (8x20 μ s waveform).....500 min @ 200A
- Maximum Clamp Voltage
- (Differential Mode @400A).....35V
- (Common Mode @1,000A).....35V
- Response Time.....< 5 nanoseconds
- Maximum Capacitance.....35 pF

Provide a data communications surge suppressor for each communications line entering or leaving the cabinet. Ensure the device meets the following specifications:

- Peak Surge Current (Single pulse, 8x20 μ s).....10,000A
- Occurrences (8x20 μ s waveform).....100 min @ 2,000A
- Maximum Clamp VoltageRated for equipment protected
- Response Time.....< 1 nanosecond
- Maximum Capacitance.....1,500 pF
- Maximum Series Resistance.....15 Ω

Provide a DC signal surge suppressor for each DC input channel in the cabinet. Ensure the device meets the following specifications:

- Peak Surge Current (Single pulse, 8x20 μ s).....10,000A
- Occurrences (8x20 μ s waveform).....100 @ 2,000A
- Maximum Clamp Voltage30V
- Response Time.....< 1 nanosecond

Provide a 120 VAC signal surge suppressor for each AC+ interconnect signal input. Ensure the device meets the following specifications:

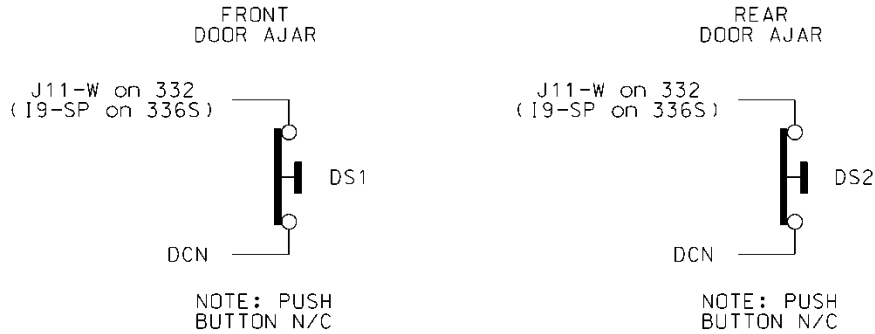
- Peak Surge Current (Single pulse, 8x20 μ s).....20,000A
- Maximum Clamp Voltage350VAC
- Response Time.....< 200 nanoseconds
- Discharge Voltage<200 Volts @ 1,000A
- Insulation Resistance..... \geq 100 M Ω

Provide conductors for surge protection wiring that are of sufficient size (ampacity) to withstand maximum overcurrents, which could occur before protective device thresholds are attained and current flow is interrupted.

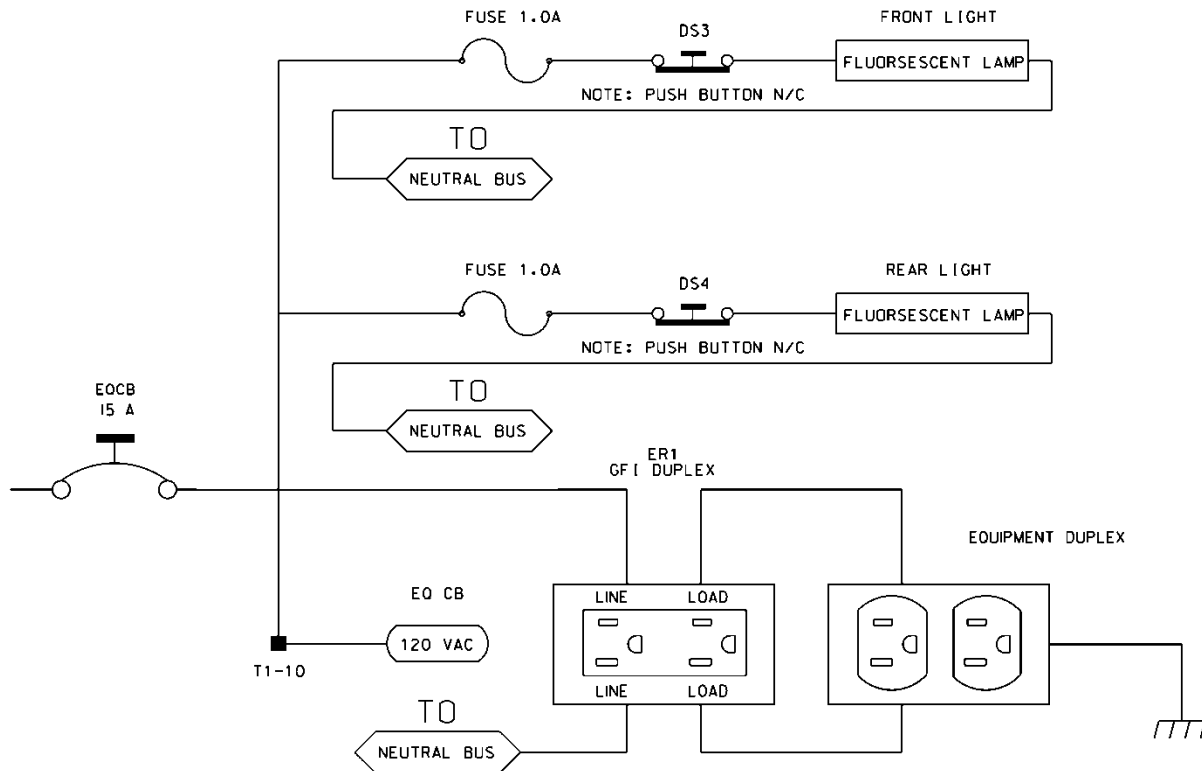
If additional surge protected power outlets are needed to accommodate fiber transceivers, modems, etc., install a UL listed, industrial, heavy-duty type power

outlet strip with a minimum rating of 15 A / 125 VAC, 60 Hz. Provide a strip that has a minimum of 3 grounded outlets. Ensure the power outlet strip plugs into one of the controller unit receptacles located on the rear of the PDA. Ensure power outlet strip is mounted securely; provide strain relief if necessary.

Provide a door switch in the front and a door switch in the rear of the cabinet that will provide the controller unit with a Door Ajar alarm when either the front or the rear door is open. Ensure the door switches apply DC ground to the Input File when either the front door or the rear door is open.



Furnish a fluorescent fixture in the rear across the top of the cabinet and another fluorescent fixture in the front across the top of the cabinet at a minimum. Ensure that the fixtures provide sufficient light to illuminate all terminals, labels, switches, and devices in the cabinet. Conveniently locate the fixtures so as not to interfere with a technician's ability to perform work on any devices or terminals in the cabinet. Provide a protective diffuser to cover exposed bulbs. Install 16 watt T-4 lamps in the fluorescent fixtures. Provide a door switch to provide power to each fixture when the respective door is open. Wire the fluorescent fixtures to the 15 amp ECB (equipment circuit breaker).



For model 332 base mounted cabinets, ensure terminals J14-E and J14-K are wired together on the rear of the Input File. Connect TB9-12 (J14 Common) on the Input Panel to T1-2 (AC-) on the rear of the PDA.

Provide detector test switches mounted at the top of the cabinet rack or other convenient location, which may be used to place a call on each of eight phases based on the chart below. Provide three positions for each switch: On (place call), Off (normal detector operation), and Momentary On (place momentary call and return to normal detector operation after switch is released). Ensure that the switches are located such that the technician can read the controller display and observe the intersection.

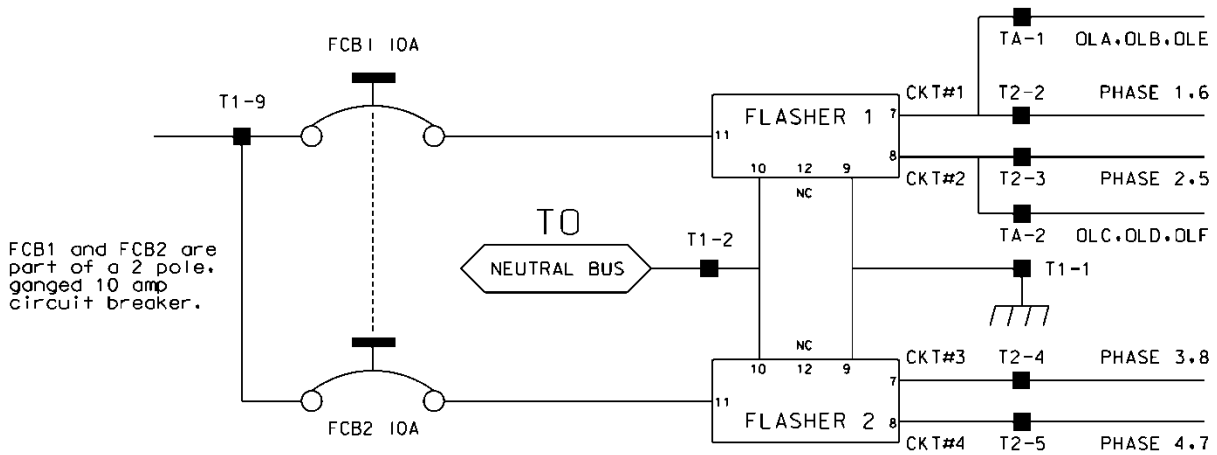
Do not wire pin 12 of the load switch sockets.

Ensure the controller unit outputs to the auxiliary output file are pre-wired to the C5 connector. When no auxiliary output file is installed in the cabinet, connect the C5 connector to a storage socket located on the Input Panel or on the rear of the PDA.

In addition to the requirements of LA Specification No. 54-053-08, ensure relay K1 on the Power Distribution Assembly (PDA) is a four pole relay and K2 on the PDA is a two pole relay.

Provide a two-pole, ganged circuit breaker for the flash bus circuit. Ensure the flash bus circuit breaker is an inverse time circuit breaker rated for 10 amps at 120 VAC with a minimum of 10,000 RMS symmetrical amperes short circuit current

rating. Do not provide the auxiliary switch feature on the flash bus circuit breaker. Ensure the ganged flash bus circuit breaker is certified by the circuit



breaker manufacturer to provide gang tripping operation.

Ensure auxiliary output files are wired as follows:

AUXILIARY OUTPUT FILE	
TERMINAL BLOCK TA ASSIGNMENTS	
POSITION	FUNCTION
1	Flasher Unit #1, Circuit 1/FTR1 (OLA, OLB)/FTR3 (OLE)
2	Flasher Unit #1, Circuit 2/FTR2 (OLC, OLD)/FTR3 (OLF)
3	Flash Transfer Relay Coils
4	AC -
5	Power Circuit 5
6	Power Circuit 5
7	Equipment Ground Bus
8	NC

Provide four spare load resistors mounted in each cabinet. Ensure each load resistor is rated as shown in the table below. Wire one side of each load resistor to AC-. Connect the other side of each resistor to a separate terminal on a four (4) position terminal block. Mount the load resistors and terminal block either inside the back of Output File No. 1 or on the upper area of the Service Panel.

ACCEPTABLE LOAD RESISTOR VALUES	
VALUE (ohms)	WATTAGE
1.5K – 1.9 K	25W (min)
2.0K – 3.0K	10W (min)

Provide Model 200 load switches, Model 204 flashers, Model 242 DC isolators, Model 252 AC isolators, and Model 206L power supply units that conform to CALTRANS' *"Transportation Electrical Equipment Specifications"* dated March 12, 2009 with Erratum 1.

Type 170 E Cabinet Physical Requirements

Do not mold, cast, or scribe the name "City of Los Angeles" on the outside of the cabinet door as specified in LA Specification No. 54-053-08. Do not provide a Communications Terminal Panel as specified in LA Specification No. 54-053-08. Do not provide terminal block TBB on the Service Panel. Do not provide Cabinet Verification Test Program software or associated test jigs as specified in LA Specification No. 54-053-08.

Provide a surge protection panel with 16 loop surge protection devices and designed to allow sufficient free space for wire connection/disconnection and surge protection device replacement. For model 332 cabinets, provide an additional 20 loop surge protection devices. Provide an additional two AC+ interconnect surge devices to protect one slot and eight DC surge protection devices to protect four slots. Provide no protection devices on slot I14.

Mount surge protection panels on the left side of the cabinet as viewed from the rear. Attach each panel to the cabinet rack assembly using bolts and make it easily removable. Mount the surge protection devices in vertical rows on each panel and connect the devices to one side of 12 position, double row terminal blocks with #8 screws. For each surge protection panel, terminate all grounds from the surge protection devices on a copper equipment ground bus attached to the surge protection panel. Wire the terminals to the rear of a standard input file using spade lugs for input file protection.

3. 2018 Enhanced Conflict Monitor

Furnish Model 208 Enhanced Conflict Monitors. Ensure that the conflict monitor meets or exceeds CALTRANS Transportation Electrical Equipment Specifications dated March 12, 2009 with Erratum 1 (hereafter referred to as CALTRANS' 2009 TEES) for a model 210 monitor unit and other requirements stated in this specification.

The Model 208 Monitor Unit shall reliably sense and cause a relay output contact (Failed State) when monitoring the following:

- A Watchdog Timer (WDT) Timeout Condition

- Cabinet +24 VDC Power Supply below specified threshold

WDT Circuitry

WDT Circuitry shall be provided to monitor a controller unit output line state routed to the monitor unit at its assigned pin. The WDT Circuitry shall sense any line state change and the time between the last change. No state change for 1.5 ± 0.1 seconds shall cause a Failed State. The timer shall reset at each state change in a Non Failed state.

- **Unit Reset / WDT**

Only the Unit Reset or a WDT inactive due to the voltage sense shall reset the WDT from a failed state.

- **Failed State**

A Failed state caused by the WDT shall illuminate a front panel indicator light, labeled "WDT ERROR". The indicator shall remain ON until Unit Reset Issuance.

- **WDT Circuitry**

The WDT Circuitry shall sense the incoming VAC Line and when the voltage falls below 98 ± 2 VAC for 50 ± 17 ms shall inhibit the WDT Function. When the WDT Circuitry senses the incoming VAC Line rise above 103 ± 2 VAC for 50 ± 2 ms the WDT shall become active. A hysteresis between the Voltage Inhibit and the Voltage Active Settings shall be a minimum of 3 Volts.

Power Supply Monitor Requirements

1. Monitor Unit

The monitor unit shall sense the Cabinet +24 VDC Power Supply Output Voltage. Voltages sensed at +18 VDC or below for a duration of 500 ms or longer shall cause a failed state. Voltages sensed at +22 VDC or above shall NOT cause a failed state.

Voltages sensed below +22 VDC for a duration of 200 ms or less shall NOT cause a Failed state. All timing and voltages conditions other than those specified above may or may not cause a failed state.

2. Indicator

A Failed state caused by sensing the power supply shall illuminate a front panel indicator light labeled “VDC FAILED”. The indicator shall remain ON until Unit Reset.

3. Unit Reset

Only Unit Reset shall reset the power supply sense circuitry from a Failed State.

4. Failed State Output Circuits

An electro-mechanical relay shall be provided to switch an output circuit during a Failed State. The relay coil shall be energized in a Non Failed State. The relay contacts shall be rated for a minimum of 3 Amperes at 120 VAC and 100,000 operations. Contact opening/closing time shall be 30 ms or less.

5. Monitor Unit Reset

A momentary SPST Control switch labeled “RESET” shall be provided on the unit front panel to reset the monitor unit circuitry to a Non Failed state. The switch shall be so positioned on the front panel that the switch can be operated while gripping the front panel handle.

6. Provision

The unit shall be provided with provision to drive an external NE2H light through a 56 K Ohm, 1/2 Watt series resistor (resident on unit).

PDA #3 WDT Reset Input

The PDA #3 WDT Reset Input shall not be sensed by the unit.

Output Relay

The output relay Contact for Failed State shall be Open.

Type 170 Detector Sensor Units

Furnish detector sensor units (i.e., detector cards) that comply with Chapter 5, Section 1, “General Requirements” and Chapter 5, Section 2, “Model 222 & 224 Loop Detector Sensor Units,” of the CALTRANS *Transportation Electrical Equipment Specifications*, dated March 12, 2009 with Erratum 1.

(C) CONSTRUCTION**1. General**

Install controllers, cabinets, detector sensor units, and hardware that provide required phasing, color sequence, and flash sequence.

For all Department-owned signals, stencil the signal inventory number on both the front and rear doors of the cabinet. Use 3-inch black characters.

Provide external electrical service disconnect, mounted independent of the cabinet, at all new cabinet locations where specified in the Plans.

Provide serial number and cabinet model number for each new controller and controller cabinet installed.

Do not mount cabinets where one of its doors opens into a street or other area subject to vehicular traffic or where an existing physical feature such as a pole, sign post, down guy, shrub or tree prevents its doors from being opened at least 90 degrees.

Program and activate controllers with proposed phasing and timing.

Install all updates to the local controller software and OS9 operating system software during the life of the project up through final acceptance of the project.

Once all new cables have been installed, seal all conduits entering the cabinet base as follows:

Seal spare conduits with approved conduit plugs.

Seal conduits containing fiber-optic communications cable with duct and conduit sealer.

Seal conduits containing signal cable, and loop lead-in wire with duct and conduit sealer.

Seal new conduits, regardless of whether cables are being removed from or installed in them.

2. Electrical Service and Grounding

Where electrical services do not include an external electrical service disconnect, modify or replace the electrical service as shown in the Plans to add an electrical service disconnect and a new grounding electrode system.

Furnish and install a grounding electrode system at all new electrical services.

Comply with all requirements of the “Electrical Service” section of these Project Special Provisions.

a. Edge Switch

Install and program the Ethernet edge switches in accordance with the “Communications Hardware” section of these Project Special Provisions.

b. Workshop

Provide enclosed workshop to store, set up and test new controllers and cabinets before installation. Locate workshop within the Region. Ensure workshop provides protection from weather and sufficient space to house two test observers, all necessary test equipment and material, controllers and cabinets. Provide the workshop until final acceptance of the project.

Configure and test each controller and cabinet to match the proposed signal design. Ensure all equipment furnished and installed or modified by the Contractor at each location operates in full compliance with the Plans and Project Special Provisions. Test each controller and cabinet for proper color sequence, flashing operation, phase timings, preemption, coordination, and conflict monitor programming. For intersections with any type of preemption, submit a completed Preemption Test Procedure Checklist. The checklist is located on the Department's Website.

Test the cabinet and controller for eight hours minimum. Following this test, and before installation, the Engineer will inspect the equipment in operation. The Engineer may require other tests to ensure proper operation. These tests shall be at no additional cost to the Department.

3. GPS Coordinates

Provide real world coordinates for all 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. Submit cut sheets on the GPS unit proposed to collect the data for approval by the Engineer.

Provide both digital copies and hard copies of all information regarding the location (including to but not limited to manufacturer, model number, and NCDOT inventory number) in the Microsoft Excel[®] spreadsheet using the format shown in example below. In addition to Excel format, provide a digital copy of the location information as an ESRI Shapefile (.SHP file format).

City System ID#	NCDOT Inv. #	Name	Location	Latitude	Longitude	Manufacturer	Model #
	05-0134	Equipment Cabinet	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5500	35.6873	McCain	Type-332
		Junction Box # 1 (Phase 2 Side)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5516	35.6879	Quazite	PG1118BA12(Box) PG1118HA00(Cover)
		Junction Box # 2 (Phase 2 Side)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5506	35.6876	Quazite	PG1118BA12(Box) PG1118HA00(Cover)
		Junction Box # 3 (Near Cabinet)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5501	35.6873	Quazite	PG1118BA12(Box) PG1118HA00(Cover)
		Junction Box # 4 (Phase 6 Side)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5486	35.6873	Quazite	PG1118BA12(Box) PG1118HA00(Cover)
		Junction Box # 5 (Phase 6 Side)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5493	35.6876	Quazite	PG1118BA12(Box) PG1118HA00(Cover)
		Junction Box # 6 (Phase 4 Side)	US 70 at Raynor Rd./ Auburn-Knightdale	-78.5503	35.6879	Quazite	PG1118BA12(Box) PG1118HA00(Cover)

COMMUNICATIONS HARDWARE

(1-27-16)

(A) GENERAL

This section details the requirements for communication hardware to support traffic data collection, traffic management devices, wrong way detection, etc. Ethernet switches will be provided by NCDOT.

(B) MATERIALS

1. Hub Cabinet

Standards: Ensure that the hub cabinet complies with the following standards:

- ANSI;
- ASTM;
- IMSA;
- ISO 9001;
- NEC;
- NEMA TS-2; and
- UL listed.

Functional: Furnish a Caltrans Type 333 hub cabinet meeting the following minimum requirements:

- Side-by-side, double doors on both front and rear of cabinet;

- Fiber-optic splice 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;
- Fluorescent 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;
- Lightning and surge protection on incoming and outgoing electrical lines (power and data);
- Power strip along vertical rail;
- Air conditioner for cooling Ethernet hub switch; and
- UPS with sufficient capacity to hold hub's electrical load for 4 hours.

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 two full-size doors with three hinges, or a full-length stainless-steel piano hinge, 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 at the top and each side of the cabinet.

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 the both 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 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 "Equipment Cabinet Base Extender" section of these Project Special Provisions.

Lighting: Provide the field cabinet with two 20-watt fluorescent lamps 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 either cabinet door is opened and go off when the doors are closed.

Electrical: 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 are UL listed and have an interrupt capacity of 5,000 amperes and insulation resistance of 100 M Ω at 500 VDC. Provide power distribution blocks that are suitable for use as power feed and as junction points for two and three wire circuits. Ensure that the line side of each block is capable of handling up to 2/0 AWG conductors. Ensure that the AC neutral and equipment ground wiring and terminal blocks are isolated from the line wiring by an insulation resistance of at least 10 M Ω when measured at the AC neutral.

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 ITS device-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. Terminate field wiring on terminal blocks with the voltage and current rating of the terminal block is greater than the voltage and current rating of the wire fastened to it.

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.

Wire into the cabinet's circuitry the connector harnesses for the ITS devices and other accessory equipment to be housed therein.

Terminate conductors on terminal blocks using insulated terminal lugs large enough to accommodate the conductor to be terminated. When two or more conductors are terminated on field wiring terminal block screws, use a terminal ring lug for termination of those conductors. Number all terminal block circuits and cover the blocks with a clear insulating material to prevent inadvertent contact.

Ventilation: Ensure the cabinet assembly can maintain the temperature and humidity within the environmental requirements of the hub switches.

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.

Air Conditioner: 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 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 R134a 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.

Environmental Requirements: Ensure the cabinet assembly can maintain the temperature and humidity within the environmental requirements of the Layer 3 Ethernet hub switch

(C) CONSTRUCTION

1. Layer 3 Ethernet Hub Switches

Ensure that all communications hardware is UL listed.

Verify that network/field/data patch cords meet all ANSI/EIA/TIA requirements for Category 5e four-pair unshielded twisted pair cabling with stranded conductors and RJ-45 connectors.

Receive approval for the System Configuration Report before submitting product submittal data, purchasing, installing, and configuring the communications hardware.

Ensure that all project IP addresses and VLAN IDs are assigned as defined in the System Configuration Report. Ensure that at a minimum, the switch configuration includes the following features: SNMP, STP, Port Security, all required VLANs. Ensure unused switch ports are disabled. Ensure the as-built documentation includes the identification of all IP addresses and VLANs, and associated hardware devices and device locations. Configure the Ethernet network so the existing CCTV cameras and DMS will be in separate VLANs.

Ensure that the Regional ITS Engineer will be able to manage each Ethernet switch individually or as a group/cluster for switch configuration, performance monitoring, and troubleshooting. Note that these specifications require additional minimum management intelligence (i.e., Layer 2+) typical of most current industrial Ethernet deployments. Ensure that the edge switch includes Layer 2+ capability providing architecture standardization, open connectivity (i.e., interoperability), bandwidth management, rate limiting, security filtering, and general integration management of an advanced Ethernet switching architecture.

Mount the Ethernet switches inside each field cabinet or communications 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 is connectorized on both ends, primarily used for interconnecting termination or patching facilities and/or equipment. Use fiber-optic jumpers that are factory assembled and connectorized and are certified by the fiber-optic jumpers' manufacturer to meet the relevant performance standards required below. Verify that network/field/data jumper cables meet all ANSI/EIA/TIA requirements for Category 5e 4-pair unshielded twisted pair cabling with stranded conductors and RJ-45 connectors.

2. Layer 3 Ethernet Hub Switches

Modify one Layer 3 Ethernet hub switch inside Hub Building 1 at I-77 and Arrowood Road. Install a Layer 3 Ethernet hub switch in the server room in the MRTMC. Connect the assigned fiber optic cable strands with fiber-optic jumpers. Both Layer 3 Ethernet hub switches shall be on the NCDOT ITS LAN.

3 Ethernet Edge Switch

Mount an Ethernet edge switch (provided by others) inside each proposed traffic management device cabinet.

4 Network Management Software

Utilize the existing MRTMC network management software (NMS) server application to manage all devices. Configure the software applications to monitor and manage the Layer 3 Ethernet routing and edge switches, and other Ethernet devices in this project. Establish/modify user access rights and monitoring rights. Expand the respective databases through an automatic utility within the NMS or manually enter the data. Establish groupings of devices with like functions or features, this would include geographically related, device types, owners. Setup automatic database and configuration backups, setup system and device alarms and alarm notifications.

Setup and modify the respective existing graphical network views. Use mapping images provided by manufacturers to locate geographically devices.

5 Hub Cabinet

General: Ensure all cabinet wiring is tagged and identified by the use of 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. 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.

Configure each cabinet mounted UPS unit for remote monitoring from the MRTMC for the hub cabinets.

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.

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.

Equip the cabinet with lightning and surge protection described separately in these Project Special Provisions.

Install base mounted cabinets as shown on the Plans developed by the Design-Build Team and as approved by the Engineer. Install the required number of conduits as shown on the Plans plus two additional spare stubbed out conduits. Position the ends of conduits approximately 2 inches above the finished surface of the concrete base.

Mount the hub cabinet on a cabinet base extender in accordance with the "Equipment Cabinet Base Extender" section of these Project Special Provisions.

Mount surge protection devices in the cabinet for the particular field devices that will be connected to that cabinet.

Terminate power service wire, 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.

Terminate the fiber-optic cable in the hub splice centers in the cabinet as described in these Project Special Provisions.

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 the hub cabinet in accordance with the requirements of these 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.

6 UPS

Install a UPS unit in the new hub cabinet. Connect the UPS unit to a power outlet. Connect the UPS monitoring port to the Layer 3 Ethernet hub switch.

Install the UPS monitoring software on the ITS LAN workstations in the MRTMC to remotely monitor the UPS. Run the UPS diagnostics. Configure the remote monitoring to send email alerts.

Plug the power cord of the Layer 3 Ethernet hub switch into the UPS.

7 Modify CCTV Software

Update the existing VideoPro server in the MRTMC and edit the existing device database to assign video inputs. The Engineer will assign input ports in the video server. All additions and edits to the databases must be viewable by all current users of the system.

The Protronix's VideoPro is the existing regional video sharing and distribution system that controls the existing video matrix switch at the MRTMC. The software utilizes a client-server architecture. Modify the Protronix CCTV central software configuration at the MRTMC to display and map the proposed devices from the network so that the CCTV video can be displayed on the existing monitors and display devices in the MRTMC.

Update the Javelin video management software and database to add the additional CCTV and quad decoders. Establish user rights for the NCTA operations staff. Setup tours for the added traffic management devices.

8 Modify DMS Software

Update the existing DMS server in the MRTMC and edit the existing device database to add the new DMSs. All additions and edits to the database must be viewable by all current users of the system.

ETHERNET CABLE

(1-27-16)

(A) MATERIALS

1. Ethernet Cable

Provide shielded Category 5 Enhanced (5e) Ethernet cable that complies with ANSI/TIA-568-A-5 standards for four-pair shielded twisted copper for Ethernet

communications. The cable shall meet all of the mechanical requirements of ANSI/ICEA S-80-576 applicable to four-pair inside wiring cable for plenum or general cabling.

Furnish Ethernet cable meeting the following minimum performance requirements:

- Specified frequency range: 1-100 MHz
- Attenuation: 24 dB
- NEXT: 37.1 dB
- ACR: 3.1 dB
- ELFEXT: 17 dB
- Power-sum ELFEXT: 14.4 dB
- Return loss: 8 dB
- Propagation delay: 548 nsec
- Delay skew: 50 nsec

Furnish Ethernet cable meeting the following physical requirements:

- Jacket: PVC, UV resistant
- Insulation: Polyolefin
- Core: Gel-filled or flooded core
- Binder: Clear Mylar with 100% coverage
- Shield: Aluminum/Mylar with 100% coverage
- Drain Wire: 24 AWG, seven stranded tinned copper
- Conductors: Annealed bare copper
- Conductor size: 24 AWG

For Ethernet cable installed in underground conduits, provide the cable rated for such conditions (i.e., UV-resistant, wet conditions, etc.).

2. Connectors

Provide RJ-45 connectors with gold wire conductors terminated according EIA/TIA-568-A/568-B standards. Provide connectors with eight contacts. Furnish connectors appropriately rated for the cable being installed. Provide cables with factory-installed connectors for interior cables.

3. Ethernet Patch Cords

Furnish Fast Ethernet patch cords meeting the following physical requirements:

- Minimum of five (5)-foot length,
- Category 5e,
- Factory pre-installed RJ-45 connectors on both ends,
- Molded anti-snag hoods over connectors, and
- Gold plated connectors.

Furnish Ethernet patch cords meeting the following minimum performance requirements:

- TIA/EIA-568-A-5, Additional Transmission Performance Specifications for 4-pair 100 Ω Enhanced Category 5e 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: 10 dB. and
- Propagation Delay: 548 nsec.

4. Environmental Requirements

Outdoor Cable

Provide 4-pair twisted copper Ethernet cable and connectors rated for an ambient operating temperature range of -30° to 165° F. The cable shall be shielded, outdoor-rated and have a UV resistant jacket. The void between the insulated copper pairs and the polyethylene outer jacket shall be injected with a water resistant flooding compound.

Indoor Cable

Provide 4-pair twisted copper Ethernet cable and connectors rated for an ambient operating temperature range of -30° to 165° F. Furnish factory pre-terminated/pre-connectorized Ethernet cables whenever possible. Provide factory pre-connectorized Ethernet cables for all cables that are less than or equal to 12 feet in length

(B) CONSTRUCTION METHODS

Furnish all tools, equipment, materials, supplies, and hardware necessary to install a fully operational Ethernet cable system as depicted in the Plans developed by the Design-Build Team. Install the Ethernet cable according to the latest version of the manufacturer's cable installation procedures and the industry-accepted installation standards, codes, and practices, or as directed by the Engineer.

Take all precautions necessary to ensure the Ethernet cable is not damaged during storage and installation. Do not step on the cable nor run over the cable with vehicles or equipment. Do not pull the cable over or around obstructions or along the ground.

Immediately cease work and notify the Engineer and the affected owner should damage to existing cables or equipment occur. Make the required repairs at no additional cost to the Department.

Provide the Engineer with three copies of the Ethernet cable manufacturer's recommended and maximum pulling tensions for each Ethernet cable size before the installation of Ethernet cable.

Install Ethernet cable in continuous lengths with no splices outside cabinets.

Cut cables to length to minimize coils of spare cable. Cut outer jacket and trim conductors per manufacturer's recommendations. Ensure all conductors extend to the end of the channel and make solid electrical contact with the gold connectors. Crimp the RJ-45 connector body to lock conductors in channels.

1. Underground Installation

Install underground Ethernet cable using cable-pulling lubricants approved by the Ethernet cable manufacturer and the Engineer. Obtain the Engineer's approval of the cable lubricant and method of pulling before the installation of underground Ethernet cable.

Do not exceed 80 percent of the manufacturer's maximum pulling tension when installing underground Ethernet cable.

Use a clutch device (dynamometer) with breakaway swivel 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.

Set cable reels up on the same side of the junction box as the conduit section in which the cable is to be installed. Place the reel level and align the reel with the conduit section such that the cable will pass from the top of the reel in a smooth bend into the conduit without twisting. Do not pull the cable from the bottom of the reel. Manually feed the cable by rotating the reel. Do not pull the cable through intermediate junction boxes, pull boxes, handholes, or openings in conduit unless otherwise approved by the Engineer.

Crimp the RJ-45 connector body to lock conductors in channels. Test each connector from end to end.

2. Ethernet Patch Cords

Install Ethernet patch cords between Ethernet patch panels and devices and network interface box and devices.

DYNAMIC MESSAGE SIGN (DMS)

(2-7-17)

DB 08-04

(A) GENERAL REQUIREMENTS

DMSs used on the State Highway System shall be preapproved on the current NCDOT ITS & Signals 2018 Qualified Products List (QPL) by the date of installation. DMSs not preapproved will not be allowed for use on the project. 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 Version 4 software (also referred to hereinafter as the "Control Software"). The QPL is available on the Department's website. The QPL website is:

<https://connect.ncdot.gov/resources/safety/Pages/ITS-and-Signals-Qualified-Products.aspx>

DMS Requirements

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 DMS systems consisting of, but not limited to, the following:

- Large Walk-In Enclosure DMS for traffic management (Type A)
 - Full Matrix, 27 pixels high and 90 pixels wide LED Walk-in DMS with 18" border
 - Mounting hardware to mount to proposed sign structure
- Small Front Access Dedicated DMS for toll rate display (Type B)
 - Full Color Matrix, 24 pixels high and 160 pixels wide LED Front Access DMS
 - Mounting hardware to mount to proposed static sign
- DMS controllers, Uninterruptible Power Supplies (UPS), cabinets and accessories with interconnect and power cabling and conduit
- Branch circuit conductors and related equipment
- All other equipment and incidentals required for furnishing, installing, and testing the DMS system and system components

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

(B) MATERIALS**1. Environmental Requirements**

Construct the DMS and DMS controller-cabinet so the equipment within shall be 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 4-2005.

2. Full Matrix LED Dynamic Message Sign (DMS)

Legibility

Construct the DMS to display at least three lines of text that, when installed, are 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.

- Type A - When displaying three lines, each line must display at least 15 equally spaced and equally sized alphanumeric individual characters. Each character must be at least 18 inches in height and composed from a luminous dot matrix. The entire LED matrix shall be at the minimum 27 pixels high and 90 pixels wide.
- Type B - When displaying the line, the line must display at least 8 equally spaced and equally sized alphanumeric individual characters. Each character must be at least 18 inches in height and composed from a luminous dot matrix. Provide an entire LED matrix that is a minimum of 24 pixels high and 160 pixels wide.

DMS Enclosure

The DMS enclosure construction shall comply with the requirements of Section 3 (Sign Mechanical Construction) of NEMA TS 4-2005 as it applies to Front Access and Walk-in enclosures. The following requirements complement TS 4-2005:

Construct the enclosure of welded aluminum type 6061-T6, 5052-H38, 5052-H34, or of an Engineer approved alternate at least 1/8-inch thick. 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).

Provide all exterior and interior DMS enclosure surfaces with natural, mill-finish aluminum. Remove all grind marks and discoloration from the surfaces.

Provide corrosion resistant nuts, bolts, washers, and other mounting and bonding parts and components used on the exterior of the DMS enclosure and ensure they are sealed against water intrusion.

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 shall be in addition to reporting power failure at the controller cabinet.

Do not paint the stainless-steel bolts on the Z-bar assembly used for mounting the enclosure.

- Type A – Construct the DMS with a metal walk-in enclosure excluding the face. Provide an aluminum walking platform inside the enclosure that is at least 28 inches wide. Ensure the width of the walking platform is free of obstructions to a height of 7 feet.

Provide one key lockable, hinged, gasket-sealed inspection door for service and maintenance along each side of the enclosure. Install one appropriately sized fire extinguisher within 12 inches of each maintenance door. Equip the DMS enclosure with internal fluorescent lighting controlled by timers installed close to each inspection door. Make certain no light emitted from the fluorescent tubes or any other light source inside the enclosure not comprising the display is leaked to the outside of the enclosure. Equip the door with a door-hold-open device. Install GFCI duplex utility receptacles every 6 feet along the width of the DMS in convenient locations for powered service tools.

- Type B - Provide one access door for the entire width of the sign enclosure. Horizontally hinge the doors and design to swing out from the face to provide access to the enclosure interior. Extend the door the full height of the display matrix.

Provide a retaining latch mechanism for the door to hold the door open at a 90-degree angle.

The door will form the face panel for 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 a minimum of two (2) screw-type captive latches to lock the door 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 door to prevent water from entering the cabinet.

DMS Interior Environment Control

Design the local field controller to monitor and control the interior DMS environment. Design environmental control to maintain the internal DMS temperature within +/- 10° F of the outdoor ambient temperature. Provide the DMS environmental control system with four primary subsystems as follows:

Internal Temperature Sensors – Provide the DMS with two internally mounted temperature sensors which are equipped with external thermocouples and which the Field Controller continuously monitors. Design the Field Controller to use this temperature information to determine when to activate and deactivate the environmental control systems described herein. Locate sensors on opposite ends of the upper 1/3 of the LED display

matrix with their external thermocouples attached to and making contact with an LED pixel circuit board. Design the thermocouple and LED board to be easily detachable, in the event that one of the units requires removal and replacement. Provide sensors capable of measuring temperatures from -40° F to $+185^{\circ}$ F. Design the Field Controller to automatically shut down the LED display whenever one or both sensors indicates that LED board temperature has exceeded $+140^{\circ}$ F, and to automatically restart the LED display whenever the suspect temperature falls below $+130^{\circ}$ F. Design both shutdown and re-start temperature thresholds to be user-programmable. Design the field controller to report sensor temperatures and DMS shutdown/re-start events to the DMS Control Software.

Housing Cooling System – Provide the DMS housing with a cooling system that circulates outside air into the DMS housing whenever the LED board temperature exceeds a user-programmable threshold. Provide this system with enough ventilation fans to exchange the internal DMS housing air volume at a minimum rate of 2 times per minute. Provide steel ball-bearing type fans. Mount fans in a line across the upper rear wall of the DMS housing to direct air out of the cabinet. Provide one filtered air intake port for each exhaust fan. Locate intake ports in a line across the lower rear wall of the DMS housing. Provide intake ports with a removable filter that will remove airborne particles measuring 500 microns in diameter and larger. Provide a filter that is of a size and style that is commercially readily available. Program the field controller to activate the DMS housing cooling system whenever the LED board temperature exceeds $+90^{\circ}$ F and to turn the cooling system off whenever LED board temperature falls below $+85^{\circ}$ F. On the DMS housing rear exterior wall, cover all air intake and exhaust ports on their top, front, and sides by an aluminum shroud fabricated from 0.090-inch aluminum sheeting. Taper the shrouds at the top. Securely fasten shrouds to the DMS housing, and provide gaskets at the interface to prevent water from entering the DMS. Design all air filters and fans to be removable from inside the DMS housing. Provide the DMS housing cooling system with an adjustable timer that will turn fans off after the set time has expired. Provide a timer that is adjustable to at least 4 hours, and locate it just inside the DMS housing door, within easy reach of a maintenance technician standing outside the DMS doorway.

LED Display Cooling System – Provide the DMS with an LED display cooling system which directs air across the LED display modules whenever LED board temperature exceeds a user-programmable threshold. Direct fan-forced air vertically across the backside of the entire LED display matrix using multiple ball-bearing fans. Program the field controller to activate the LED cooling fan system whenever LED board temperature exceeds $+90^{\circ}$ F and to deactivate the system whenever LED board temperature falls to

$+85^{\circ}$ F. Locate cooling fans so as not to hinder removal of LED display modules and driver boards.

Front Face Panel Defog / Defrost System – Provide the DMS with a defog / defrost system which circulates warm, fan-forced air across the inside of the polycarbonate front face whenever LED board temperature falls below a user-programmable threshold. Provide multiple steel ball-bearing fans that provide uniform airflow across the face panel. Program the field controller to activate the defog / defrost system whenever LED board temperature falls below +40° F and to deactivate the defog/defrost system whenever LED board temperature exceeds +106° F. Mount a 100-watt pencil-style heating element in front of each defog / defrost fan to warm the air directed across the DMS face. Design heating elements to be on only when the defog / defrost fans are on.

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

Front Panel

Protect the DMS face with contiguous, weather-tight, removable panels. These panels shall be a polycarbonate material that are ultraviolet protected, have an antireflection coating, and are a minimum of 1/8- 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 270° F and 66 PSI at 288° F
- Coefficient of Thermal Expansion: 3.9×10^{-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%

For substitutes, submit one 12" x 12" sample of the proposed material together with a description of the material attributes to the Engineer for review and approval. Install a .09" aluminum mask on the front of the panel (facing the motorists) that contains a circular opening for each LED pixel. Prime and coat the front side of the aluminum mask, which faces the viewing motorists, with

automotive-grade flat 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.

Display Modules

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 and replaceable without using special tools. Provide plug-in type power and communication cables to connect to a display module.

Provide the module with an equal vertical and horizontal pitch between pixels, and columns that are perpendicular to the rows (i.e., no slant). 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.

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

- Type A - Manufacture each display module with a standard number of pixels, not to exceed an array of 9 x 5, which can be easily removed.

Construct each display module as a rectangular array of 5 horizontal pixels by 7 to 9 vertical pixels.

- Type B - Manufacture each display module with a standard number of pixels, not to exceed an array of 24 x 16, which can be easily removed.

Construct each display module as a rectangular array of 16 horizontal pixels by 24 vertical pixels.

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. Viewing cone tolerances shall be as specified in the LED manufacturer's product specifications and shall not exceed +/- 3 degrees half-power viewing angle of 30 degrees.

Provide LEDs that are untinted, non-diffused, high output solid state lamps utilizing indium gallium aluminum phosphide (InGaAlP) technology. No substitutions will be allowed.

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 that have a single part number. 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. Document the procedure to be used to comply with this requirement as part of the material submittal.

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 +14° F at 95% relative humidity, non-condensing.

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

- Type A - Provide T1 ¾, 0.2-inch size LEDs that emit a true amber color at a wavelength of 590 ± 5 nm.
- Type B - Provide LEDs that emit a full color.

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 48 volts DC or less. Wire the supplies in a redundant parallel configuration that uses multiple power supplies per display. Provide the 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. 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.

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.

Construct the pixels with two 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.

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. Provide the sign controller with the ability to detect the failure of any LED string and identify which LED string has failed. Submit a complete schematic of the LED power and driver circuits with the material submittals.

- Type A - Design each pixel to be a maximum of 2 inches in diameter.
- Type B - Design each pixel to be a maximum of 20mm in diameter.

Character Display

Design display modules to be easily removable without the use of tools. Position cooling fans so they do not prevent removal of an LED pixel board or driver board.

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.

Design the controller to automatically detect failed LED strings or drivers and initiate a report of the event to the Control Software. Design the controller to be able to read the internal temperature of the DMS enclosure and the ambient temperature outside the DMS enclosure and report these to the Control Software.

Display Capabilities

- Type A - Design the DMS with at least the following message displays:
 - Static display
 - Flashing display with dynamic flash rates
 - At least two alternating static and/or flashing sequences (multi-page messages)
- Type B - Design the DMS with at least the following message displays:
 - A static display, red in color, reading “CLOSED”
 - A static display, white in color, reading “HOV ONLY”
 - A static display, white in color, with the ability to display a toll rate in the following format “\$XX.XX”

DMS Mini Controller

Furnish and install a mini controller inside the DMS that is interconnected with the main controller using a fiber optic cable, CAT-5 cable, or an approved alternate. 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.

Alternatively, install an EIA/TIA-232E port inside the DMS enclosure to enable a maintenance technician to communicate with the DMS main controller and obtain access to and perform all functions of the main controller using a laptop computer.

2. DMS Enclosure Structure Mounting

Design the DMS enclosure supports to allow full access to the DMS enclosure inspection door. Mount the DMS enclosure according to the manufacturer's recommendations.

Submit plans for the DMS enclosure, 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 AASHTO *LRFD Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, 1st Edition, and the latest Interim Specifications, and the section titled "DMS Pedestal Structure" of these Project Special Provisions.

- Type A - Mount the DMS enclosure and interconnect system securely to the support structures.

Furnish and install U-bolt connections of hanger beams to overhead assembly 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.

- Type B - Mount the DMS enclosure and interconnect system securely to the supporting signs

3. DMS / DMS Controller Interconnect

Furnish and install all necessary cabling, conduit, and terminal blocks to connect the DMS and the DMS controller. Use approved manufacturer's specifications and the project 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.

4. DMS Controller and Cabinet

Furnish and install one DMS controller with accessories per DMS in a new equipment cabinet. Mount the controller cabinet on the DMS support structure. Install cabinet so that the height from the ground to the middle of the cabinet is four feet. Ensure a minimum of three-foot 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 requirements 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.

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

- Power supply and distribution assembly
- 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)
- Serial 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, such as screwdrivers. 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 10 keys to the Engineer. In addition, design the handle to permit pad-locking.

Provide the interior of the cabinet with ample space for housing the controller and all associated equipment and wiring; use no more than 75% of the useable space in the cabinet. 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 so as 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 3-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 shall utilize the GFCI receptacle. Furnish one spare non-GFCI 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 6 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 6 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 supported by fasteners that support work surfaces. Install all connectors, devices and conductors in accordance to manufacturer's 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 $120V \pm 10\%$ at a frequency of $60 \text{ Hz} \pm 3 \text{ Hz}$. 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 and accessories and for servicing DMS equipment and cabinet utilities.

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 2 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 wave-shape	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

Radio Interference Suppressor

Provide each controller cabinet with sufficient electrical and electronic noise suppression to enable all equipment in it to function properly. Provide one or more radio interference suppressors (RIS) connected between the stages of the power line surge suppressor that minimize interference generated in the cabinet in both the broadcast and the aircraft frequencies. Each RIS must provide a minimum attenuation of 50 decibels over a frequency range of 200 KHz to 75 MHz. Clearly label the suppressor(s) and size them at least at the rated current of the main circuit breaker but not less than 50 amperes.

Provide RIS that are hermetically sealed in a substantial metal case which is filled with a suitable insulating compound and have nickel-plated 10/24 brass stud terminals of sufficient external length to provide space to connect #8 AWG wires. Mount them so that the studs cannot be turned in the case. Properly insulate ungrounded terminals from each other, and maintain a surface linkage distance of not less than 1/4" between any exposed current conductor and any other metallic parts. The terminals must have an insulation factor of 100-200 MΩ, dependent on external circuit conditions. Use RIS designed for 120 VAC \pm 10%, 60Hz, and which meet the standards of UL and the Radio Manufacturers Association.

Communications Surge Protector

Equip the cabinet with properly labeled hybrid data line surge protectors that meet the following general requirements:

Surge current occurrences at 2000 ampere, 8 x 20 microsecond waveform	> 80
Surge current occurrences at 400 ampere, 10x700 microsecond waveform	> 80
Peak surge current for 8 x 20 microsecond waveform	10,000 A (2500 A/line)
Peak surge current for 10x700 microsecond waveform	500 A/line
Response time	< 1 nanosecond
Series resistance	< 15 Ω
Average capacitance	1500 pF
Temperature range	-10° F to 150° F
Clamp Voltage	As required to match equipment in application

Lightning Arrester

Protect the system with an UL-approved lightning arrester installed at the main service disconnect. It shall meet 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 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, IEEE 587

Provide the UPS unit capable of supplying 30 minutes of continuous backup power to the equipment connected to it when this 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, and etc. Furnish a LCD display with a minimum size of 240x64 dots with LED back light.

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.

5. Photo-Electric 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 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 elements in each Light Level Mode.
- The ambient light level at which each Light Level Mode is activated.

6. 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 an itemized list of equipment costs.

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

7. 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.

8. 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.

9. Character Set Submittal

Submit an engineering drawing of the DMS character set including 26 upper case and lower-case letters, 10 numerals, an asterisk (*), a dash, a plus sign (+), a designated lane diamond, a slash, an ampersand, and arrows at 0, 45, 90, 135, 180, 225, 270, and 315 degrees.

10. 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, 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.

11. 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.

12. Maintenance Procedures

Specify the recommended preventative maintenance procedures and checks at pre-operation, monthly, quarterly, semi-annual, 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.

13. 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 disassemblies, overhaul, and re-assemblies, 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.

14. Field Trial

At the request of the Engineer, supply a three-character demonstration module with characters of the size and type specified for the project, an appropriate control device and power supply to allow character display within 30 working days of the request. Perform a field trial on this module at a time and location selected by the Engineer.

This trial will allow the Engineer or his selected representatives to test the readability of the DMS at the maximum distance required for specified character size. Test the module with the sun directly above the DMS, and near the horizon in front of and behind the DMS (washout and back-lit conditions).

(C) CONSTRUCTION METHODS**1. Description**

This article establishes practices and procedures and gives minimum standards and requirements for the installation of Dynamic Message Sign 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 controllers and electric utilities that conform to NEC standards. Express wire sizes according to the American Wire Gauge (AWG).

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.

2. Layout

The Engineer will establish the actual location of each Dynamic Message Sign assembly. It is 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 project 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.

3. 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.

4. 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. Install strapping according to the strapping manufacturer's recommendations. 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 3 feet from the center of bends, fittings, boxes, switches, and devices.

Locate underground conduit as shown in the project plans developed by the Design-Build Team in a manner consistent with these Project Special Provisions.

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

5. Wiring Methods

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 assemblies any other color.

Bury underground circuits at the depth shown in the project plans developed by the Design-Build Team and surround it with at least 3 inches of sand or earth back-fill free of rocks and debris. Compact backfill in 6 inch layers. Do not splice underground circuits unless specifically noted in the project plans developed by the Design-Build Team and approved by the Department.

6. Equipment and Cabinet Mounting

Mount equipment securely at the locations shown in the project 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 one key-operated, pin tumbler, dead bolt padlock, with brass or bronze shackle and case, conforming to Military Specification MIL-P-17802E (Grade I, Class 2, Size 2, Style A) for each electrical panel and switch on the project. Key all padlocks alike, and provide 10 keys to the Engineer.

Provide cabinets with all mounting plates, anchor bolts, and any other necessary mounting hardware in accordance with these Project Special Provisions and the project 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.

7. 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.

NTCIP REQUIREMENTS

(1-2-18)

DB 08-04

This section defines the detailed NTCIP requirements for the DMSs covered by these Project Special Provisions and the project plans developed by the Design-Build Team.

(A) REFERENCES

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.

Table 1: NTCIP Standards

Abbreviated Number	Full Number	Title
NTCIP 1101	NTCIP 1101:1997	<i>Simple Transportation Management Framework</i>
NTCIP 1201	NTCIP 1201:1997	<i>Global Object Definitions</i>
NTCIP 1203	NTCIP 1203:1997	<i>Object Definitions for Dynamic Message Signs</i>
NTCIP 2001	NTCIP 2001:1997	<i>Class B Profile</i>
NTCIP 2101	NTCIP 2101	<i>SP-PMPP/232 Subnet Profile for PMPP over RS-232</i>
NTCIP 2102	NTCIP 2102	<i>SP-PMPP/FSK Subnet Profile for PMPP over FSK Modem</i>
NTCIP 2103	NTCIP 2103	<i>SP-PPP/232 Subnetwork Profile for PPP over RS232 (Dial Up)</i>
NTCIP 2104	NTCIP 2104	<i>SP-Ethernet Subnet Profile for Ethernet</i>
NTCIP 2201	NTCIP 2201	<i>TP-Null Transport Profile</i>
NTCIP 2202	NTCIP 2202	<i>TP-Internet Internet Transport Profile (TCP/IP and UDP/IP)</i>
NTCIP 2301	NTCIP 2301	<i>AP-STMF AP for Simple Transportation Management Framework</i>

(B) GENERAL REQUIREMENTS**1. Subnet Level**

Ensure each serial port on each NTCIP Component supports NTCIP 2103 over a dial-up connection with a contractor provided external modem with data rates of 28.8 kbps, 19.2 kbps, 14.4 kbps, 9600 bps, 4800 bps, 2400 bps, 1200 bps,

600 bps, and 300 bps. Enable the NTCIP Component to make outgoing and receive incoming calls as necessary and support the following modem command sets:

- Hayes AT - Command Set
- MNP5
- MNP10
- V.42bis

Ensure each serial port on each NTCIP Component supports NTCIP 2103 over a null-modem connection with data rates of 19.2 kbps, 14.4 kbps, 9600 bps, 4800 bps, 2400 bps, 1200 bps, 600 bps, and 300 bps.

Ensure each serial port on each NTCIP Component supports NTCIP 2101 with data rates of 9600 bps, 4800 bps, 2400 bps, 1200 bps, 600 bps, and 300 bps.

Ensure NTCIP components support NTCIP 2102 and NTCIP 2104.

NTCIP Components may support additional Subnet Profiles at the manufacturer's option. At any one time, make certain only one Subnet Profile is active on a given serial port of the NTCIP Component. Ensure the NTCIP Component can be configured to allow the field technician to activate the desired Subnet Profile and provide a visual indication of the currently selected Subnet Profile.

2. Transport Level

Ensure each NTCIP Component complies with NTCIP 2201 and 2202.

NTCIP Components may support additional Transport Profiles at the manufacturer's option. Ensure Response datagrams use the same Transport Profile used in the request. Ensure each NTCIP Component supports the receipt of datagrams conforming to any of the identified Transport Profiles at any time.

3. Application Level

Ensure each NTCIP Component complies with NTCIP 1101 and 2301 and meets the requirements for Conformance Level 1 (NOTE - See Amendment to standard).

Ensure each NTCIP Component supports SNMP traps. An NTCIP Component may support additional Application Profiles at the manufacturer's option. Ensure Responses use the same Application Profile used by the request. Ensure each NTCIP Component supports the receipt of Application data packets at any time allowed by the subject standards.

4. Information Level

Guarantee each NTCIP Component provides Full, Standardized Object Range Support of all objects required by these Special Provisions unless otherwise indicated below. Make certain the maximum Response Time for any object or group of objects is 200 milliseconds.

Design the DMS to support all mandatory objects of all mandatory Conformance Groups as defined in NTCIP 1201 and NTCIP 1203. Table 2 indicates the modified object requirements for these mandatory objects.

Table 2: Modified Object Ranges for Mandatory Objects

Object	Reference	Project Requirement
ModuleTableEntry	NTCIP 1201 Clause 2.2.3	Contains 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 modelVersion indicates the model version number of the component.
MaxGroupAddresses	NTCIP 1201 Clause 2.7.1	At least 1
CommunityNamesMax	NTCIP 1201 Clause 2.8.2	At least 3
DmsNumPermanentMsg	NTCIP 1203 Clause 2.6.1.1.1.1	At least 1*
DmsMaxChangeableMsg	NTCIP 1203 Clause 2.6.1.1.1.3	At least 21
DmsFreeChangeableMemory	NTCIP 1203 Clause 2.6.1.1.1.4	At least 20 when no messages are stored.
DmsMessageMultiString	NTCIP 1203 Clause 2.6.1.1.1.8.3	The DMS supports any valid MULTI string containing any subset of those MULTI tags listed in Table 4

DmsControlMode	NTCIP 1203 Clause 2.7.1.1.1.1	Support at least the following modes: Local External central Central Override
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*** Ensure the Permanent Messages display the content shown in Table 3.**

Ensure the sign blanks if a command to display a message contains an invalid Message CRC value for the desired message.

Table 3: Content of Permanent Messages

Permanent Message Number	Description
1	Permanent Message # 1 blanks the display (i.e. consists of an empty MULTI string). It has a run-time priority of one (1)

Table 4: Required 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.

The NTCIP Component implements all mandatory and optional objects of the following optional conformance groups with FSORS.

Test Heading

a. Time Management

As defined in NTCIP 1201

b. Timebase Event Schedule

As defined in NTCIP 1201. The following list indicates the modified object requirements for this conformance group.

Table 5: Modified Object Ranges for the Timebase Event Schedule Conformance Group

Object	Reference	Project Requirement
MaxTimeBaseScheduleEntries	NTCIP 1201 Clause 2.4.3.1	At least 28
maxDayPlans	NTCIP 1201 Clause 2.4.4.1	At least 14
maxDayPlanEvents	NTCIP 1201 Clause 2.4.4.2	At least 10

c. Report

As defined in NTCIP 1201. The following list indicates the modified object requirements for this conformance group.

Table 6: Modified Object Ranges for the Report Conformance Group

Object	Reference	Project Requirement
maxEventLogConfigs	NTCIP 1201 Clause 2.5.1	At least 50
eventConfigurationMode	NTCIP 1201 Clause 2.4.3.1	The NTCIP Component supports the following Event Configuration Modes: onChange greaterThanValue smallerThanValue
MaxEventLogSize	NTCIP 1201 Clause 2.5.3	At least 200
MaxEventClasses	NTCIP 1201 Clause 2.5.5	At least 16

d. PMPP**e. Font Configuration**

As defined in NTCIP 1203. The following list indicates the modified object requirements for this conformance group.

Table 7: Modified Object Ranges for the Font Configuration Conformance Group

Object	Reference	Project Requirement
NumFonts	NTCIP 1203 Clause 2.4.1.1.1.1	At least 4*
MaxFontCharacters	NTCIP 1203 Clause 2.4.1.1.1.3	At least 127**

* Upon delivery, the first font is a standard 18” font. The second font is a double-stroke 18” font. The third font is a 28” font. The fourth font is empty.

** Upon delivery, the first three font sets are configured in accordance with the ASCII character set for the following characters:

- “A” thru “Z”- All upper-case letters.
- “0” thru “9”- All decimal digits.
- Space (i.e., ASCII code 0x20).
- Punctuation marks shown in brackets [. , ! ? - ‘ ’ “ ” / ()]
- Special characters shown in brackets [# & * + < >]

f. DMS Configuration

As defined in NTCIP 1203.

g. MULTI Configuration

As defined in NTCIP 1203. The following list indicates the modified object requirements for this conformance group.

Table 8: Modified Object Ranges for the MULTI Configuration Conformance Group

Object	Reference	Project Requirement
DefaultBackgroundColor	NTCIP 1203 Clause 2.5.1.1.1.1	The DMS supports the following background colors: black
DefaultForegroundColor	NTCIP 1203 Clause 2.5.1.1.1.2	The DMS supports the following foreground colors: amber
DefaultJustificationLine	NTCIP 1203 Clause 2.5.1.1.1.6	The DMS supports the following forms of line justification: left center right full
defaultJustificationPage	NTCIP 1203 Clause 2.5.1.1.1.7	The DMS supports the following forms of page justification: top middle bottom
defaultPageOnTime	NTCIP 1203 Clause 2.5.1.1.1.8	The DMS supports the full range of these objects with step sizes no larger than 0.5 seconds
defaultPageOffTime	NTCIP 1203 Clause 2.5.1.1.1.9	The DMS supports the full range of these objects with step sizes no larger than 0.5 seconds
defaultCharacterSet	NTCIP 1203 Clause 2.5.1.1.1.10	The DMS supports the following character sets: eightBit

- h. Default Message Control** as defined in NTCIP 1203
- i. Pixel Service Control** as defined in NTCIP 1203
- j. MULTI Error Control** as defined in NTCIP 1203
- k. Illumination / Brightness Control**

As defined in NTCIP 1203. The following list indicates the modified object requirements for this conformance group.

Table 9: Modified Object Ranges for the Illumination/Brightness Control Conformance Group

Object	Reference	Project Requirement
dmsIllumControl	NTCIP 1203 Clause 2.8.1.1.1.1	The DMS supports the following illumination control modes: photocell timer manual
dmsIllumNumBrightLevels	NTCIP 1203 Clause 2.8.1.1.1.4	At least 16

- l. Auxiliary I/O**
- m. Scheduling**

As defined in NTCIP 1203. The following list indicates the modified object requirements for this conformance group.

Table 10: Modified Object Ranges for the Scheduling Conformance Group

Object	Reference	Project Requirement
NumActionTableEntries	NTCIP 1203 Clause 2.9.1.1.1.1	At least 21

- n. Sign Status** as defined in NTCIP 1203
- o. Status Error** as defined in NTCIP 1203
- p. Pixel Error Status** as defined in NTCIP 1203
- q. Fan Error Status** as defined in NTCIP 1203

r. **Power Status** as defined in NTCIP 1203

s. **Temperature Status** as defined in NTCIP 1203

Install necessary hardware for the support of items q, r and s above.

Table 11: Some Optional Object Requirements

Object	Reference	Project Requirement
DefaultFlashOn	NTCIP 1203 Clause 2.5.1.1.1.3	The DMS supports the full range of these objects with step sizes no larger than 0.5 seconds
DefaultFlashOff	NTCIP 1203 Clause 2.5.1.1.1.4	The DMS supports the full range of these objects with step sizes no larger than 0.5 seconds
DmsMultiOtherErrorDescription	NTCIP 1203 Clause 2.7.1.1.1.20	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.

5. Documentation

Supply software with full documentation, including a CD-ROM containing ASCII versions of the following Management Information Base (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.

(C) 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 10 days in advance of a scheduled testing date. Develop test documents based on the NTCIP requirements of these Project Special Provisions. The acceptance test shall use the NTCIP Exerciser, and / or other authorized testing tools and shall 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 to 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 TESTING REQUIREMENTS

(1-2-18)

DB 08-04

(A) GENERAL TEST PROCEDURE

Test the DMS system in a series of design approval and functional tests. The results of each test must 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 North Carolina Department of Transportation, 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, showing a test 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. The Engineer will reject all equipment not tested according to these requirements. It shall be the Design-Build Team's responsibility to ensure the DMS system functions properly even after the Engineer accepts the DMS test results.

Provide 4 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.

(B) DESIGN APPROVAL TESTS

Design Approval Tests are applicable to DMS systems not currently on the QPL.

The Design Approval Tests consists of all tests described in Section 2.2 "DMS Equipment Tests" of NEMA TS 4-2005 (Hardware Standards for Dynamic Message Signs with NTCIP Requirements). Perform all tests and submit certified results for review and approval.

PROTOTYPE – Manufacture a prototype Dynamic Message Sign and controller of the type and size described in the project special provisions. In the Engineer's presence, test the prototype according to the Design Approval and Operational Tests. When all corrections and changes (if any) have been made, the Department may accept the prototype DMS and controller as the physical and functional standard for the system furnished under this contract. The Design-Build Team may use the prototype units on this project if, after inspection and rework (if necessary), they meet all physical and functional specifications. In the case of standard product line equipment, if the Design-Build Team can provide test results certified by an independent testing facility as evidence of prior completion of successful design approval tests, then the Engineer may choose to waive these tests.

In each Design Approval Test, successfully perform the Functional Tests described below. Apply the extreme conditions to all associated equipment unless stated otherwise in these Project Special Provisions (PSP).

(C) OPERATIONAL FIELD TEST (ON-SITE-COMMISSIONING)

Conduct an Operational Field Test of the DMS system installed on the project to exercise the normal operational functions of the equipment. The Operational Field Test shall consist of the following tests as a minimum:

1. Physical Examination

Examine each piece of equipment to verify that the materials, design, construction, markings, and workmanship comply with the mechanical, dimensional, and assembly requirements of these Project Special Provisions.

Perform the following tests as a minimum:

- Verify that all surfaces are free of dents, scratches, weld burns, or abrasions. Round sharp edges and corners.
- Verify bend radius of cables is not excessive or could potentially cause damage.
- Verify all modules, lamps, and components are properly secured.
- Verify that there are no exposed live terminals.

2. Continuity Tests

Check the wiring to assure it conforms to the requirements of the appropriate paragraphs of this Special Provision.

3. Functional Tests

Perform the following functional tests:

- Start-up and operate the DMS locally using a laptop computer.
- Use automatic (photo-electric sensor controlled), DMS Control Software to switch between “dim”, “normal”, and “bright” light levels.
- Operation of the DMS with all display elements flashing continuously for 10 minutes at the maximum flash rate.
- Exercise the DMS by displaying static messages, flashing messages, and alternating static and flashing message sequences.
- Automatically poll the DMS by the Control Software at various intervals and verify the data received by Control Software from DMS.
- Download and edit messages using Control Software.
- Execute status request on the DMS controller.
- Observe normal operations during uploading and downloading.
- Input and select messages from the sign controller’s local user interface.
- Test sequence activation at chosen intervals.
- Display and verify all stored messages.
- Verify resumption of standard operation upon interruption of electrical power.
- Demonstrate detected failures and response functions.

- Demonstrate proper operation of the Failure Log.
- Set controller clock using the Control Software.
- Execute system shutdown using the Control Software and local user interface.
- Verify detection of a power failure in the DMS enclosure and the report feature of the failure to the Control Software.

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.

(D) 30-DAY OBSERVATION PERIOD

The 30-Day Observation Period shall be part of work to be completed by the project completion date.

Upon successful completion of all project work, the component tests, the System Test, and the correction of all deficiencies, including minor construction items, the 30-day Observation Period may commence. This observation consists of a 30-day period of normal, day-to-day operations of the new field equipment in operation with the new central equipment without any failures. The purpose of this period is to ensure that all components of the system function in accordance with the project plans developed by the Design-Build Team and these Project Special Provisions.

Respond to system and / or component failures (or reported failures) that occur during the 30-day Observation Period within twenty-four (24) hours. Correct said failures within forty-eight (48) hours. Any failure that affects a major system component as defined below for more than forty-eight (48) hours shall suspend the timing of the 30-day Observation Period beginning at the time when 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 failure in any of the major system components exceeding a total of three (3) occurrences shall terminate the 30-day Observation Period and cause the 30-day Observation Period to be restarted from day zero when the redesigned components have been installed and / or the failures corrected. The major system components are:

- DMS Field Controller
- DMS Display Module
- DMS Workstation software

DMS ASSEMBLIES

(1-2-18)

DB 08-04

(A) DESCRIPTION

This section includes all design, fabrication, furnishing, and erection of the DMS structures, platforms, walkways, and ladders for access to the DMS inspection doors, and attachment of the DMS enclosures to the structures in accordance with the requirements of these Project Special Provisions and the project plans developed by the Design-Build Team. Fabricate the supporting DMS assemblies from tubular steel. Furnish pedestal type or overhead type DMS assemblies as shown in the project plans developed by the Design-Build Team and as approved by the Engineer.

Cantilevered and Monotube (horizontal truss) DMS structures will not be allowed.

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.

Provide full-span overhead DMS structures with a minimum of 20 feet clearance from the high point of the road to the bottom of the DMS enclosure.

Design the DMS assemblies (including footings), DMS mounting assemblies, maintenance platforms, and access ladders and submit shop drawings to the Engineer for approval. A Professional Engineer that is registered in the state of North Carolina will 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 Design-Build Team shall furnish DMS S-dimension drawings for each proposed DMS to the Engineer for approval.

(B) MATERIAL

Use materials that meet the following requirements of the 2018 *Standard Specifications for Roads and Structures*:

Structural Steel	Section 1072
Overhead Structures	Section 1096
Signing Materials	Section 1092
Organic-Zinc Repair Paint	Article 1080-9
Reinforcing Steel	Sub-article 1070
Direct Tension Indicators	Sections 440 and 1072

(C) CONSTRUCTION METHODS

1. General

Fabricate the new DMS assemblies, maintenance platforms, attachment hardware, and access ladders in accordance with the details shown in the approved shop drawings prepared by the Design-Build Team and the requirements of these Project Special Provisions.

No welding, cutting, or drilling in any manner will be permitted in the field, unless approved by the Engineer.

Drill bolt holes and slots to finished size. Holes may also be punched to finished size, provided the diameter of the punched holes is at least twice the thickness of the metal being punched. Flame cutting of bolt holes and slots will not be permitted.

Erect the DMS in accordance with the requirements indicated on the project plans developed by the Design-Build Team and in these Project Special Provisions. Field drill two holes per connection in the Z bars for attaching the DMS to the structure. Use two bolts at each connection. Provide two (2) U-bolts at each U-bolt connections such as 1) each truss chord to sign hanger, or 2) each truss chord to platform support. Provide two (2) U-bolts at each U-bolt connection where ends of truss chords are supported. Minimum diameter of all U-bolts shall be ½ inch.

Use two coats of a zinc-rich paint to touch up minor scars on all galvanized materials (Refer to Section 1076-6 of the 2018 *Standard Specifications for Roads and Structures*).

For high strength bolted connections, provide direct tension indicator washers.

2. Shop Drawing

Submit to the Engineer for approval a complete design for the DMS assemblies (including footings), maintenance platforms, access ladders, DMS assembly hardware, brackets for supporting the DMS and maintenance platforms. Base the design on the line drawings and correct wind speed in accordance with the latest edition of the AASHTO *LRFD Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, 1st Edition, and the latest Interim Specifications.

The manufacturer of the DMS assembly must ensure that design of the assembly is compatible with the DMSs for mounting and attachment.

Submit six copies of completely detailed shop drawings and one copy of the design computations for the DMS assembly to the Engineer for approval prior to fabrication. Show in the shop drawings complete design and fabrication details including foundations, provisions for attaching the DMS, maintenance platform and access ladders to supporting structures, applicable material specifications, and any other information necessary for procuring and replacing any part of the complete DMS assembly.

Allow a minimum of 15 working days for shop drawing approval after the Engineer receives them. If revised drawings are necessary, allow an additional 15 working days for review and approval of final shop drawings.

Approval of shop drawings by the Engineer shall not relieve the Design-Build Team of their responsibility for the correctness of drawings, or for the fit of all shop and field connections and anchors.

3. Design and Fabrication

For additional design and fabrication requirements, see Section 906 of the 2018 *Standard Specifications for Roads and Structures*.

Dynamic Message Sign Assemblies

Fabricate the supporting structures using tubular members of either aluminum or steel, using only one type of material throughout the project.

Horizontal components of the supporting structures for overhead DMS shall be of a truss design to support the DMS. Truss centerline shall coincide with the centerline of the DMS design area shown on the structure line drawing developed by the Design-Build Team. Provide permanent camber in addition to dead load camber in accordance with the AASHTO *LRFD Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, 1st Edition, and the latest Interim Specifications. Indicate on the shop drawings the amount of camber provided and the method employed in the fabrication of the support to obtain the camber.

For all U-bolt connections of hanger beams to overhead assembly truss chords, provide U-bolts with a flat washer, a lock washer and double nuts at each end of the U-bolts. All double nuts that are on any U-bolt shall be the same thickness and weight. When assembled, the double nuts shall be brought tight against each other by the use of two wrenches.

Fabricate the attachment assembly for mounting DMS in a manner that will ensure easy removal the DMS.

DMS Maintenance Platform (Walkway)

Provide a maintenance platform, a minimum of three feet wide with open skid-resistant surface and safety railing on the DMS assemblies for access to the DMS inspection door. Provide platforms with fixed safety railings along both sides from the beginning of the platform to the inspection door.

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

- The top of the platform grading surface is vertically aligned with the bottom of the DMS door. Ensure the platform extends from the DMS enclosure to the access ladder.
- The DMS door will open 90-degrees from its closed position without any obstruction from the platform or safety handrails.
- The platform is rigidly and directly connected to the walkway brackets and there is no uneven surface between sections.
- 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.
- 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 DMS structures, leading to and ending at the access platform. Equip the ladder with a security cover (ladder guard) and lock to prohibit access by unauthorized persons. Furnish locks to operate with a Corbin #2 key and furnish two keys per lock. Design the rungs on 12-inch center to center typical spacing. The first ladder rung shall be no more than 18 inches above the landing pad. Attach the security cover approximately 6 feet above the concrete landing. 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 4 inches deep, 24 inches wide, and 36 inches long to serve as a landing pad for accessing the ladder. Design the landing pad to be directly below the bottom rung. Access to the ladder shall not be obstructed by the DMS foundation. Provide pre-formed or cast-in place concrete pads.

GEOTEXTILE FOR PAVEMENT STABILIZATION

(5-7-14) (Rev. 2-9-18)

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. Geotextile for pavement stabilization may be required 12 to 18 inches below subgrade elevation to prevent pavement cracking at locations shown in the plans developed by the Design-Build Team and as directed by the Engineer. Where Class IV Subgrade Stabilization in lieu of Chemical Stabilization is used, the Geotextile for Pavement Stabilization may be used in place of the Geotextile for Soil

Stabilization, Type 4 provided the Construction Methods described in this section are followed.

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

The Design-Build Team shall determine if geotextile for pavement stabilization is required. The Design-Build Team shall show proposed locations in the plan views developed by the Design-Build Team and other locations as directed by the Engineer. Use of geotextile for pavement stabilization will be based on sampling and testing for chemical stabilization. This sampling can be done when the embankment is completed to within 2 feet of subgrade elevation.

Place geotextile for pavement stabilization 12 to 18 inches below subgrade elevation 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 perpendicular to the survey or lane line in the MD and adjacent to each other in the CD as shown in the plans developed by the Design-Build Team. Continuous geotextiles are required in the MD, i.e., do not splice or overlap geotextiles so seams are parallel to the survey or lane line. Completely cover stabilized subgrades or subbases with geotextile for pavement stabilization. Overlapping geotextiles in the CD is permitted but not required. Overlap geotextiles in the direction that soil or aggregate will be placed to prevent lifting the edge of the top geotextile. Hold geotextiles in place with wire staples or anchor pins as needed.

Do not damage geotextile for pavement stabilization when placing aggregate or soil. Place and compact soil and aggregate in accordance with this scope of work and the 2018 *Standard Specifications for Roads and Structures*. Do not operate heavy equipment on geotextiles any more than necessary to construct base courses or subgrades. Replace any damaged geotextiles to the satisfaction of the Engineer.

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 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 *Standard Specifications for Roads and Structures*.

Geotextiles

Areas of embankment 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.

FOUNDATIONS AND ANCHOR ROD ASSEMBLIES FOR METAL POLES

(1-17-12) (Rev. 9-8-17)

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
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" 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 1/4". 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 1" of 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 a casing installation method is approved.

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 a concrete placement procedure is approved by the Engineer. 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 a procedure for placing anchor rod assemblies and conduit or constructing grade beams or wings is approved by the Engineer.

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 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 3/4" 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" 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
$\leq 1 \frac{1}{2}$	1/3 turn (2 flats)
$> 1 \frac{1}{2}$	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 4 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
$\geq 1\ 1/2$	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, and the latest Interim Specifications.

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 7 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 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 AASHTO *LRFD Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, 1st Edition, and the latest Interim Specifications. 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 1" 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, and the latest Interim Specifications.

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.

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.

MICROWAVE VEHICLE DETECTION SYSTEM - MULTIPLE DETECTION ZONES

(1/23/18)

(A) GENERAL REQUIREMENTS

Design, furnish and install a microwave vehicle detection system with the manufacturer recommended cables and hardware in accordance to the plans developed by the Design-Build Team and specifications. Ensure the detection system provides multiple detection zones (minimum of 12 lanes). Provide a detectors that collect volume, speed, classification, and wrong way detection data. Provide detectors that can identify vehicles traveling in the opposite direction (i.e. wrong-way vehicles).

(B) MATERIALS

1. General

Provide design drawings showing design details and microwave sensor locations for review and acceptance before installation. Provide mounting height and location requirements for microwave sensor units on the design based on a site survey. Design microwave vehicle detection system with all necessary hardware. Indicate all necessary poles, spans, mast arms, luminaire arms, cables, microwave sensor mounting assemblies and hardware to achieve the required detection zones where Department owned poles are not adequate to locate the microwave sensor units. Do not design for the installation of poles in medians.

Obtain the Engineer's approval before furnishing microwave vehicle detection system. The contractor shall be responsible for the final design of microwave vehicle detection system. Review and acceptance of the designs by the Department does not relieve the contractor from the responsibility to provide fully functional systems and to ensure that the required detection zones can be provided. With the exception of contractor-furnished poles, mast arms, and luminaire arms, furnish material, equipment, and hardware under this section that is pre-approved on the ITS and Signals QPL. Submit and obtain Engineer's approval of shop drawings for any poles, mast arms, and luminaire arms provided by the contractor prior to ordering from manufacturer.

Provide a detector for either side-fire or forward-fire configuration. Ensure the detector will detect vehicles in sunny, cloudy, rainy, snowy, and foggy weather conditions. Ensure the detector can operate from the voltage supplied by a NEMA TS-1/TS-2 or Type 332 or 336 traffic signal cabinet. Ensure the detector can provide detection calls to the traffic signal controller within a NEMA TS-1/TS-2 or Type 332 or 336 cabinet. Ensure the detection system provides a constant call in the event of a component failure or loss of power.

Provide a detector housing that meets NEMA 250 for icing, water spray, corrosion and sealing.

Provide a detector that uses dual radars in a single unit for speed trap data collection.

Provide each detector unit to allow the placement of at least ten detection zones with a minimum of ten detection channel outputs. When the microwave vehicle detection system requires an integrated card rack interface(s), provide only enough interface cards to implement the vehicle detection shown on the signal plans developed by the Design-Build Team. Provide a means acceptable to the Engineer to configure traffic lanes and detection zones. Provide each channel output with a programmable means to delay the output call upon activation of a detection zone that is adjustable in one-second increments (maximum) over the range of 0 to 25 seconds. Provide each channel output with a programmable means to extend the output call that is adjustable in one-second increments (maximum) over the range of 0 to 25 seconds. Ensure both delay and extend timing can be set for the same channel output.

Ensure the advance detection system provides each channel output call of at least 100 ms in duration.

For units without an integrated card rack interface, provide Form C output relay contacts rated a minimum of 3A, 24VDC.

If a laptop is used to adjust detector settings, ensure that software is licensed for use by the Department and by any other agency responsible for maintaining or operating the microwave detection system. Provide the Department with a license to duplicate and distribute the software as necessary for design and maintenance support.

After initial detector configuration and installation, ensure routine adjustments or calibration are not needed to maintain acceptable performance.

(C) PERFORMANCE REQUIREMENTS

Ensure the detector has an operating temperature range of -30 to 165 degrees F and operates within the frequency range of 10 to 25 GHz. Ensure the detector is provided with a watertight housing offering NEMA 4X protection and operates properly in up to 95% relative humidity, non-condensing.

For advance detection system, ensure the detector senses vehicles in motion at a range of 50 to 250 feet from the detector unit for forward-fire configuration and a range of 50 to 250 feet from the detector unit for side-fire configuration with an accuracy of 95% for both configurations. The per lane volume count accuracy must exceed 95%. The per lane speed average speed and per direction average speed each must be accurate within 2 mph. the per vehicle speed measurement accuracy must be within 3 mph for 90% of the vehicles measured. The per lane occupancy accuracy must be +/- 20% and the per direction occupancy accuracy must be +/- 10%. The classification accuracy shall be minimum of 80%.

For stop bar presence detection system, ensure the detector outputs a constant call while a vehicle is in the detection zone and removes the call after all vehicles exit the detection zone. Ensure the presence detector unit can cover a detection zone as shown on the plans developed by the Design-Build Team and has an effective range of 10 to 120 feet from the detector unit.

(D) CONSTRUCTION METHODS

Install the microwave vehicle detection system in accordance with the manufacturer's recommendations.

Monitor and maintain each detector unit during construction to ensure microwave vehicle detection system is functioning properly and aimed for the detection zone shown in the plans developed by the Design-Build Team. Refer to Subarticle 1700-3 (D) Maintenance and Repair of Materials of the 2018 *Standard Specifications for Roads and Structures* for failure to maintain the microwave detection system.

WRONG-WAY DRIVER DETECTION SYSTEM

(1/23/17)

(A) GENERAL REQUIREMENTS

The work under this item shall consist of furnishing and installing the camera and detection devices, cabinet, sign controller, wrong-way static sign with flashing/blinking LED border, detection assemblies, sign controller, sign mounting hardware, electronic components, materials, tools, and labor necessary to provide a complete and fully operational system.

The wrong-way sign and detection assembly shall successfully detect 99.9% of all wrong-way vehicles.

Deliver one complete assembly to the Department for evaluation and testing for a period of one week prior to approving the material submittal for items related to the sign assembly.

(B) MATERIALS**1. General**

Use only UL listed and approved electronic and electrical components in the wrong-way sign and detection system.

Furnish operating LED Wrong-Way signs systems consisting of, but not limited to, the following:

- 42” by 30” static “Wrong-Way” Sign (R5-1A),
- 36” by 36” static “Do Not Enter” Sign (R5-1),
- LED-illuminated sign borders,
- Sign mounting brackets and hardware,
- Conduit, fittings, hardware, and junction boxes between controller and LED modules,
- Controller, controller cabinets, cabinet foundations, software and software licenses,
- Type 332 or 336 ground mounted aluminum cabinet, cabinet mounting/foundation,
- Splice trays and fiber-optic cable patch panels, and
- Category 6 Ethernet or serial cabling between the wrong-way sign and the wrong-way cabinet.

Furnish signs, camera, detection device mounted on a Type III pedestal either in the median or behind a barrier wall.

2. LED Sign Panel

Furnish and install light emitting diode (LED) Wrong-Way signs with controller, cables, equipment cabinets, cabinet mountings and foundations.

Furnish and install LED Wrong-Way signs compliant with UL standards 48, 50, 879, and 1433.

Add and configure the new LED Wrong-Way signs in the system using the control software and computer system.

The assembly shall include:

- one 42” x 30” static “Wrong-Way” (R5-1A)
- one 36” by 36” static “Do Not Enter” Sign (R5-1), and
- a minimum of 70 red LEDs which illuminate the border of each sign.

The LED’s shall flash at a rate of approximately 60 flashes per minute when activated.

The light source for the sign border shall be LEDs (light emitting diodes). All exterior surfaces of the static sign shall be powder-coat painted in accordance with Military Standard MIL-C-24712A (Powder Coating). Finish will meet the requirements of ASTM D3359 (Adhesion), ASTM D3363 (Hardness), and ASTM D552. The illuminated sign border shall have a weatherproof design that ensures water does not reach internal components, and shall be able to do so in its design, without the use of silicone.

The sign shall be designed and constructed to withstand 100 mph wind loads in conformance with the requirements of the AASHTO publication, "Standard Specifications for Structural Supports of Highway Signs, Luminaries and Traffic Signals," 6th Edition with 2015 revisions. Signs shall be tested and certified for the following environmental conditions: Exclusion of Water Test, Strain Relief Test, Temperature Test, Dielectric Voltage-Withstand Test.

The sign shall be listed and approved to UL 48 Standards by a Nationally Recognized Testing Laboratory. The outside of the sign shall be marked with a certification mark for Electric Signs UL 48.

The sign shall have anti-graffiti film applied meeting the specifications and the requirements of the sign sheeting manufacturer.

Sign shall have a warranty for a minimum of five years.

The sign support hardware shall be certified by the hardware manufacture that it is structurally adequate and compatible to support the sign assembly considering wind and other loads in the specifications. Manufacturers of sign components shall certify the components are MUTCD compliant.

All mounting hardware shall be provided by the contractor.

The Department may request one sign assembly to be provided for evaluation and testing for a period of one week prior to approving the material submittal for items related to the sign assembly.

Provide weatherproof modular components for the construction of the sign display and assembly. The design will utilize weatherproof modular components for the construction of the sign display and the sign assembly.

Furnish modular sign components that withstand harsh environments without the need of a sealed sign case for component protection and environmental controls.

The illuminated sign border shall flash/blink when the sign is activated and be dark when off. The sign assembly shall be activated, for a user-adjustable duration up to 10 minutes, based off a short pulse contact closure from a microwave or detection camera output (Cameras may include thermal camera options).

The sign will only be activated when a wrong-way vehicle is detected by the system. Electronic components for the sign including relays, transformers, and flasher shall be installed in a NEMA Type 332 or 336 cabinet or within the internally illuminated sign housing. Components shall be able to withstand and operate at temperature extremes of -22 degrees F to +140 degrees F.

3. Display Modules.

Furnish display modules that accept the following communication inputs:

- Manufacturer-supplied hand-held input device when used
- Manufacturer-supplied controller
- NTCIP for DMS
- Windows® based PC
- Main Bus

Provide mounted signs capable of withstanding winds in excess of 100 mph.

Furnish a main bus that is capable of withstanding harsh vibrations and environmental conditions as set forth by SAE J1455. The main bus will use ultrasonic metal welding for wire splice creating a high quality metallurgical bond of the copper wires to provide reliable and consistent transmission of the low voltage signals.

Provide main busses that use weatherproof connectors that exceed ISO performance criteria for harsh environmental conditions. The connectors will utilize center rib connector seals to provide reliable connector- to- connector for sealing in harsh environments.

Furnish connectors that utilize indexing features so that mis-mating of connectors will not allow electrical contact nor lock features to engage. Connector termination voltage drop will be less than 4MV/AMP to provide reliable and consistent transmission of low voltage signals.

Provide weatherproof connectors that utilize a pump handle primary lock system that provides for a lower engage force and reliable connector-to-connector interface.

The light source for the sign borders shall be LEDs (light emitting diodes). The LEDs shall have a minimum rated lumen maintenance of 70% at 50,000 hours (an L70 of 50,000 hours).

4. Manufacturer-Supplied Controller

Furnish a manufactured supplied controller that will be mounted in a rugged-environmental box that can be mounted at any location within 1,000 ft. of the LED Wrong-Way sign. Controllers may be 2070E Controllers described elsewhere in the Project Special Provisions.

Provide controllers that will meet the following minimum functional requirements:

- Initiate LED flashing sign borders as directed by contact closure input. No other message shall be programmed into the controller.
- Supply other controller functions as necessary to meet the integration and operational

5. Cabinet

Provide a cabinet to house the controller, power supply, Ethernet edge switch and battery backup. Provide a NEMA 332 or 336 ground mounted style, or similar, aluminum cabinet with 19 inch EIA rack mounting system to house the following equipment:

- Power distribution assembly with 120/240 VAC input.
- Industry standard surge protection Category A, 120kA per phase, 60kA per mode in accordance with ANSI/IEEE C62.41.
- Ethernet edge switch (paid separately).
- Fiber-optic patch panels and splice trays (paid separately).
- Work light.
- Mounting for concrete foundation as shown on the plans (paid separately).
- Height as required for equipment supplied.
- Pad lockable door handle.

6. Detection

The detection system shall successfully detect 99.9% of all wrong-way vehicles in all light conditions. Acceptable technologies are microwave, video and ultrasonic based. Upon detection, a color day/night camera shall take a photo and video for transmission with an alert to the MRTMC via the fiber-optic network.

7. Communications

Provide a 100 Mbps Ethernet port on the controller board. Provide Layer 2 Ethernet communications.

8. Electrical

Electrical conductors shall enter the sign housing on the bottom (preferred) or side of the sign.

LED single output switching power supply shall be a fully-encapsulated, constant-current design built to withstand a 300VAC surge input for 5 seconds, with inherent short circuit/over current/over voltage protection. The power supply shall be housed in a fully isolated weather resistant case to prevent water

intrusion. The sign's LED single output switching power supply shall be rated for 25% more than the rated current and input voltage range of 115-270 AC.

Provide a battery backup system that shall provide 24 hours of continuous power.

9. Environmental Requirements

Construct the LED Wrong-Way sign and controller cabinet so the equipment within is protected against moisture, dust, corrosion, and vandalism.

Design the LED Wrong-Way sign and detection system to comply with the requirements of Section 2.1 (Environmental and Operating Standards) of NEMA TS 4-2005.

Provide all equipment capable to meet the uncontrolled environmental operations characterized by a temperature range of -40°C (-40°F) to +75°C (167°F) and a humidity range of 5% to 95% (non-condensing).

(C) CONSTRUCTION

1. General

The sign shall be mountable by a center post to the barrier wall or with two sign posts and foundations. The sign manufacturer shall provide installation drawings for the signs.

The LED wrong-way sign assembly shall be installed with the bottom of the lower of the two LED wrong-way signs three feet above the roadway elevation.

All mounting hardware shall be provided by the contractor. Mounting shall be as shown in the plans for the illuminated wrong-way sign assembly detail and mounting detail.

The Engineer and contractor shall perform a field visit together and precisely locate and stake the sign assemblies considering visibility and site details.

2. Detection

Mount the detection and camera units on the pedestal pole with a camera and detector for each direction of travel as shown in the Plans. Configure detection zones to achieve the 99.9% accuracy.

3. Communications

Terminate the fiber-optic drop cable in the controller cabinet. Install the fiber-optic drop with LC connectors and connect to the Ethernet edge switch. Provide an Ethernet patch cord between the Ethernet edge switch and the on-board Ethernet port of the controller.

4. Electrical

Grounding for the sign housing and posts shall be provided by a 25-foot coil of #4 AWG bare copper conductor, or a 14-inch square copper ground plate, installed before the concrete post foundation is poured and shall be covered with 6 inches of fill. The ground shall be connected to the sign assembly providing ground to the posts and sign housing.

LED BLANK-OUT SIGN

(1/23/18)

(A) GENERAL REQUIREMENTS

The work under this item shall consist of furnishing and installing LED Blank-out Signs, sign controller, sign mounting hardware, electronic components, materials, tools, and labor necessary to provide a complete and fully operational system.

Furnish and install Light Emitting Diode (LED) blankout signs with all necessary hardware as set forth in the plans and specifications. Design the signs with the options to display "NO (LEFT or RIGHT) TURN". Fabricate the sign to be between 27" and 29" wide, between 37" and 39" high and approximately 8" deep.

(B) MATERIALS

Provide Light Emitting Diode (LED) blank-out signs to display the words listed in the bid line item for each sign. Fabricate the sign housing with an approximate depth of 8", a maximum width of 29" and a maximum height of 39". Fabricate the message using 6" high Series "E" letters for the word "NO" and 5" high Series "D" letters for all other words.

Provide a modular design with the following self-contained modules: message display, rack mounted message drivers, driver rack assembly, and enclosure. Ensure all internal components are adequately supported to withstand mechanical shock and vibration from ratings meeting AASHTO's requirements of 80 mph with a 30% gust factor. Design display to operate without moving parts.

Provide a message display that is a PCB matrix with a matte black solder mask with minimum thickness of 0.093 inches and a silk screened component identifier. Mount LEDs on front of the PCB matrix. Mount all other components on the back of the black matrix. Ensure that a person with 20/20 vision can read a fully intensified, legible message from 500 feet in front of the sign under any light conditions. Ensure the message is not legible when the sign is off, even if in direct sunlight.

Use white LEDs that are the latest InGaN technology or better with a minimum luminous intensity of 6,000 mcd at 20 mA. Distribute the LEDs evenly. Ensure that the maximum distance, center to center, between consecutive LEDs is 0.5 inches, plus or minus 10%. Connect the individual LED light sources so that failure of a single LED will result in a loss of no more than 5 LEDs. Ensure the sign is still legible.

Protect and seal the rear side of the PCB with a molded polymeric back cover. Mount the display PCB with back cover into the front door, which consists of an aluminum frame and face lens. Provide a clear 0.25-inch, non-glare, matte finish polycarbonate lens with a UV resistant surface treatment. Ensure that the lens has light transmission properties equal to or greater than 80%.

Design the entire display face and door as a one piece, self-contained module that can be removed from the sign housing in less than one minute without using tools. Seal the module against dust and moisture intrusion to meet the requirements of NEMA Type 4 enclosures.

Mount the module on the sign housing with three stainless steel “lift-off” hinges, and latch it with a minimum of two stainless steel ¼ turn link locks. Provide a retaining rod to hold the door in the open position. Configure the front door frame assembly to cover a gutter surrounding the full perimeter of the housing body and fit flush to the exterior of the body.

Fabricate the weatherproof housing out of 0.125 inch aluminum with all corner seams welded their full length. Weld the full length of all corner seams using tungsten inert gas method. Provide a 1-inch diameter vent plug in four bottom corners of the housing to prevent the collection of water from possible gasket leaks. Ensure each vent plug has a corrosion resistant screen, which allows the passage of water but does not allow insects to enter the housing. Install a terminal block that accommodates a spade lug sized for a number 10 terminal screw. Provide 4 terminals with each having 2 terminal screws that have a shorting bar between them. Fabricate an entrance for wires on top-center of the housing that is compatible to connect a standard traffic signal mounting gooseneck (wire entrance).

Provide a standard sun visor made of 1/16-inch aluminum. Paint the inside of the visor with 2 coats of dull black paint. Paint the exterior and interior of the sign case and the outside of the visor Federal Standard 595C yellow by the dry powder method. Apply the yellow finish by electrostatic spray and heat cure. Ensure the thickness of the finish is a minimum of 2.5 mils thick. Do not apply paint to the latching hardware.

Provide an aluminum driver rack assembly that is a single part, self-contained module consisting of an interconnect PCB and an anodized aluminum frame. Ensure that it is vented from top to bottom and has latches to lock the modules in place. Design the driver rack assembly to be easily removable in less than one minute without the use of tools.

Design the driver modules to be industry standard 6.5 x 4.5 inches rack mounted. Provide driver modules that consist of a PCB with aluminum front plate and handle as used for inductive loop detectors. Ensure that the LED current does not exceed the manufacturer’s maximum current rating. Ensure that the driver modules are fused. Provide voltage surge protection to withstand high repetition noise transients and low repetition high energy transients as stated in Section 2.1.6 of the NEMA Standard TS-2, 1992.

Ensure compatibility and proper triggering and operation with load switches and conflict monitors in signal controllers currently used by the Department. Ensure the on-board circuitry meets FCC title 47, sub-part B, section 15 regulations on the emission of electronic noise. Design the driver modules to maintain a constant LED drive current regardless of the outside temperature.

Design the driver modules to automatically reduce the light intensity of the display by 35% based on the ambient light. Include a delay to prevent interference caused by extraneous light. Provide a green LED for power status and a red LED for alarm status on the drive module.

Design the interconnect PCB to include terminals for all field wiring, 120VAC controls, external photocell, and alarm signals. Design all interconnections within the sign to be accomplished through the PCB with no internal wiring with the exception of a single cable for the message display and wires from the input terminal block. Provide a multi-conductor cable with an individual 2-pin connector for each word. Identify all connectors and terminals by the silk screen identifier on the surface of the PCB. Mount all PCBs vertically to facilitate air-cooling and to prevent collection of dust and moisture.

Design and certify the LED blank out sign to operate over a temperature range of -35°F to 165°F with an operating voltage range of 105 to 130 volts. Ensure that all electronic components are standard industry items that are available from wholesale electronics distributors. Provide components that are “solid state” type. Do not use electro-mechanical components.

(B) CONSTRUCTION

1. General

The sign shall be mounted on the appropriate traffic signal mast-arm pole as shown in the AET Concept Plans.

All mounting hardware shall be provided by the contractor and installed as per the manufacturer's recommendations.

The Engineer and contractor shall perform a field visit together and precisely locate the sign assemblies considering visibility and site details.

2. Communications

Terminate the communication cables in the controller cabinet. Install the fiber-optic drop with LC connectors and connect to the Ethernet edge switch. Provide an Ethernet patch cord between the Ethernet edge switch and the on-board Ethernet port of the controller.

CENTRAL VIDEO EQUIPMENT**(A) DESCRIPTION**

Furnish and install a video monitor processing unit (VMPU), using software to decode digitized video signals from the traffic management CCTV cameras and to manage the switching of video images onto user-selectable video monitors.

(B) MATERIALS**1. Video Monitor Processor Unit**

Provide a server class computer that will serve as a video monitor processor unit. Provide video monitor display cards to operate the existing display monitors. The video monitor processor unit shall meet the following requirements:

- Support Windows® 7 Professional (64-Bit) operating system,
- Occupy no more than three rack units,
- Include 10/100/1000 MB network interface cards,
- Include one terabyte of storage,
- Include a quad core (or better) processor,
- Provide minimum of 8 Gigabytes of RAM,
- Provide software-based video decoding for a minimum of sixteen (16) H.264 video streams at 25 frames per second.
- Provide video monitor display cards described below.

2. Video Monitor Display Card

Provide video display output cards that meet the following requirements:

- Form Factor: ATX
- Graphics Bus: PCI Express 2.0 x16
- Number of Slots: One
- Resolution: Up to 3840 x 2160 @ 60Hz
- Memory interface: 128-bit
- Frame buffer memory: 2 GB DDR3

- Memory bandwidth: 28.5 GB/s per graphics processor unit (GPU)
- Display Connectors: 4x mini DisplayPort
- Passive Heat sink

3. Display Connector Cables

Furnish display connector cable with the appropriate connectors at each end to connect the outputs of the video monitor display card to the existing video monitors.

4. Software

Furnish and install software onto the VMPU to decode, switch and display video streams onto the existing video monitors and video wall.

Decoding Software

Furnish decoder software to decode the digitized video from all existing CCTV cameras as well as the CCTV cameras installed on this project.

Furnish decoder software that supports multiple video formats, specifically MPEG-2 and MPEG-4.

Furnish decoder software that permits the easy addition and configuration of encoders and cameras into the database as well as the ability to manage and identify cameras and encoders within the system.

Furnish software that allows additional video decoders to be easily added to the system.

Video Switching Software

Furnish video switching software that enables a user to pair an encoder with video decoder using the drag and drop method. Once paired, the Video Processing Unit (VPU) will instantly start decoding the digitized video stream and display it on the video window.

Furnish video switching software that enables decoded video to be displayed on multiple monitor outputs on a single VPU and allows a user to drag and drop any given video output to any video display.

Furnish video switching software that allows a user to split each video window into four, nine and sixteen streams.

Existing Operator Workstation

Furnish compatible client video management software to reside on an operator workstation on the network to allow operator interaction with the VMPU to pair encoders and decoders, and to switch video inputs and outputs as desired.

(C) CONSTRUCTION METHODS

1. Video Monitor Processor Unit

Install the video monitor processing unit in an existing communications rack in the MRTMC. Integrate the unit with the Ethernet LAN switch and video display subsystem.

Install and configure the video decoding software and video switching software on the video monitor processor unit. Configure the decoding software to decode digitized video streams from the new CCTV cameras installed on this project.

Configure the video switching software to pair encoders with the correct decoders.

Install compatible client video management software onto an existing operator workstation on the network to allow operator interaction with the VMPU to pair encoders and decoders, and to switch video inputs and outputs as desired.

INTEGRATION AND CONFIGURATION

(A) DESCRIPTION

Install and fully integrate new central equipment at the MRTMC. Fully configure existing central hardware and software at the MRTMC to establish communications with new CCTV and DMS devices. Install and integrate the microwave vehicle detection system and central software. Any reference to "DMS" shall refer both to full-size DMS and the toll rate DMS equipment.

Coordinate the working hours and building access for all central configuration activities with the Engineer.

(B) CENTRAL INTEGRATION

Furnish media access control (MAC) addresses for all equipment utilized as part of this project. Affix a label with the MAC Address to each device utilized. Furnish IP addresses for all equipment utilized as part of this project. Affix final IP address each device utilized. Use labels that do not smear or fade.

Integrate the digital video received over the Ethernet network with a new Video Monitor Processor Unit (VPMU) to be provided by the Design-Build Team.

Configure the existing CCTV server and video wall server software to recognize the new CCTV units and to process the digital video and control data for sharing with the MRTMC.

Integrate the serial device servers with the managed core Ethernet switch and existing DMS server.

Configure the existing DMS server to recognize the new DMS units and process control data for sharing with the MRTMC.

Configure the new vehicle detection server to recognize the new microwave detection units and process control data for sharing with the MRTMC.

(C) CENTRAL CONFIGURATION

The existing DMS central software that controls the DMS units at the MRTMC is Daktronics Vanguard. Modify the existing DMS central software configuration at the MRTMC to display and map the new DMS units in the software GUI. Ensure that the software also allows for full communications and control of the DMS unit.

Integrate the new CCTV units with NCDOT's anticipated all-digital regional video sharing and distribution system to allow local and remote users to view and control the new CCTV units.

TESTING & ACCEPTANCE

(A) GENERAL TEST PROCEDURE

Test the CCTV, DMS, and microwave vehicle detection systems in a series of design approval and functional tests. Any reference to "DMS" shall refer both to full-size DMS and the toll rate DMS equipment. The results of each test must 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 North Carolina Department of Transportation, 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.

Use only approved procedures for the tests. Include the following in the test procedures:

- A step by step outline of the test sequence, showing a test 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, and
- 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. The Engineer will reject all equipment not tested according to these requirements. It is the Contractor's responsibility to ensure the system functions properly even after the Engineer accepts the CCTV, DMS, and microwave vehicle detection 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.

(B) DESIGN APPROVAL TESTS

1. DMS System

Design Approval Tests are applicable to DMS systems not currently on the QPL.

The Design Approval Tests consists of all tests described in Section 2.2 "DMS Equipment Tests" of NEMA TS 4-2005 (Hardware Standards for Dynamic Message Signs with NTCIP Requirements). Perform all tests and submit certified results for review and approval.

PROTOTYPE – Manufacture a prototype DMS and controller of the type and size described in the Project Special Provisions. In the presence of the Engineer, test the prototype according to the Design Approval and Operational Tests. When all corrections and changes (if any) have been made, the Department may accept the prototype DMS and controller as the physical and functional standard for the system furnished under this contract. You may use the prototype units on this project if, after inspection and rework (if necessary), they meet all physical and functional specifications. In the case of standard product line equipment, if the Contractor can provide test results certified by an independent testing facility as evidence of prior completion of successful design approval tests, then the Engineer may choose to waive these tests.

In each Design Approval Test, successfully perform the Functional Tests described below. Apply the extreme conditions to all associated equipment unless stated otherwise in these Project Special Provisions.

2. Microwave Vehicle Detection System

Design Approval Tests are applicable to microwave vehicle detection systems not currently on the QPL. Develop a test plan to calibrate the detectors.

PROTOTYPE – Manufacture a prototype microwave vehicle detector of the type and size described in the Project Special Provisions. In the presence of the Engineer, test the prototype according to the Design Approval and Operational Tests. When all corrections and changes (if any) have been made, the Department may accept the prototype microwave vehicle detector as the physical and functional standard for the system furnished under this contract. You may use the

prototype units on this project if, after inspection and rework (if necessary), they meet all physical and functional specifications. In the case of standard product line equipment, if the Contractor can provide test results certified by an independent testing facility as evidence of prior completion of successful design approval tests, then the Engineer may choose to waive these tests.

In each Design Approval Test, successfully perform the Functional Tests described below. Apply the extreme conditions to all associated equipment unless stated otherwise in these Project Special Provisions.

3. CCTV System

No design approval test is required.

4. Fiber-optic Communications

No design approval test is required.

5. Central Hardware

No design approval test is required.

(C) COMPATIBILITY TESTS

1. DMS System

No compatibility test is required.

2. Microwave Vehicle Detection System

No compatibility test is required.

3. CCTV System

Compatibility Tests are applicable to CCTV cameras and video encoders/decoders that the Contractor wishes to furnish but are of a different manufacturer or model series than the existing units in the field or existing units installed at the MRTMC. 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 Design-Build Team shall be responsible for configuring proposed equipment at the MRTMC and proving compatibility.

The Engineer will determine if the Compatibility Test was acceptable for each proposed device.

4. Fiber-optic Communications

No compatibility test is required.

5. Central Hardware

Compatibility Tests are applicable to field Ethernet switches that the Design-Build Team wishes to furnish but are of a different manufacturer or model series than the existing units in the field or existing units installed at the MRTMC. 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 fully-functioning unit to be tested. The Department will provide access to existing equipment to facilitate these testing procedures. The Design-Build Team shall be responsible for configuring proposed equipment at the MRTMC and proving compatibility. The Engineer will determine if the Compatibility Test was acceptable for each proposed device.

(D) OPERATIONAL FIELD TEST (ON-SITE COMMISSIONING)

1. DMS System

Conduct an Operational Field Test of the DMS system installed on the project to exercise the normal operational functions of the equipment. The Operational Field Test will consist of the following tests as a minimum:

Physical Examination

Examine each piece of equipment to verify that the materials, design, construction, markings, and workmanship comply with the mechanical, dimensional, and assembly requirements of these Project Special Provisions.

Perform the following tests as a minimum:

- Verify that all surfaces are free of dents, scratches, weld burns, or abrasions. Round sharp edges and corners,
- Verify bend radius of cables is not excessive or could potentially cause damage,
- Verify all modules, lamps, and components are properly secured, and

- Verify that there are no exposed live terminals.

Continuity Tests

Check the wiring to assure it conforms to the requirements of these Project Special Provisions.

Functional Tests

Perform the following functional tests:

- Start-up and operate the DMS locally using a laptop computer,
- Use automatic (photo-electric sensor controlled) DMS Control Software to switch between “dim”, “normal”, and “bright” light levels,
- Operate the DMS with all display elements flashing continuously for 10 minutes at the maximum flash rate,
- Exercise the DMS by displaying static messages, flashing messages, and alternating static and flashing message sequences,
- Automatic poll the DMS by the Control Software at various intervals and verify the data received by Control Software from DMS,
- Download and edit messages using Control Software,
- Execute status request on the DMS controller,
- Observe normal operations during uploading and downloading messages,
- Input and select messages from the sign controller’s local user interface,
- Test sequence activation at chosen intervals,
- Display and verify all stored messages,
- Verify resumption of standard operation upon interruption of electrical power,
- Demonstrate detected failures and response functions,
- Demonstrate proper operation of the Failure Log,

- Set controller clock using the Control Software,
- Execute system shutdown using the Control Software and local user interface, and
- Verify detection of a power failure in the DMS enclosure and the report feature of the failure to the Control Software,
- Display IP address and web settings,
 - Verify that the IP address is not publically accessible. Placing a display on a private network or VPN helps mitigate the lack of security,
 - Disable the telnet, Web Interface, Web LCD, and ICMP (PING) interfaces,
 - Change the default password,
- Set the controller to enable a controller log file.

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.

2. Microwave Vehicle Detection System

Conduct an Operational Field Test of the microwave vehicle detection system installed on the project to exercise the normal operational functions of the equipment. The Operational Field Test will consist of the following tests as a minimum:

Physical Examination

Examine each piece of equipment to verify that the materials, design, construction, markings, and workmanship comply with the mechanical, dimensional, and assembly requirements of these Project Special Provisions.

Perform the following tests as a minimum:

- Verify that all surfaces are free of dents, scratches, weld burns, or abrasions. Round sharp edges and corners,
- Verify bend radius of cables is not excessive or could potentially cause damage,
- Verify all modules and components are properly secured, and

- Verify that there are no exposed live terminals.

Continuity Tests

Check the wiring to assure it conforms to the requirements of these Project Special Provisions.

Functional Tests

Perform the following functional tests:

- Start-up and operate the microwave vehicle detectors locally using a laptop computer,
- Configure each detector for the lane configuration of the roadway.
- Calibrate the data using ground counts.
- Automatic poll the microwave vehicle detectors by the central software at various intervals and verify the data received by central software from the microwave vehicle detectors,
- Verify resumption of standard operation upon interruption of electrical power,
- Demonstrate detected failures and response functions,
- Demonstrate proper operation of the failure log,
- Execute system shutdown using the central software and local user interface, and
- Verify detection of a power failure in the microwave vehicle detectors and the report feature of the failure to the central software,
- Display IP address and web settings,
 - Verify that the IP address is not publically accessible. Placing a display on a private network or VPN helps mitigate the lack of security,
 - Disable the telnet, Web Interface, Web LCD, and ICMP (PING) interfaces,
 - Change the default password,

Approval of Operational Field Test results does not relieve the Contractor to conform to the requirements in these Project Special Provisions. If the microwave vehicle detectors do 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.

3. CCTV System

Perform the following local operational field tests at the camera assembly field site in accordance with the test plans. A laptop computer shall provide camera control and positioning. After installing the camera assembly, including the camera hardware, field Ethernet switch, power supply, and connecting cables:

- Furnish all equipment, appliances, and labor necessary to test the installed cable and to 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,
- Connect devices to the power sources,
- Verify installation of specified cables and connections between the camera, PTZ, field Ethernet switch, and control cabinet,
- Perform the CCTV assembly manufacturer's initial power-on test in accordance with the manufacturer's recommendation,
- Set the VLAN, IP address, default gateway, and subnet mask for the camera and field Ethernet switch,
- Verify the presence and quality of the video image with a portable NTSC-approved monitor,
- Exercise the pan, tilt, zoom, focus, iris opening, and manual iris control selections, and the operation, preset positioning, and power on/off functions,
- Demonstrate the pan and tilt speeds and extent of movement to meet all applicable standards, specifications, and requirements,
- Verify proper voltage of all power supplies,

- Interconnect the communication interface device with the communication network's assigned fiber-optic trunk cable and verify that there is a transmission LED illuminated, and
- Verify that the CCTV camera's built-in digital video Ethernet encoder is properly encoding its video signal.

Approval of Operational Field Test results does not relieve the Contractor 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.

4. Fiber-Optic Communications

Conduct optical time domain reflectometer (OTDR) tests on the cable on the reel and after the cable is installed and terminated. Provide written notification a minimum of ten days before beginning fiber-optic cable testing.

After splicing is completed, perform bi-directional OTDR tests on each fiber, including unused fibers, to ensure the following:

- Fusion splice loss does not exceed 0.05 dB,
- Terminations and connections have a loss of 0.5 dB or less, and
- Reflection loss is 40 dB or greater for each connector.

Install a 1,000-foot pre-tested launch cable between the OTDR and fiber-optic cable to be tested.

If exceeded, remake splices until the loss falls below 0.05 dB. The Department will record each attempt for purposes of acceptance.

Furnish durable labeled plots and electronic copies on a CD or DVD of test results for each fiber including engineering calculations demonstrating that OTDR test results meet or exceed the attenuation requirements and that optical properties of the cable have not been impaired. Include digital photographs that clearly show the workmanship for each splice. Label all test results (plots and discs) with the manufacturer and model number of the OTDR testing equipment.

Provide a tabular summary or spreadsheet detailing and comparing the loss budget and actual loss calculations per link. Provide test results for fiber-optic cable that demonstrates the loss budget where the fiber originates and the point where the fiber meets an electronic device.

If any fiber exceeds the maximum allowable attenuation or if the fiber-optic properties of the cable have been impaired, take approved corrective action

including replacement of complete segments of fiber-optic cable if required. Corrective action will be at no additional cost to the Department.

5. Central Hardware

The Contractor shall perform a Network System Test (NST) on the local area network. During the NST, the Design-Build Team must demonstrate successful local operation of field equipment operating from the field Ethernet switches as well as successful control of the equipment from the MRTMC.

In the event of a failed NST, the Design-Build Team, at his expense, must perform all necessary activities required to provide proper operation of the LAN, which can include full replacement of field equipment or cabling.

The Engineer or his representative will witness all NSTs. Documentation of all testing procedures and activities must be provided to the Engineer prior to full acceptance of the system ring.

(E) 30-DAY OBSERVATION PERIOD

The 30-Day Observation Period shall not be considered part of work to be completed by the project completion date.

Upon successful completion of all project work, the component tests, the System Test, and the correction of all deficiencies, including minor construction items, the 30-day Observation Period may commence. This observation consists of a 30-day period of normal, day-to-day operations of the new field equipment in operation with the new 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 said failures within forty-eight (48) hours. 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 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 failure in any of the major system components exceeding a total of three (3) occurrences will terminate the 30-day Observation Period and cause the 30-day Observation Period to be restarted from day zero when the redesigned components have been installed and/or the failures corrected. The major system components are:

- DMS Field Controller and Display Module,
- CCTV Camera, PTZ, and built-in digital video Ethernet encoder,
- Microwave Vehicle Detectors,

- Fiber-optic Communications Cables and Splices, and
- Local Area Network including Ethernet switches

(F) 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 the 30-day observation period has been successfully completed.

The project will be ready for final acceptance upon the satisfactory completion of all tests detailed in this Section of the Project Special provisions; the rectification of all punch-list discrepancies; and the submittal of all project documentation.

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 PaintArticle 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*.

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 plans prepared by the Design-Build Team 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 7 feet below finished grade and
- 3) Slope of finished grade 6:1 (H:V) or flatter.

A subsurface investigation and high mount foundation design are 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 plans prepared by the Design-Build Team 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 plans 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, and the latest Interim Specifications.

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" 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 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

1.00 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 plans. Perform all work in accordance with these Special Provisions, the Plans, the National Electrical Code, and North Carolina Department of Transportation "Standard Specifications for Roads and Structures" *2018 Standard Specifications for Roads and Structures*.

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 1405	Standard Foundation
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

2.00 HIGH MOUNT STANDARD

Replace the second paragraph of Article 1401-2(A) of the *2018 Standard Specifications for Roads and Structures* with the following:

Design the support, including base plate and anchorage, in conformance with the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, Sixth Edition, 2013* and the Interim Specifications valid at the time of letting. The handhole to shaft diameter ratio and handhole placement guidelines shown in the *Sixth Edition* are waived from these specifications. Location and dimensions of the handhole shall be approved by NCDOT based on sound engineering practices. Use Fatigue Category II. Design and fabricate welds in accordance with Article 1072-18 of the *2018 Standard Specifications for Roads and Structures*. Design the support for the wind velocity shown in the plans.

3.00 REPLACE LUMINAIRES

3.10 DESCRIPTION

The work covered in this section involves removing existing luminaires on 80', 100' and 120' high mast standards and 45' single arm standards and installing new luminaires on all standards. It also includes installing new circuitry inside the single arm standards from the transformer base to the luminaire.

3.20 MATERIALS

Provide materials as described in Sections 1400-2 (C) of the *2018 Standard Specifications for Roads and Structures* and Sections 4.00 and 5.00 of these Special Provisions.

3.30 CONSTRUCTION METHODS

For all single arm light standards not relocated as part of this contract, remove existing luminaires, fuseholders and circuitry inside the standard. Deliver the fuseholders, in good condition, to the NCDOT Warehouse. Dispose of the luminaires in accordance with the North Carolina Department of Natural Resources (NCDNR) regulations for disposal of hazardous materials. Replace single arm luminaires with the appropriate luminaires shown in the plans and detailed in the Section 4.00 of these Special Provisions. Install new circuitry inside the standard from the luminaire to feeder circuitry at the base, and install new breakaway fuseholders.

To lower the carrier ring of the high mast standards, the portable drive unit may be obtained from the NCDOT Traffic Services Supervisor. Remove existing high mast luminaires and dispose of the luminaires in accordance with the NCDNR regulations for disposal of hazardous materials. Replace high mast luminaires with the appropriate luminaires shown in the plans and detailed in Section 8.00 of these Special Provisions.

4.00 LIGHT STANDARD LIGHT EMITTING DIODE (LED) LUMINAIRES

4.10 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 ft. 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 plans.

The manufacturer shall state the Light Loss Factor (LLF) used in the photometric calculations for the proposed luminaire. LLF shall be calculated as follows:

$$\text{LLF} = \text{Lamp Lumen Depreciation (LLD)} \times \text{Luminaire Dirt Depreciation (LDD)}$$

- 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

4.20 MATERIALS

4.21 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.
- 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 plans. 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 $\pm 10\%$.
- 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 email.

4.30 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.

4.40 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.

5.00 HIGH MAST LIGHT EMITTING DIODE (LED) LUMINAIRES**5.10 DESCRIPTION**

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	# 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:

$$LLF = \text{Lamp Lumen Depreciation (LLD)} \times \text{Luminaire Dirt Depreciation (LDD)}$$

- 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.

5.20 MATERIALS

5.21 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.
- 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 plans. 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 $\pm 10\%$.
- 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 email.

5.30 WARRANTY

Provide a minimum five-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.

5.40 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 will be replaced by the Design-Build Team at no additional cost to the Department.

6.00 LIGHTING CONTROL SYSTEM

6.10 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 will be standard electrical components in a stainless steel enclosure mounted on a metal pole with a concrete foundation as shown in the contract.

6.20 MATERIALS

Refer to Division 10 of the *2018 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 Standard Specifications for Roads and Structures*.

Use a piece of 4" rigid galvanized steel conduit (RGC), embedded in concrete as shown in the plans, 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 plans. Provide only openings necessary for the entrance of conduits as shown in the plans. 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 plans.

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 plans.

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.

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 60947-4-1A Panel Shop, a third party, recognized by the Department of Insurance as having the authority, shall label the control systems.

6.30 CONSTRUCTION METHODS

Construct the new control system foundation at the new location as shown in Standard Drawing 1408 of the Roadway Standard Drawings, with the top of the foundation 3 inches above finished grade.

Fasten the enclosure to the pole by means of a galvanized bracket assembly as shown in the plans. 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 plans. Stub all feeder circuit conduits and spare conduits from Control System in the Control System Junction Box. See Section 1412 of the 2018 *Standard Specifications for Roads and Structures* for junction box construction methods. See plans 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 6 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 *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.

7.00 COMMUNICATION GATEWAY

7.10 DESCRIPTION

The Design-Build Team shall provide and install a communication gateway at each control system location on the project. The communication gateway will be used to provide communication from the control nodes on the luminaires to the central monitoring software. The communication gateway will be mounted on a piece of rigid galvanized conduit installed above the control system.

7.20 MATERIAL

The communication gateway shall be a GE LightGrid gateway rated for the voltage shown in the plans.

Use conduit and conductors as specified in Article 1400-2 of the 2018 *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).

7.30 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 control system 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.

8.00 CONTROL NODE

8.10 DESCRIPTION

The Design-Build Team shall provide and install a communication node with each LED luminaire on the project. The communication node will be used to interface with the Department’s Statewide lighting control system.

8.20 MATERIALS

The communication node shall be a GE LightGrid version 2.0 node rated for the same service voltage as the luminaire. No other materials are required for this section.

8.30 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.

The Department will be responsible for programming the nodes to work with the existing Statewide GE LightGrid infrastructure.

9.00 RELOCATE LIGHT STANDARDS

9.10 DESCRIPTION

The work covered by this section consists of providing all equipment, labor and materials necessary to move an existing single arm light standard to a new foundation at locations shown on the plans. The standard to be relocated may be near the proposed final location, or may be one removed from another location. This section also includes storage of materials to be reused, and removal of the existing foundation. Construction of a new foundation is not included in this section.

9.20 MATERIALS

Reuse existing materials, including the light standard, breakaway base and arm. Shims and washers may be reused, but new connecting bolts are required. Replace materials that are to be reused if they are damaged during relocation. Materials damaged during relocation will be replaced with new materials at no additional cost to the Department.

The Design-Build Team shall be responsible for the storage and protection of the reused materials against loss or damage.

9.30 CONSTRUCTION METHODS

Dismount the light standard from the existing standard foundation. Reassemble and reinstall light standards on a new foundation and reuse the existing breakaway base. Replace the connecting bolts joining the standard to the breakaway base and attachment hardware for the standard-to-arm connection. Use rope or web slings when hoisting or lifting the light standard, to prevent damage or marking. If the light standards are to be stored between dismantling and reinstalling, provide proper transportation and supports to prevent warping. Provide protection against the elements.

Remove or abandon existing concrete light standard foundations. Dispose of the removed concrete, reinforcing steel, and anchor bolts in manner acceptable to the Engineer. Backfill the holes with suitable material and compact the material as required.

Abandon or remove the conductors and conduit as required by construction. install new feeder circuitry as shown on the plans.

Refer to Section 1400-10 of the 2018 *Standard Specifications for Roads and Structures* for abandonment requirements.

All other lighting operating from the same lighting control panel as the relocated light standard shall remain operational while the light standard is relocated or stored.

Install new luminaire as detailed in the section of these Special Provisions titled “Replace Luminaires”.

10.00 RELOCATE HIGH MOUNT LIGHT STANDARDS

10.10 DESCRIPTION

The work covered by this section consists of providing all equipment, labor and materials necessary to move an existing high mount light standard to a new foundation at the location shown on the plans. This section also includes storage of materials to be reused, and removal of the existing foundation. Construction of a new foundation is not included in this section. Reference the High Mount Foundations Project Special Provisions found elsewhere in this RFP for additional requirements.

10.20 MATERIALS

Reuse existing materials, including the high mount standard shaft, lowering device head frame, luminaire carrier ring, luminaires, winch assembly, hoist cables, enclosed circuit breaker, connectors and branch circuitry at luminaire carrier ring. Replace materials that are to be reused

if they are damaged during relocation. Materials damaged during relocation will be replaced with new materials at no additional cost to the Department.

The Design-Build Team shall be responsible for the storage and protection of the reused materials against loss or damage.

The Design-Build Team shall provide new anchor bolts, nuts and washers. The Design-Build Team shall verify that the anchor bolts furnished on the project are equal to the existing anchor bolts. The Department will provide the specifications of the existing anchor bolts upon request.

Provide new heavy duty Type SO power cord in each high mast at the I-77 interchange.

10.30 CONSTRUCTION METHODS

Dismount the high mount light standard from the existing foundation and reinstall on a new foundation. Use rope or web slings when hoisting or lifting the high mount light standard to prevent damage or marking. If the light standards are to be stored between dismantling and reinstalling, provide proper transportation and supports to prevent warping. Provide protection against the elements.

The existing high mount light standard shall be kept in operation until such time that it is in conflict with construction. The Design-Build Team shall schedule high mount standard relocation work as directed by the Engineer to cause minimal disruption of traffic.

All other lighting operating from the same lighting control panel as the relocated high mount light standard shall remain operational while the high mount standard is relocated or stored.

Remove or abandon existing concrete high mount light standard foundations. Dispose of the removed concrete, reinforcing steel, and anchor bolts in manner acceptable to the Engineer. Backfill the holes with suitable material and compact the material as required.

Abandon or remove the conductors and conduit as required by construction. Install new feeder circuitry as shown on the plans.

Refer to Section 1400-10 of the 2018 *Standard Specifications for Roads and Structures* for abandonment requirements.

For the existing high mount standards at the I-77 interchange, remove the heavy duty Type SO power cord and replace with new. Replacement of the Type SO power cord shall be done after the high mount has been relocated.

After relocation of the high mount light standard, the operation of the lowering device shall be demonstrated by the Design-Build Team by raising and lowering the carrier ring with luminaires a minimum of two (2) times. The raising and lowering demonstration shall include latching and unlatching at the top and connection of test cables at the bottom. Twisting of the cables, failure of

the carrier ring to latch or unlatch, unlevelness of the carrier ring or hang up of the guide arms shall be sufficient reason for the Engineer not to accept the relocated high mount.

Install new luminaire as detailed in the section of these Special Provisions titled “Replace Luminaires”.

HIGH VISIBILITY TRAFFIC CONTROL DEVICES

(2/15/2018)

Description

In accordance with this RFP, the Design-Build Team shall furnish and install High Visibility devices for projects on Interstates and Freeways with durations of 24 months or more. High Visibility devices include drums, stationary work zone signs and portable work zone signs. All of these devices shall be new. Used devices are not 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 (Type XI fluorescent orange sheeting)
- 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 Type XI 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

are prohibited and shall not be accepted on the Interstate/Freeway or associated intersecting roadways.

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*. The remainder of the existing requirements of Section 1089-1 of the 2018 NCDOT *Standard Specifications for Roads and Structures* remain. Used sign stands are 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 are not permitted for use. The use of skinny drums are prohibited for any 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 1 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.

WORK ZONE PERFORMANCE PAVEMENT MARKINGS

(06/04/2015)

Description

In accordance with this RFP, 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 (greater than 55 MPH) 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 will last the full duration of a traffic pattern during any particular phase of construction without having to be replaced or reapplied for a period of up to 12 months. In addition, they are to provide a higher performance level for both initial and residual retroreflectivity than standard traffic paints to improve nighttime work zone visibility.

Materials

A) General

Use materials in accordance with the Manufacturer's recommendations that will retain both durability and a minimum retroreflectivity as described elsewhere in this specification for a period of up to 12 months. In addition, it 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 marking applications.

- Polyurea
- Thermoplastic (Extruded and Sprayed)
- Epoxy
- Polymer (Single System)
- Cold Applied Plastic (Type IV)
-

B) Material Qualifications / Certifications

Only use Work Zone Performance pavement marking materials as listed above that are on the NCDOT Approved Products List. In addition, provide a Type 3 Material Certification for all materials and a Type 3 and Type 4 certification for all reflective media in accordance with Article 106-3, and Section 1087-4 of the 2018 NCDOT *Standard Specifications for Roads and Structures*.

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 and or removing from any project under contract.

Construction Methods

Do 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 are to be installed in a single application.

A) Testing Procedures

All Work Zone Performance pavement markings will 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 of this specification are met.

B) Application Equipment

See 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 = 50 mils (Extruded or Sprayed)

Polymer = 20 mils wet

Cold Applied Plastic (IV) = Manufacturer's recommendation

Unless otherwise stated in the plans, the line widths are as follows:

Edge lines, Solid Lane Lines, Skip and Mini-Skip Lines = 6"

Gorelines = 12"

"No track" dry times for the liquid systems shall be 10 minutes or less. Traffic shall not be placed on any material until it's sufficiently dry / cured to eliminate wheel tracking. The minimum level of retroreflectivity for any Work Zone Performance pavement marking system selected is as follows:

Reflectometer Requirements for Work Zone Performance Pavement Markings

Color	Initial	6 Months
White	375 mcd/lux/m ²	275 mcd/lux/m ²
Yellow	250 mcd/lux/m ²	150 mcd/lux/m ²

The above chart describes the retroreflectivity levels the work zone performance pavement markings are required to meet during initial placement and maintain for a minimum of 6 months. Initial retroreflective measurements will be taken with a mobile retroreflectometer within 30 days after initial placement. The Contractor shall notify the Engineer 7-10 days prior to the installation of new pavement marking lines. Accordingly, the Engineer will notify the Signing and Delineation Unit's Standards Engineer so the Mobile Retroreflective Contractors can be scheduled to measure the pavement markings for compliance.

In addition, work zone performance pavement markings are intended to maintain hardy retroreflective levels for the full 12 month duration. If the markings appear to be non-performing within the first 6 months, the Engineer may request additional retroreflectivity readings be taken. If and when this becomes necessary, the same notification procedure as described above will be used to have markings read by the Mobile Retroreflective Contractors. If measured and found not to be in reasonable compliance, the markings are to be replaced at no cost to the Department.

If Work Zone Performance pavement markings are snowplowed within their 12 month expected life, the material shall be durable to withstand a single snow event without showing excessive fatigue in both bond and retroreflectivity. However, if excessive damage has occurred during a single event or multiple snow plow events, resulting in more than 25% of the pavement marking edgelines or skips being physically removed, then the Work Zone Performance pavement markings are to be replaced unless the traffic pattern is to change within 30 days. This will be paid for as Extra Work in accordance with Article 104-7.

Unless the Work Zone Performance pavement marking is replaced due to excessive damage, it shall meet the following minimum retroreflectivity values within the single snow event:

Reflectometer Requirements for Work Zone Performance Pavement Markings After Single Snow Event

Color	MINIMUM
White	150 mcd/lux/m ²
Yellow	100 mcd/lux/m ²

If the work zone experiences more than more than 1 snow event requiring snowplowing, the retroreflectivity numbers in the chart no longer apply. The Engineer will determine if the pavement markings are still performing adequately or if replacement is necessary due to excessive damage caused by snowplow activities. If the markings are found to be deficient, they shall be replaced at the contract unit price unless the traffic pattern is to change within 30 days.

D) Surface Preparation

All pavement surfaces to receive Work Zone Performance pavement markings are to be swept clean and prepared in accordance with the Manufacturer's recommendation.

E) Temperature and Weather Limitations

Do not apply Work Zone Performance pavement markings unless the ambient air temperature and the pavement temperature is 50°F or higher for thermoplastic and is 40°F or higher for all other materials. Do not install unless the pavement surface is completely dry and not within 4 hours of a heavy rain event such as a thunderstorm with rainfall intensities greater than 1 inch / per hour.

In the event a traffic shift has to take place when the air and pavement temperatures are below the required minimums or if a rain event occurs prior to or during a planned traffic shift, upon

approval by the Engineer, an acceptable alternative is to install temporary pavement marking. Use 1 application of standard traffic paint to produce a 4" line with at 15 mils (wet). Beads shall also be applied to provide proper retroreflectivity until the "performance" material can be installed. The Work Zone Performance pavement markings shall be applied within 90 days of installation of the temporary pavement markings.

Maintenance

Replace any Work Zone Performance pavement material that prematurely fails due to debonding or excessive wearing where it doesn't maintain its retroreflectivity for the required 12 month duration. Any traffic control and Work Zone Performance pavement marking costs due to replacement is at no cost to the Department unless it's due to excessive damage caused by snowplow damage.

WORK ZONE TRAFFIC PATTERN MASKING

(2/15/2018)

Description

In accordance with this RFP, The Design-Build Team shall furnish and install Work Zone Traffic Pattern Masking material for placement on existing asphalt or concrete pavements during work zone operations. The Work Zone Traffic Pattern Masking material shall be black in color and used during traffic pattern changes to completely cover the entire pavement surface; thus masking / concealing the existing pavement markings and allowing the revised work zone pavement markings to be placed on a newly applied black surface. Its purpose is to eliminate the grind marks and "ghost markings" on pavement surfaces which can create motorist confusion and pavement damage while providing an incomparable contrast between the revitalized black pavement color and newly applied pavement markings for work zone patterns of up to a year.

Materials

A) General

Use materials in accordance with Manufacturer's recommendations that will retain a black color for a period of up to 12 months. The black material shall be a flat black color when fully cured and shall completely mask/conceal the existing pavement markings for the same 12 month period.

The material shall not exhibit glare or retroreflectance in either day or night conditions. To ensure the material provides ample concealment and doesn't exhibit excessive glare, the material opaqueness shall be a minimum of 95% and the retroreflective properties shall not exceed 4 mcd/lux/m².

It shall not adversely affect the ability of the pavement to drain water or make the pavement adversely slick in either dry and wet conditions and shall meet the skid properties as described in Section C below.

The material shall not contain any petroleum components and shall not contain any Volatile Organic Compounds (VOC's).

The material shall not exhibit excessive cracking or create excessive cracking to the pavement surface after placement.

In addition, it shall be manufactured to bond successfully to both concrete and asphalt pavements and allow resurfacing treatments to be applied directly over its surface without having to be removed for successful bonding of the new asphalt or concrete overlays.

It should also be manufactured to receive any type of polyurea, epoxy, polymer, cold applied plastic, or thermoplastic pavement marking materials.

B) Material Qualifications/Certifications

Use Work Zone Traffic Pattern Masking materials that are on the NCDOT Approved Products List. Provide a Type 3 (Manufacturers) Certification in accordance with Article 106-3 in the North Carolina Standard Specifications for Roads and Structures to ensure the material meets or exceeds the requirements in this specification.

In addition, provide a Type 5 (Typical Certified Test Report) Certification in accordance with Article 106-3 the 2018 NCDOT *Standard Specifications for Roads and Structures* that ensures the material has been tested by an independent testing company that meets or exceeds the braking/skid requirements as described in Section (C) below.

C) Performance

The Work Zone Pattern Masking material shall be tested by an independent test laboratory for skid properties according to the test standards in ASTM E274 or ASTM E303-93 (2008). The material shall provide minimum frictional resistance numbers when tested with either test standard. The minimum average Skid Number (SN) for ASTM E274 is 37. The minimum average British Pendulum Number (BPN) for ASTM E303-93 (2008) is 37.

The work zone travel lane shall retain its black distinguishable appearance throughout the life of the traffic pattern. Normal wearing is expected in the wheel paths of the travel lanes, but the work zone travel lanes shall always have a noticeable black appearance at all times during the expected 12-month traffic pattern life.

At any time this material fails to keep previously installed pavement markings concealed, resulting in conflicting traffic patterns or does not retain its black color contrast for the required 12-month duration, it is not meeting the requirements and intention of this specification and shall be replaced immediately.

The Work Zone Pattern Masking material shall retain its black color and continue to conceal the pavement markings underneath after a single snowplow event within its 12-month expected life.

If the work zone experiences more than 1 snowplowing event, the Engineer will determine if the Work Zone Pattern Masking is still performing adequately or if replacement is necessary due to excessive damage caused by snowplow activities. If the material is damaged to the point where 20% or more of the concealed pavement markings are revealed, it shall be replaced, at an 8" width to re-conceal the exposed pavement markings, at the contract unit price unless the traffic pattern is to change within 30 days.

Poor performance of Work Zone Pattern Masking material 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

A) Application Equipment

The equipment to apply Work Zone Traffic Pattern Masking material shall be truck mounted pneumatic or airless spray machines with suitable arrangement of atomizing nozzles and controls to cover the entire pavement surface to achieve uniform coverage with consistent thickness as required in this specification. Do not use hand applied methods or any other non-truck mounted application equipment or device to install material for applications longer than 1,000 feet.

The application spray equipment shall be set up in such a manner to apply the Work Zone Traffic Pattern Masking material in spray pattern widths to ensure complete and uniform coverage of the entire travelway and to reduce the overlap from multiple passes. If the application equipment isn't equipped to spray a full 12' travel lane in a single pass, it shall be set-up to spray a 6 foot minimum width. No more than 2 passes per travel lane will be allowed. A 1" overlap width is required when applying the material in less than the full width of the travel lane.

B) Material Application

The Work Zone Traffic Pattern Masking material is to be applied to the full width and length of the pavement surface where traffic patterns are to change thus masking/concealing the existing pavement markings as well as providing a new black surface for the placement of the revised pavement markings. The masking/concealment of individual pavement marking edge lines, skips, mini skips, lane lines or gore lines is not allowed.

The Work Zone Traffic Pattern Masking material shall be applied at a uniform thickness of approximately 20 mils (+/-) directly onto the existing pavement. The material shall be set and/or cured to receive pavement markings within 10 minutes of installation according to the temperature requirements stated within this specification.

C) Surface Preparation

- i) Asphalt- The existing pavement surface shall be swept clean and prepared in accordance with the Manufacturer's recommendations to receive the Work Zone Traffic Pattern Masking material. Although, no existing pavement marking line removal is

required, any loose, flaking or other laitance material from existing markings shall be machine broomed or scarified as directed by Manufacturer before placing the Work Zone Traffic Pattern Masking material.

ii) Concrete- The *existing* concrete surface shall be swept clean and prepared in accordance with the Manufacturer's recommendations to receive the Work Zone Traffic Pattern Masking material.

Although, no existing pavement marking line removal is required, any loose, flaking or other laitance material from existing markings shall be machine broomed or scarified as directed by Manufacturer before placing the Work Zone Traffic Pattern Masking material.

NOTE: For newly placed concrete pavements, newly installed concrete bridge decks or existing concrete pavements that do not receive a surface treatment, Work Zone Traffic Pattern Masking Material shall not be placed. The conflicting pavement marking lines shall be removed by water blasting methods only.

D) Temperature and Weather Limitations

Do not apply Work Zone Traffic Pattern Masking material unless the ambient air temperature and the pavement temperature is 40°F or higher. Do not install unless the pavement surface is completely dry and not within 4 hours of a significant rain event such as a thunderstorm with rainfall intensities greater than 1 inch / per hour. Always follow the Manufacturer's recommendations for placement during periods of excessive humidity.

Maintenance

There should be no required maintenance of the Work Zone Traffic Pattern Masking material. Replace any Work Zone Traffic Pattern Masking material that prematurely fails to keep pavement markings masked / concealed for the full 12 month duration. Any traffic control or material costs due to replacement will be at no cost to the Department.

SEQUENTIAL FLASHING WARNING LIGHTS

(10/08/2016)

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 interstates and freeways with speed limits greater than 55 MPH and or facilities that have significant traffic volumes.

The purpose of these lights is to assist the motorist in determining which direction to merge when approaching a lane closure. It's 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 current 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.

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.

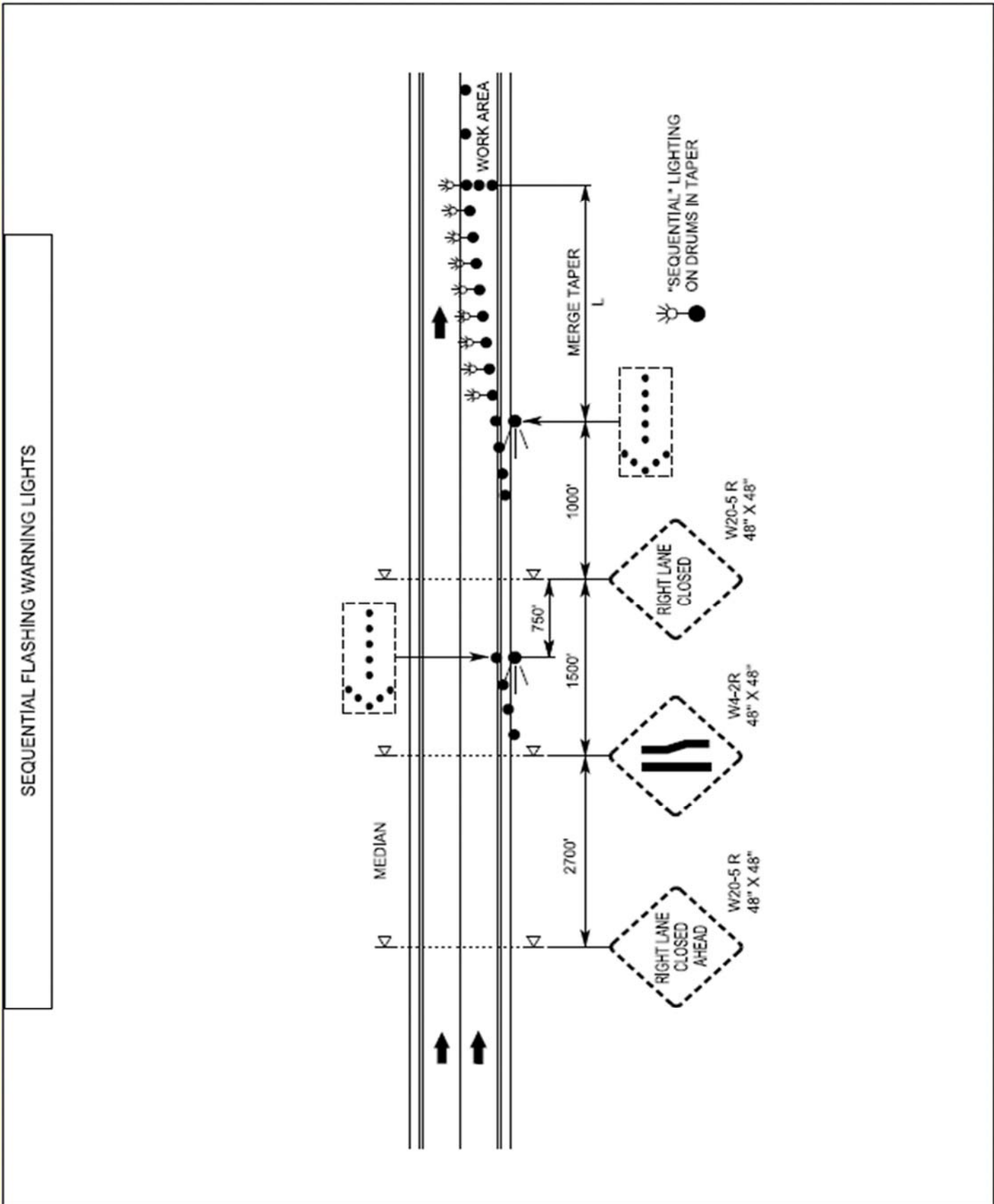
The number of lights used in the drum taper shall equal the number of drums used in the taper.

Drums are the only channelizing device allowed to mount sequential flashing warning lights.

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 10 to 100 feet. A 10 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 1 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.



WORK ZONE PRESENCE LIGHTING

(10/08/2016)

Description

In accordance with this RFP, the Design-Build Team shall furnish and install Work Zone Presence Lighting to supplement the Design-Build Team's task (Portable Construction Lighting) and equipment lighting during nightly work activities on high speed (greater than 55 MPH) facilities and/or facilities that have significant traffic volumes and impacts. The purpose of this additional lighting is to alert the motorist to the existence of an active work zone and to assist in compliance of the work zone speed limit by providing lighting in advance and throughout the length of the lane closure.

Materials

Anti-glare lighting systems are required. They are in addition to the Design-Build Team's portable construction lighting. These devices shall be installed in accordance with the attached drawing and 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.

All Work Zone Presence Lighting equipment shall be on the NCDOT Work Zone Traffic Control Approved Products List.

Construction Methods

Work Zone Presence Lighting is to provide lighting to areas of the lane closure where there is an absence of the Design-Build Team's task lighting. If the Design-Build Team provides sufficient task lighting to meet the luminance requirements of Section 1413-3 of the 2018 NCDOT *Standard Specifications for Roads and Structures* for the full length of the lane closure, or if there is sufficient existing overhead lighting, Work Zone Presence Lighting may be eliminated as directed by the Engineer. Work Zone Presence Lighting shall not conflict with the Design-Build Team's lighting or work operations.

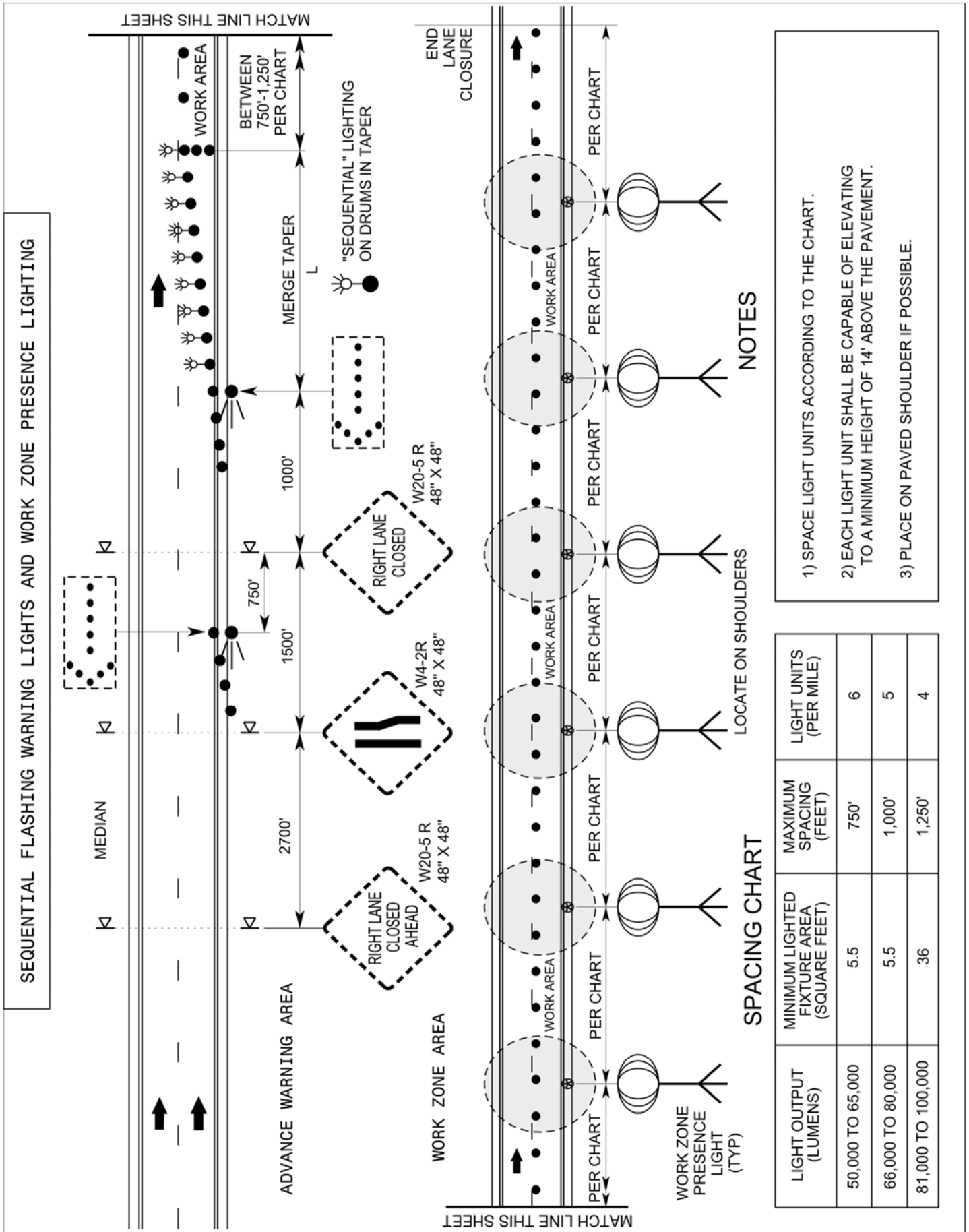
Each light unit shall be capable of providing a minimum of 50,000 lumens illuminating a minimum area of approximately 20,000 square feet. The light shall be capable of being elevated to a height of 14 feet above the pavement. The lighting units shall be installed inside the full length of the lane closure as shown on the attached drawing and spaced according to the chart.

SPACING CHART

Light Output (Lumens)	Minimum Lighted Fixture Area (Square Feet)	Maximum Spacing (Feet)	Light Units (Per Mile)
50,000 to 65,000	5.5	750'	6
66,000 to 80,000	5.5	1,000'	5
81,000 to 100,000	36	1,250	4

Each light unit shall be installed along with the lane closure traffic control devices and moved as necessary to allow for efficient paving operations to take place as well as to not interfere with the Contractor's ability to light the work area.

Whenever possible, each light unit shall be placed on the 10 foot paved shoulder according to the above spacing based on the amount of light output for each unit. Each light unit support structure or mounting stand shall have the capability of being leveled.



WORK ZONE DIGITAL SPEED LIMIT SIGNS

(10/08/2016)

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 greater than 55 MPH and or facilities that have significant traffic volumes and impacts. These signs are regulatory speed limit signs with LED displays for the speed limit numbers. The purpose of 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

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 Digital Speed Limit sign shall be mounted such that the bottom of the sign is 7’ above roadway.

The LED panel shall be a minimum of 18” wide x 28” 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 allows for 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.

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.

The batteries, when fully charged; shall be capable of powering the display for 20 continuous days with no solar power. The unit shall be capable of being powered by standard 110/120 VAC power source.

Store the battery bank and charging system in a lockable, weather and vandal resistant box.

Optional Equipment/Capabilities

Work Zone Digital Speed Limit systems may include speed data collection. If provided, this information is to be available in a spreadsheet format and accessed remotely from a secure cloud location.

The Work Zone Digital Speed Limit systems may have radar equipment to detect approaching speeds.

The Work Zone Digital Speed Limit systems may have flashing beacons. If used, the beacons are to be 12" diameter LED circular yellow. They may be mounted either above, beside or below the sign assemblies and are to be centered horizontally. If used, the beacons shall alternately flash at rates not less than 50 or more than 60 times per minute.

All Work Zone Digital Speed Limit equipment shall be on the NCDOT Work Zone Traffic Control Approved Products List.

Construction Methods

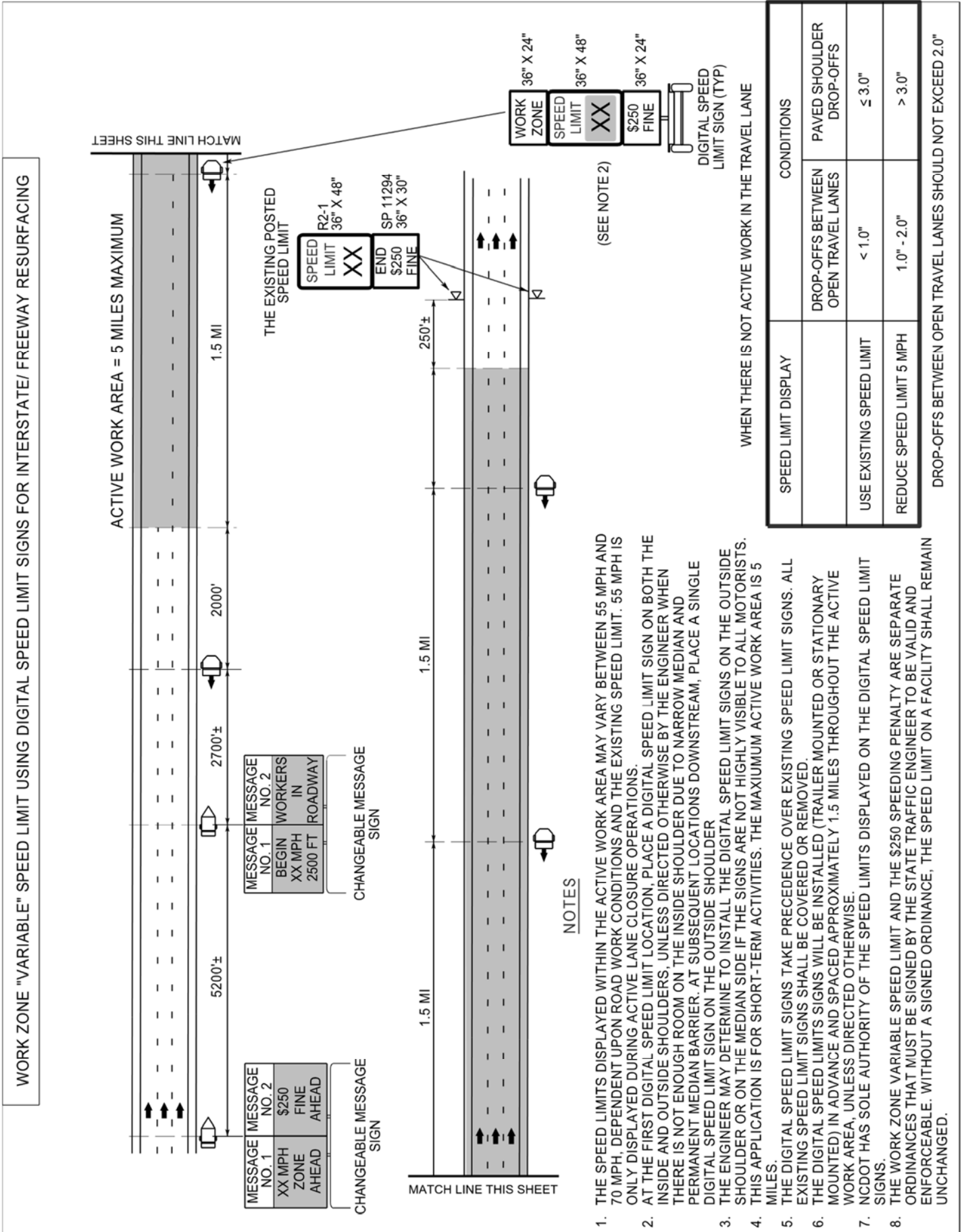
The Speed Limit shall be continuously displayed on the signs. The speed limits are the sole authority of the NCDOT. All speed limits are to be ordinated by the State Traffic Engineer in order to have a lawfully enforceable speed limit.

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 Contractor will be responsible for coordinating with the Engineer when the Work Zone Speed Limits are to be changed and will have to seek approval by the Engineer or his designee before the Speed Limit is changed.

If the system has radar equipment and flashing beacons, the Digital Speed Limit systems shall have beacons activated when the "55 MPH" speed limit is being displayed. At all other speed limit displays (60 MPH, 65 MPH, 70 MPH), the beacons are not to be automatically activated until approaching speeds are detected to be 7 MPH or higher above the posted speed limit.

Whenever possible, each trailer mounted unit shall be placed on the paved shoulder and shall have the capability of being leveled.



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 to be provided by the Department.

(B) ALTERNATE PILE SPACING

As an alternate, the Design-Build Team may submit plans for pile spacing greater than 10 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. 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. 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 4 inches \pm ¼ inch thick with a stained, 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 1/4-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, textured surface on both faces of pre-cast concrete panels used in sound barrier walls and retaining 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 form liners (molds) and a compatible concrete coloring system. The Engineer shall provide the specific concrete surface treatment and color requirements

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 (size, shape, texture, pattern and relief) pattern specified by the Engineer with panel staining on both sides to match the palette color specified by the Engineer and found in the Federal Standard 595B – Colors Used in Government Procurement. All texture shall be in addition to the nominal thickness of the wall panels of four inches \pm ¼ inch. Maximum depth of textured surface shall not exceed 1½ inches. 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 patterns 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

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 Sound 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 Grey Palette Color # FS 36122 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. The Design-Build Team shall provide a Color Application Artist who is trained in the special techniques to achieve realistic surface appearances, if requested by the Engineer. 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.

REPAIR OF BRIDGE DECKS AND APPROACH PAVEMENT WITH LATEX MODIFIED CONCRETE

Description

This work consists of repairing existing bridge decks and approach pavement by removing existing asphalt overlay and loose, deteriorated or contaminated concrete and resurfacing with latex modified concrete overlayment course together with other work necessary to restore structural integrity to the deck in accordance with this provision, applicable parts of the 2018 *Standard Specifications for Roads and Structures*, and the dimensions, lines and grades shown on the plans or established by the Engineer.

Equipment

Use the following Surface Preparation Equipment:

- Sawing equipment capable of sawing concrete to the specified depth.
- Scarifying equipment that is a power-operated, mechanical scarifier or grinder capable of removing at least 1/4 inch (6 mm) for each pass.
- Sandblasting equipment capable of removing rust scale from reinforcing steel, or removing small chips of concrete partially loosened by the scarifying or chipping operation, and of removing rehydrated dust left from scarification.
- Power driven hand tools for removal of unsound concrete are required that meet the following requirements:
- Pneumatic hammers weighing a nominal 35 lb (16 kg) 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.

- Vibratory screed for overlays, except as noted herein.

Construction Methods

Remove all existing asphalt overlays and all loose, disintegrated, unsound or contaminated concrete from the bridge deck and approach pavement in accordance with the following surface preparation classifications:

- **Class IA Surface Preparation:** Scarify and remove portland cement concrete from the concrete approach pavement to the depth shown on the plans to permit the construction of a 1¼ inch (32 mm) minimum depth overlay on the approach pavement to the limits shown on the plans. Transversely saw the existing concrete pavement to create a square construction joint for the overlay. Remove concrete in front of the sawed joint with power driven hand tools. Dispose of removed concrete and thoroughly clean the exposed scarified pavement surface.
- **Class IB Surface Preparation:** Scarify, or use other acceptable means, to remove all asphalt overlay from the existing bridge deck and, if applicable, the concrete approach pavement. Limits for this removal are the same as for Class I and, when applicable, Class IA Surface Preparation. Perform this work as a separate operation prior to the Class I or IA Surface Preparation and make sure the concrete surface is not removed.
- **Class I Surface Preparation:** Scarify and remove the entire concrete surface of the deck to a uniform depth of 1/2 inch (13 mm), remove and dispose concrete, and thoroughly clean the scarified surface. Perform Class I Surface Preparation before Class II or Class III. In areas where reinforcing steel is located in the 1/2 inch (13 mm) depth to be scarified, use another method with the Engineer's approval.
- **Class II Surface Preparation (Partial Depth):** Remove by chipping with hand tools all loose, unsound and contaminated deck concrete and in areas where reinforcing steel is exposed, by scarifying to an average depth of approximately one-half the deck thickness, but no less than 3/4 inch (19 mm) below the top mat of steel. Dispose of the removed concrete, clean, repair or replace rusted or loose reinforcing steel, and thoroughly clean the newly exposed surface.

When chipping, be careful not to cut, stretch, or damage any exposed reinforcing steel.

In overhangs, removing concrete areas of less than 0.60 ft²/ft (0.2 m²/m) length of bridge without overhang support is permitted unless the Engineer directs otherwise. For concrete areas greater than 0.60 ft²/ft (0.2 m²/m) length of bridge, approval of the overhang support is required.

Refill areas where concrete was removed with Class AA concrete up to the bottom of the proposed concrete overlay in accordance with Section 420 of the 2018 *Standard Specifications for Roads and Structures*. Any of the methods for curing Class AA

concrete as stated in the 2018 *Standard Specifications for Roads and Structures* are permitted except the membrane curing compound method.

Provide a raked finish to the surface of the Class AA concrete. Place the overlay course only after the Class AA concrete has attained 2500 psi (17.2 MPa) as measured by an approved, non-destructive test method.

Refilling the areas from which concrete has been removed with latex modified concrete during the Class I repair is permitted if any of the following conditions are met:

- The reinforcing steel cover is 1½ inches (38 mm) or less.
 - The area being repaired is less than 1 yd² (1 m²).
 - The Engineer directs the fill.
- Class III Surface Preparation (Full Depth): Remove full depth all loose, unsound and contaminated deck concrete. Thoroughly clean the routed out area and dispose of concrete removed. Clean, repair, or replace reinforcing bars and fill the areas from which unsound concrete has been removed with Class AA concrete up to the bottom of the proposed concrete overlay.

Clean or replace reinforcing bars and place Class AA concrete in accordance with the methods described under Class II Surface Preparation.

Provide a raked finish to the surface of the Class AA concrete. Place the overlay course only after the Class AA concrete has attained 2500 psi (17.2 MPa) as measured by an approved non-destructive test method.

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

Submit for approval detailed plans for Class III Surface Preparation. Detail how waste and debris is kept from falling below. When Class III repairs adjacent to the rail are necessary, support the rail in a manner approved by the Engineer.

General

After scarification, the Engineer locates and marks structural cracks. Remove all concrete within 2 inches (50 mm) each side of the crack by chipping to a minimum depth of ¾ inch (19 mm). When reinforcing steel is exposed, chip to a minimum depth of ¾ inch (19 mm) below the top mat of steel. Remove, chip, and dispose of the concrete, clean, repair, or replace reinforcing bars, and place Class AA concrete in accordance with the methods described under Class II or III Surface Preparation.

When concrete is removed under Class II or III Surface Preparation, provide 90° corners and vertical sides.

The Engineer determines the areas where concrete is to be removed under Class II or Class III Surface Preparation and inspects for delaminations by sounding with a chain drag.

Thoroughly clean exposed reinforcing steel by sandblasting. Remove bar sections that have lost 25% or more of their original section dimension and weld new, same-size bars in their place. Maintain 1½ inches (38 mm) cover of Class AA concrete over the reinforcing steel.

Provide a minimum overlay thickness of 1¼ inches (32 mm) and a final surface that is approximately ¾ inch (19 mm) higher than the original surface. Prior to placing the overlay, attach a 1¼ inch (32 mm) filler block to the bottom of the screed and pass it over the area to be repaired to check the thickness. Remove all concrete that the block does not clear.

Keep areas where unsound concrete has been removed free of slurry produced from wet sawing or scarifying by planning the work so that this slurry drains away from the completed area of preparation. Remove all slurry from prepared areas before placing any overlay. Sandblast the edge of previously placed lanes of overlayment. If necessary, use detergent followed by sand and air blasting to remove rust, oil, or other foreign materials detrimental to achieving bond.

LATEX MODIFIED CONCRETE

Description

This work consists of furnishing and placing an overlay of latex modified concrete over conventional existing concrete or repair concrete on bridge decks and approach pavement. Perform this work in accordance with this Special Provision and the applicable parts of the 2018 *Standard Specifications for Roads and Structures*. For material, equipment, and proportioning and mixing of modified compositions, see Section 1000-7 of the 2018 *Standard Specifications for Roads and Structures*.

Preparation of Surface

Completely clean all surfaces within 48 hours prior to placing the overlay unless otherwise approved.

Thoroughly soak the clean surface for at least 2 hours immediately prior to placing the latex modified concrete. After soaking the surface for at least 2 hours, cover it with a layer of white opaque polyethylene film that is at least 4 mils thick. Immediately prior to placing the latex modified concrete, remove standing water from the surface.

Placing and Finishing

Prior to placing modified material, install a bulkhead of easily compressible material at expansion joints to the required grade and profile. Placing material across expansion joints and sawing it later is not permitted.

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.

Separate screed rails and / or construction dams from the newly placed material by passing a pointing trowel along their inside face. Carefully make this trowel cut for the entire depth and length of rails or dams after the modified composition has sufficiently stiffened and cannot flow back.

Brush a latex cement mixture onto the wetted, prepared surface. Carefully give all vertical and horizontal surfaces a thorough, even coating and do not let the brushed material dry before it is covered with the additional material required for the final grade.

Construction joints other than those shown on the plans are not permitted.

When a tight, uniform surface is achieved and before the concrete becomes non-plastic, further finish the surface of the floor by burlap dragging or another acceptable method that produces an acceptable uniform surface texture.

Do not allow more than 15 feet of exposed latex concrete behind the screed. In the event of a delay of 10 minutes or more, temporarily cover all exposed latex concrete with wet burlap and white opaque polyethylene.

As soon as the surface supports burlap without deformations, cover the surface with a single layer of clean, wet burlap.

Do not place the latex modified concrete before the burlap is saturated and approved by the Engineer. Drain excess water from the wet burlap before placement.

Within 1 hour of covering with wet burlap, place a layer of 4 mil white opaque polyethylene film on the wet burlap and cure the surface for 48 hours. Then remove the curing material for an additional 96 hours air cure.

As soon as practical, after the concrete has hardened sufficiently, test the finished surface with an approved rolling straightedge that is designed, constructed, and adjusted so that it will accurately indicate or mark all floor areas which deviate from a plane surface by more than 1/8 inch in 10 feet. Remove all high areas in the hardened surface in excess of 1/8 inch in 10 feet with an approved grinding or cutting machine. Where variations are such that the corrections extend below the limits of the top layer of grout, seal the corrected surface with an approved sealing agent if required by the Engineer. If approved by the Engineer, correct low areas in an acceptable manner.

Unless otherwise indicated on the plans, groove the bridge floor in accordance with Article 420-14(B) of the 2018 *Standard Specifications for Roads and Structures*.

Limitations of Operations

The mixer is not permitted on the bridge deck unless otherwise approved.

No traffic is permitted on the finished latex modified concrete surface until the total specified curing time is completed and until the concrete reaches the minimum specified compressive strength.

Do not place latex modified concrete if the temperature of the concrete surface on which the overlay is to be placed is below 40° F or above 85° F. Measure the surface temperature by placing a thermometer under the insulation against the surface.

Prior to placing latex modified concrete, the Engineer determines the air temperature and wind speed. Do not place latex modified concrete if the ambient air temperature is below 45°F or above 85°F, or if the wind velocity is in excess of 10 mph. If working at night, provide approved lighting. Provide aggregates for use in the latex modified concrete that are free from ice, frost and frozen particles when introduced into the mixer.

Do not place latex modified concrete when the temperature of the latex modified concrete is below 45° F or above 85° F.

Do not place latex modified concrete if the National Weather Service predicts the air temperature at the site to be below 35° F during the next 72 hours. If this predicted air temperature is above 35° F but below 50° F, then use insulation to protect the latex modified concrete for a period of at least 48 hours.

Use insulation that meets the requirements of Subarticle 420-7(C) and, if required, place it on the latex modified concrete as soon as initial set permits.

When using insulation to protect latex modified concrete during the wet curing period, do not remove the insulation until the ambient air temperature is at least 40° F and rising. Leave the latex modified concrete uncovered for the 96 hour air curing period.

Assume all risks connected with the placement of latex modified concrete under cold weather conditions referred to above.

Stop all placement operations during periods of precipitation. Take adequate precautions to protect freshly placed latex modified concrete from sudden or unexpected precipitation. Keep an adequate quantity of protective coverings at the worksite to protect the freshly placed pavement from precipitation.

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 Contract Standards and Development Unit within the Technical Services 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 10 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 unless otherwise stipulated in the scope of work. 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. 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. The Design-Build Team shall inform the Design-Build Unit in writing of any proposed changes to the NCDOT preliminary designs, Technical Proposal and / or previously reviewed submittals and obtain approval prior to incorporation. 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 Design-Build Project I-5507 provides an eastbound and westbound express lane within the I-485 median from I-77 to US 74 (Independence Boulevard), a distance of approximately 16.6 miles. The project will also provide a new I-485 / Weddington Road interchange, and modifications to the I-485 / East Johns Street - Old Monroe Road interchange. The proposed improvements will include the design and construction of All-Electronic Toll (AET) toll zone facility infrastructure along the express lanes and Direct Connectors at Westinghouse Boulevard and Johnston Road. The North Carolina Turnpike Authority will procure a Toll System Integrator (TSI) to design, install, test, and operate all roadside toll AET equipment and technology components (antennas, cameras, cables, etc.).

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.
- **All-Electronic Toll (AET) Toll Zone Facilities Infrastructure** - design and construction of AET toll site infrastructure to support the toll collection system (toll technology components to be installed by others)
- **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**

The following project planning documents have been completed or are in process:

- The I-5507 Categorical Exclusion (CE) is anticipated to be approved in Spring 2018.
- The R-0211EC Environmental Assessment (EA) was approved in May 2007 and the R-0211EC Finding of No Significant Impact (FONSI) was approved in February 27, 2009.
- The U-4714 Environmental Assessment (EA) was approved in July 13, 2016 and the U-4714 Finding of No Significant Impact (FONSI) is anticipated to be approved in Summer 2018.

NCDOT is currently developing the I-5507 Categorical Exclusion (CE) and the U-4714 Finding of No Significant Impact (FONSI), which are anticipated to be completed in Spring 2018 and Summer 2018, respectively. It is important for Proposers to note, at this time, the proposed project remains in the environmental process and that final environmental approvals have not been secured. Additional alternatives, including a no-build alternative, are always considered in the environmental process, and it is possible that the project scope may need to be modified to comply with the environmental process, or that a no-build alternative may be adopted. Nothing contained in the RFP is intended to modify, limit, or otherwise constrain the environmental process or commit NCDOT to undertake any action with respect to the project.

Construction Engineering Inspection will be provided by the NCDOT Division personnel or will be performed under a separate contract.

GENERAL SCOPE

The scope of work for this project includes design, construction and management of the project. The design work will include all aspects to construct approximately 16.6 miles of an eastbound and westbound express lane within the I-485 median from I-77 to US 74 (Independence Boulevard). The project will also provide 1) a Direct Connector at Westinghouse Boulevard and Johnston Road, 2) an I-485 eastbound and westbound General Purpose Lane from Rea Road to Providence Road, 3) a new I-485 / Weddington Road interchange, 4) modifications to the I-485 / East Johns Street - Old Monroe Road interchange, and 5) an eastbound and westbound auxiliary lane between the new Weddington Road interchange and the modified East Johns Street - Old Monroe Road interchange. 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 and Price Proposal submission date or the Best and Final Offer submission date.

Unless noted otherwise elsewhere in this RFP, all documents referenced herein shall be the edition / version, including all interim revisions, effective on the Design-Build submittal date.

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 four-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:

- Permit Application
- Hydraulic Design
- Roadway Design
- Structure Design
- Geotechnical Engineering
- GeoEnvironmental Remediation
- Construction

Erosion and Sedimentation Control Design and Implementation
Lighting (Construction Only)
Utility Construction
R/W Utilities, Conflicts and / or Construction
Transportation Management Plan Design and Implementation
Pavement Marking Design
Foundation Design for Structures and Roadway
Signing Design
Traffic Signal Design
Design and Construction Management
Construction Surveying
Location and Surveys
Right of Way Acquisition
Public Information
Project Management
Subgrade Stabilization
Railroad Coordination
Intelligent Transportation Systems (ITS) Design
All-Electronic Tolling (AET) Toll Facilities Infrastructure Design

All designs shall be in Microstation format using Geopak software (current version used by the Department).

DESIGN AND CONSTRUCTION PERFORMED BY DESIGN-BUILD TEAM

The design work consists of the preparation of all construction documents for constructing approximately 16.6 miles of an eastbound and westbound express lane within the I-485 median from I-77 to US 74 (Independence Boulevard). The project will also provide 1) a Direct Connector at Westinghouse Boulevard and Johnston Road, 2) an I-485 eastbound and westbound General Purpose Lane from Rea Road to Providence Road, 3) a new I-485 / Weddington Road interchange, 4) modifications to the I-485 / East Johns Street - Old Monroe Road interchange, and 5) an eastbound and westbound auxiliary lane between the new Weddington Road interchange and the modified East Johns Street - Old Monroe Road interchange, 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 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 Technical and Price Proposal submittal deadline. Subcontractors need only be prequalified prior to performing the work. Design firms should be prequalified prior to the Technical and Price Proposal submittal deadline. If not prequalified at the time of the Technical and Price 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. Design firms and Natural Systems firms are prequalified by the particular office performing the work. If the work is to be performed by an office other than the one that is prequalified, that office shall be prequalified prior to any design submittals.

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. The Design-Build Project Manager for each short-listed team shall provide a list of team members that will require access to this portal. This list shall include the name, e-mail address and North Carolina Identity Management (NCID) for each individual team member. Once the list is complete, it shall be submitted to the Design-Build e-mail address (designbuild@ncdot.gov). No distribution of Provided Materials will be possible prior to this list being submitted and the access privileges established as noted herein.

To create an NCID account, each individual shall go to NCDOT's Connect website (<https://connect.ncdot.gov>) and click on the "How to get an Account" link and then, "Create NCID".

The Department will obtain access rights for these individuals and notify the Design-Build Project Manager accordingly. Individuals may then re-enter the "Connect" site and login with their NCID account. Once logged in, the Teamsite "I-5507 / R-0211EC / U-4714AB Project" 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 or their subcontractors shall restrict such person or persons from working on any of the Design-Build Team's contracted projects in which the person or persons were "formerly involved" while employed by the State. The restriction period shall be for the duration of the contracted project with which the person was involved. *Former Involvement* shall be defined as active participation in any of the following activities:

Drafting the contract
Defining the contract scope
Design-Build Team selection
Negotiation of the contract cost (including calculating manhours or fees); and
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 project, including but not limited to during the procurement phase. The Design-Build Team shall provide a list of all embedded personnel to the Department, and if necessary, provide the appropriate Confidentiality Agreement for each embedded employee, as well as their employer. The Design-Build Team shall submit the aforementioned list to Mr. Ronald Davenport, Jr., PE, State Contract Officer, within ten business days of the issuance of the First Industry Draft RFP and provide updated lists, as appropriate, throughout the project duration.

Failure to comply with the terms stated above in this section shall 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. The Department will only evaluate the maximum number of allowable pages noted below. Thus, the Department may 1) reject submissions that exceed the page limitations or 2) remove the page(s) that exceed the page limitations prior to evaluating the submission. The Department will notify the Proposer in writing of the reason(s) for the rejection or the details of the altered submission.

GENERAL

Technical and Price Proposals will be accepted until **4:00 p.m. Local Time on Tuesday, June 26, 2018**, at the office of the State Contract Officer:

Mr. Ronald Davenport, Jr., P.E.
Contract Standards and Development
1020 Birch Ridge Drive
Century Center Complex - Building B
Raleigh, NC 27610

No Proposals will be accepted after the time specified.

Proposals shall be submitted in two separate, sealed parcels containing the Technical Proposal in one and the Price Proposal in the other parcel.

TECHNICAL PROPOSAL – Hard Copies

Hard Copies of the Technical Proposals 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 C203970
TIP Number I-5507 / R-0211EC / U-4714AB
Mecklenburg County

I-485 from I-77 to US 74 (Independence Boulevard); I-485 / Weddington Road Interchange; and
I-485 / East John Street – Old Monroe Road Interchange

If delivered by mail, the sealed envelope shall be placed in another sealed envelope and the outer envelope addressed to the Contract Officer as stated in the Request for Proposals. The outer envelope shall also bear the statement "Technical Proposal for the Design-Build of State Highway Contract No. C203970".

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) 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 Davenport, Jr., P.E. shall include a statement acknowledging that the NCDOT may destroy all Technical Proposals not retained by the Department, **or** 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 Davenport, Jr., P.E., 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 shall be created by converting the original MicroStation / GeoPak files into PDF format. The electronic copy shall be scaled to reproduce to the appropriate page format, as defined above. 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 C203970
TIP Number I-5507 / R-0211EC / U-4714AB
Mecklenburg County

I-485 from I-77 to US 74 (Independence Boulevard); I-485 / Weddington Road Interchange; and
I-485 / East John Street – Old Monroe Road Interchange

If delivered by mail, the sealed envelope shall be placed in another sealed envelope and the outer envelope addressed to the Contract Officer as stated in the Request for Proposals. The outer envelope shall also bear the statement "Technical Proposal for the Design-Build of State Highway Contract No. C203970"

PRICE PROPOSAL

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 C203970
TIP Number I-5507 / R-0211EC / U-4714AB
Mecklenburg County

I-485 from I-77 to US 74 (Independence Boulevard); I-485 / Weddington Road Interchange; and
I-485 / East John Street – Old Monroe Road Interchange)

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.

If delivered by mail, the sealed envelope shall be placed in another sealed envelope and the outer envelope addressed to the Contract Officer as stated in the Request for Proposals. The outer

envelope shall also bear the statement "Price Proposal for the Design-Build of State Highway Contract No. C203970".

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	8
2. Responsiveness to Request for Proposal	30
3. Long Term Maintenance	5
4. Schedule and Milestones	30
5. Innovation	7
6. Maintenance of Traffic and Safety Plan	15
7. Oral Interview	5

TECHNICAL PROPOSAL EVALUATION CRITERIA

1. Management – 8 points

Provide a comprehensive Organizational Chart that identifies the design, quality and construction management, and the relationships with subconsultants / subcontractors. The 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 Structure Plans (Direct Connector Flyover Structures and components), Intelligent Transportation System (ITS), All-Electronic Tolling (AET) Toll Zone Facilities Infrastructure, Signing Plans, ITS & Signal Plans, Signal System Timing Plans, Pavement Marking Plans, and Transportation Management 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.
- If applicable, list projects, including description and similarity to the subject project, the Design-Build Team's designer(s) have developed straddle bent designs.

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.
- Detail the number of inspectors the Design-Build Team expects the Department to furnish, during various phases, to allow satisfactory progress of project construction.
- 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.

Construction Management

- 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.
- Provide a brief narrative of the Design-Build Team's proposed plan for performing construction. This 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 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.
 - Describe the Design-Build Team's plans and procedures to insure timely deliveries of materials to achieve the project schedule.

- Describe the Design-Build Team's approach to site access and material staging.

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, surface waters, 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 and the Team's comfort level with obtaining the required permits within the allowed timeframe.
- Identify methods of construction in wetlands, streams, and surface waters.
- 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.
- Describe efforts to minimize excavation within the contaminated sites and associated disturbance to underlying soil.
- 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.
- Show mainline typical sections.
- Specify the mainline pavement Alternate chosen. The pavement Alternate chosen for the mainline will not be a part of the Technical proposal evaluation and the selection thereof will not impact the technical scores; although an alternate pavement design as, approved as an ATC, may be considered in the evaluation.
- Specify the proposed mainline subgrade stabilization, or combination, with approximate limits of each type.
- If applicable, specify where all underlying longitudinal joints will be located and demonstrate how these underlying longitudinal joint locations will minimize reflective cracking.
- Indicate how longitudinal joints will be located on a lane line or lane midpoint.
- Identify proposed deviations to the preliminary design provided by the Department.
- Identify drainage modifications and designs to be implemented.
- Identify all hydraulically deficient storm drainage systems and the proposed mitigation on the plans.

- 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.
- 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.
- Identify all bridge types / components to be constructed, including any special design features or construction techniques needed.
- Specify the material proposed for all integral bents and straddle bents
- If applicable, specify the extent of impacts to properties with contaminated soils, indicating the anticipated contamination excavation limits.
- Identify the appropriate design criteria for each feature, if not provided herein.
- Identify any deviations, including proposed design exceptions, from the established design criteria that will be utilized. Explain why the deviation is necessary.
- 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 Scope of Work.
- 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.
- Identify the months the Department should schedule the interagency hydraulic design review meeting and interagency permit impacts meeting.
- Describe how the design will affect the Department's right of way costs.
- Identify types of any retaining walls and / or sound barrier walls, if applicable.

3. Long Term Maintenance – 5 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 – 30 points

- 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 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.

- 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"**.

5. Innovation – 7 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 – 15 points

Maintenance of Traffic

- Provide a Transportation Management Phasing Concept (TMPC).
- 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.
- Specifically describe how business, school and residential access will be maintained, if applicable.
- Identify any self-imposed liquidated damages and associated Intermediate Contract Time(s), 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.
- If a temporary portable barrier system will be utilized, provide the type and why it is needed.
- Identify the type of I-485 positive median cross-over protection proposed and replacement / resetting requirements.
- 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 the need for a Work Zone Speed Limit Reduction Ordinance.
- Identify the need for a Speeding Penalty Ordinance.
- Describe the Design-Build Team's approach to providing the public with communication access to project personnel to inquire as to traffic impacts, including vehicular and pedestrian.
- 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 10 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 3 year guarantee, as outlined in the *Three-Year 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 Three-Year Guarantee. The warranties and / or guarantees shall also define how disputes will be handled. Prior to the first partial payment, the Design-Build Team shall submit a document that provides additional warranty / guarantee specifics in sufficient detail that allows the document to be made a part of the contract through supplemental agreement.

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 proposals are responsive to the requirements of the Request for Proposals. 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 will 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 Proposal score for each Design-Build Team to the State Contract Officer.

Quality Credit Evaluation Factors for Technical Proposals

Management	8
Responsiveness to Request for Proposal	30
Long Term Maintenance	5
Schedule and Milestones	30
Innovation	7
Maintenance of Traffic and Safety Plan	15
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 proposal based on the proposal's overall Technical Score. The maximum quality credit percentage for this project will be **30%**. 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	30.00	84	14.00
99	29.00	83	13.00
98	28.00	82	12.00
97	27.00	81	11.00
96	26.00	80	10.00
95	25.00	79	9.00
94	24.00	78	8.00
93	23.00	77	7.00
92	22.00	76	6.00
91	21.00	75	5.00
90	20.00	74	4.00
89	19.00	73	3.00
88	18.00	72	2.00
87	17.00	71	1.00
86	16.00	70	0.00
85	15.00		

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 Proposals are rejected 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	25.00	3,000,000	750,000	2,250,000
B	90	20.00	2,900,000	580,000	2,320,000
C *	90	20.00	2,800,000	560,000	2,240,000
D	80	10.00	2,700,000	270,000	2,430,000
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 contain that Team's score only.

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 Proposal, Technical Score and Adjusted Price 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 to not 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 of 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 their Technical Proposal details. 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 total 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 **\$150,000** 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 award of the contract 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 Design-Build Proposal submittal date current at the time of the suspension, no stipulated fee will be paid.

ROADWAY SCOPE OF WORK (1-12-17)

It should be noted that TIP Project, I-5507, as referenced throughout this Request for Proposals (RFP), represents TIP Project I-5507, R-0211EC and U-4714AB. All references to TIP Projects I-5507, R-0211EC and U-4714 in material provided by the Department shall apply to this project.

Throughout this RFP, references to the Design Map shall denote the I-5507 / R-0211EC / U-4714AB Design Map.

Project Details

- The Design-Build Team shall design and construct an eastbound and westbound express lane within the I-485 median from I-77 to US 74 (Independence Boulevard). Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall design and construct the -L- Line providing the same or better access, widening, improvements and traffic measures of effectiveness, in the Department's sole discretion, included in the Design Map provided by the Department. The limits of -L- Line construction shall be of sufficient length to tie to existing based upon the current NCDOT guidelines and standards. The -L- Line shall be designed and constructed to meet a 75-mph design speed for a rolling urban freeway designed to interstate standards. The Design-Build Team shall provide all other design criteria in the Technical Proposal.
- Excluding the section of I-485 constructed under TIP Project R-4902, the Design-Build Team shall design and construct minimum 12-foot outside shoulders, ten-foot of which shall be full depth paved shoulders along the -L- Line including all acceleration, deceleration and auxiliary lanes, and ramps / loops / Direct Connections to the back of the gore (12-foot width). Within the section of I-485 constructed under TIP Project R-4902, the Design-Build Team shall not reduce the existing -L- Line outside shoulder width, including but not limited to the paved shoulder width. (Reference the Pavement Management Scope of Work found elsewhere in this RFP)
- The Design-Build Team shall design and construct the I-485 / Rea Road interchange Loop A and Loop C acceleration lengths to meet a 75 mph design speed.
- Along the -L- Line, the Design-Build Team shall design and construct a full depth paved median at the minimum widths shown on the Design Map. The Design-Build Team shall design and construct Type "T" double-faced concrete median barrier on the aforementioned full depth median pavement.
- Along the -L- Line, the Design-Build Team shall design and construct a delineation area between the express lane and the general purpose lanes at the minimum widths shown on the Design Map. The Design-Build Team may shift the express lane entry and exit points a maximum of 500 feet, in either direction, from the locations shown on the Design Map.
- The Design-Build Team shall design and construct a minimum 550-foot long exclusive northbound left turn on East Westinghouse Boulevard that access Old Nations Ford Road.

- The Design-Build Team shall design and construct observation and enforcement areas that adhere to the design parameters in the December 1, 2016 Concept Plan for *I-5507 Observation and Enforcement Areas Memorandum*. West of Rae Road, the Design-Build Team shall not overlap any portion of the eastbound and westbound observation and enforcement areas. The Design Build Team shall design and construct observation and enforcement areas at the following locations:
 - I-485 Eastbound
 - AET 1.2 - The observation area shall be 100 feet beyond the tolling point. The enforcement area shall be between Westinghouse Boulevard and NC 51 / Pineville-Matthews Road.
 - AET 2.2 – The observation area shall be 100 feet beyond the tolling point. The enforcement area shall be within the wider median shoulder section east of Rea Road.
 - AET 3.2 – The observation area shall be 100 feet beyond the tolling point. The enforcement area shall be immediately beyond the observation area, between Providence Road and Weddington Road.
 - I-485 Westbound
 - AET 3.1 – The observation area shall be 100 feet beyond the tolling point. The enforcement area shall be immediately beyond the observation area, between John Street and Weddington Road.
 - AET 2.1 – The observation area shall be 100 feet beyond the tolling point located west of the Ballantyne Commons Parkway overpass. The enforcement area shall be immediately beyond the observation area, east of the Rea Road interchange.
 - AET 1.1 – The observation area shall be 100 feet beyond the tolling point. The enforcement area shall be immediately beyond the observation area, between Johnston Road and NC 51 / Pineville-Matthews Road
- Along Weddington Road, the Design-Build Team shall design and construct a four-lane curb and gutter facility, with 12-foot inside lanes and 14-foot outside lanes, to accommodate bicycles. The Design-Build Team shall design and construct ten-foot berms with five-foot sidewalks on both sides of Weddington Road.
- The Design-Build Team shall coordinate with Projects U-4714A and U-4714B design and construction to ensure accurate hydrology, capacity, and horizontal and vertical ties that adhere to the design criteria. The Design-Build Team shall not make any design or construction revisions that impact the design or construction of projects U-4714A and U-4714B without prior written approval from the Design-Build Unit (Reference the *Cooperation Between Contractors* Project Special Provision found elsewhere in this RFP).

- Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall design and construct -Y- Lines, ramps, loops and Direct Connections providing the same or better access, widening, improvements and traffic measures of effectiveness, in the Department's sole discretion, included in the Design Map provided by the Department. The limits of -Y- Line construction shall be of sufficient length to tie to existing based upon the current NCDOT guidelines and standards.
- The Design-Build Team shall design and construct all -Y- Lines such that the through movement is not required to change lanes throughout the limits of construction.
- Excluding Direct Connectors, the Design-Build Team shall design and construct one-lane ramps that provide a minimum 16-foot lane width, and two lane ramps that provide minimum 12-foot lanes. Excluding Direct Connectors, 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 Direct Connectors in accordance with the requirements noted below:
 - At East Westinghouse Boulevard, a two-lane / two-way Direct Connector shall be designed and constructed with minimum 16-foot lanes and 14-foot outside shoulders, 12-foot of which shall be full depth paved shoulders. The lanes shall be separated by a minimum eight-foot full depth paved shoulder and appropriate double-face concrete barrier of sufficient height to provide a glare screen. The bridge section shall be designed and constructed with 12-foot bridge rail offsets.
 - At Johnston Road, the eastbound Direct Connector (-Y2DCC-) shall be designed and constructed with 1) a minimum 16-foot lane, 2) a 14-foot outside shoulders, four-foot of which shall be full depth paved shoulder, and 3) a 12-foot inside shoulder, four-foot of which shall be full depth paved shoulder. The bridge section shall be designed and constructed with 12-foot bridge rail offsets.
 - At Johnston Road, the westbound Direct Connector (-Y2DCD-) shall be designed and constructed with 1) a minimum 16-foot lane, 2) a 14-foot outside shoulder, 12-foot of which shall be full depth paved shoulder, and 3) a 12-foot inside shoulder, four-foot of which shall be full depth paved shoulder. The bridge section shall be designed and constructed with a 12-foot inside bridge rail offset and a four-foot outside bridge rail offset.
 - The minimum design speed for all Direct Connectors shall adhere to the middle range design speed noted in Table 10-1, *Guide Values for Ramp Design Speed as Related to Highway Design Speed* shown in AASHTO's *A Policy on Geometric Design of Highways and Streets* (2011).

- The 0.06 Maximum Superelevation Table in AASHTO's *A Policy on Geometric Design of Highways and Streets* (2011) shall be used for all Direct Connectors.
- The Design-Build Team shall design and construct loops that adhere to Table 3-29, *Design Widths of Pavements for Turning Roadways*, shown in AASHTO's *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.
- Excluding transitions required to tie to existing and steeper cross slopes (0.025 maximum) required to eliminate hydroplaning, the I-485 normal crown cross slope shall be 0.02. The I-485 crown point shall be located such that the express lane, the delineation area, and the inside general purpose lane, in each direction of travel, slope towards the median, and the remaining lanes slope towards the outside.
- Unless allowed otherwise elsewhere in this RFP, the Design-Build Team shall design and construct at-grade intersections with the lane configurations noted in the *I-485 Express Lanes Traffic Operations Technical Memorandum*, the August 31, 2007 *R-0211EC – Capacity Analysis of Roadway Plans Memorandum*, and the July 2015 *U-4714 Build Traffic Operations Technical Memorandum* provided by the Department. 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 aforementioned Memorandums provided by the Department shall adhere to the NCDOT Recommended Treatment for Turn Lanes, as defined in the NCDOT *Roadway Design Manual - Section 9-1, Figures F-4A and F-4B*. These lengths shall be determined by adding the storage length defined in the aforementioned Memorandums 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 Roadway Design Manual (Reference Section 9-1, Figure F-4C).
- The Design-Build Team shall design and construct all diverging diamond interchanges (DDI), in accordance with the requirements noted below:
 - Between and through the DDI crossovers, the Design-Build Team shall design and construct lane widths that accommodate a WB-67; however, the minimum lane width between and through the DDI crossovers shall be 15 feet. All approach / departure lanes

to / from the crossovers shall be tapered to the crossover lane-width prior to entering / after exiting the curve approaching / departing the crossover.

- The Design-Build Team shall design and construct lane widths for all spurs (right and left turn movements from / to the ramps) that accommodate a WB-67; however, the minimum spur lane width shall be 15 feet. All approach / departure ramp lanes to / from the spurs shall be tapered to the spur lane width prior to entering / after exiting the spur. Regardless of the spur lane width, all spur alignments shall be located 15 feet from the outside edge of travel lane.
- The four ramp channelization islands shall be raised grass islands bordered with 2'-6" curb and gutter. Within the aforementioned ramp channelization islands, the Design-Build Team shall provide a minimum five-foot wide pedestrian accommodation that accesses the pedestrian median accommodation noted below.
- Between the DDI crossovers, the Design-Build Team shall provide a minimum ten-foot wide pedestrian accommodation within the -Y- Line median. Along both sides of the aforementioned ten-foot pedestrian accommodation, the Design-Build Team shall provide barrier (2'-6" concrete dual flat-faced barrier with metal handrail and no glare screen) that extends a minimum of 42" above the walking surface. The barrier shall meet AASHTO Manual for Assessing Safety Hardware, TL-2 crash test requirements and terminate with a ten-foot taper that reduces the barrier height to 2'-3". Excluding within the aforementioned ten-foot taper, the handrail shall be installed in accordance with the 10-30-2013 Proposed Pedestrian Safety Rail Detail provided by the Department.
- The curves approaching / departing the crossovers shall slope from the median to the outside at a 0.02 cross slope.
- For all intersection / interchange 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. For the aforementioned traffic analysis, the Design-Build Team shall use the highest design year build condition traffic volume for each movement.
- I-485 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 shown on the Design Map provided by the Department. The proposed right of way and / or control of access limits may deviate in proximity to cultural, historic, or otherwise protected landmarks, including cemeteries, to eliminate / minimize impacts. Prior to negotiating right of way, easement and / or control of access with property owners, the Design-Build Team shall delineate the proposed acquisitions on the Right of Way Plans developed by the Design-Build Team for the Department's review and acceptance.
- 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 woven wire 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 remove and dispose of all existing control of access fence, and install new control of access fence.
- The Design-Build Team shall replace all control of access fence damaged during construction.
- The Design-Build Team shall install all missing control of access fence.
- The Department will provide approved Interchange Access Reports (IAR) for I-5507 and U-4714AB (TIP Project R-0211EC does not require an IAR). If the Design-Build Team revises the roadway design such that the approved I-5507 IAR and / or U-4714AB IAR are nullified, the Design-Build Team shall re-analyze the interchange(s) and complete a revised I-5507 IAR and / or U-4714AB IAR, if 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 Design Map provided by the Department. Unless approved otherwise by the Department in writing, the Design-Build Team shall not acquire right of way, easements or control of access from the aforementioned features unless shown on the Design Map provided by the Department.
- The Design-Build Team shall design and construct all retaining walls a minimum of ten-foot inside the right of way.
- The Design-Build Team shall provide milled rumble strips along the mainline outside and median paved shoulders, including ramp and loop terminals, Direct Connections, and acceleration, deceleration and auxiliary lanes, in accordance with the 2018 NCDOT *Roadway Standard Drawings*.
- 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 adheres 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.
- Throughout construction areas that consist solely of pavement marking obliterations / revisions, the Design-Build Team shall provide a uniform overlay or design and construct a resurfacing grade. Excluding construction areas that consist solely of pavement marking

obliterations / revisions that are uniformly overlaid and haul roads, the Design-Build Team shall design and construct resurfacing grades for all roadways impacted by construction. All uniform overlays and resurfacing grades shall completely cover the entire pavement surface (travel lanes and paved shoulders). 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.
- The Design-Build Team shall resurface each one-way roadway of a divided facility throughout the limits of the one-way roadway widening and construction, allowing varying resurfacing limits for the opposing directions of travel.
- 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 any gaps along the facility where construction activities are not required.
- The Design-Build Team shall provide turn-arounds on all roads that are dead-ended.
- Excluding the changes 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 Design Map 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 shall 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.

The proposed design revisions noted above shall be subject to the Department’s review and acceptance.

- The Department prefers not to have design exceptions for the -L- Line or -Y- Lines. Excluding locations where bridge piers, concrete barrier, overhead sign assemblies, express lane entry points or express lane exit points reduce the median shoulder width to less than ten feet, design exceptions will not be allowed for the -L- Line, including all ramps, loops and Direct Connections. Design exceptions will not be approved for mainline median shoulder widths less than four feet wide. 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 Final Plans, the Design-Build Team must obtain prior conceptual approval from the Design-Build Unit and the FHWA. If conceptual approval is obtained, the Design-Build Team shall be responsible for the development and approval of all design exceptions.
- Prior to recording the Right of Way Plans, the Design-Build Team shall locate and install right of way markers that delineate the proposed right of way for all parcels within the project limits. The Design-Build Team will be allowed to temporarily delineate the aforementioned proposed right of way with temporary metal caps and fiberglass markers prior to recording the Right of Way Plans. However, prior to final project acceptance, the Design-Build Team shall locate and install concrete right of way markers to delineate the aforementioned proposed right of way. The Design-Build Team shall remove and dispose of all metal caps and fiberglass markers used to temporarily delineate the proposed right of way. For all parcels, the Design-Build Team shall locate and install metal caps with fiberglass markers that delineate all proposed permanent easements within the project limits. The Design-Build Team shall replace all existing right of way and permanent easement markers / monuments damaged and / or relocated during construction. In accordance with NCDOT Policy, the Department will furnish the metal caps with fiberglass markers.
- The Department will provide an approved Traffic Noise Report (TNR) and associated Preliminary Noise Wall Recommendation Memorandum that is based on the Department's preliminary design. Post Award, the Design-Build Team shall evaluate the **entire** I-5507 / R-0211EC / U-4514AB project and develop the Design Noise Report (DNR) based on the plans developed by the Design-Build Team, regardless of changes to the Department's preliminary design. 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. 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. Prequalification under Discipline Code 441 shall be required for the firm developing the DNR.

The Design-Build Team is cautioned that the TNR and Preliminary Noise Wall Recommendation Memorandum are provided to show the general location of potential walls. Thus, as with all information provided by the Department, the TNR and Preliminary Noise Wall Recommendation Memorandum are provided for informational purposes only and should not be used for bid purposes.

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 shall not construct any sound barrier walls until the balloting process has been completed by the Department.

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 all sound barrier walls, the Design-Build Team shall provide 1) a minimum 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.

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 allowed otherwise elsewhere in this RFP, the design shall be in accordance with the 2011 AASHTO *A Policy on Geometric Design of Highways and Streets*, and 2013 *Errata*, 2002 NCDOT *Roadway Design Manual*, including all revisions effective on the Technical Proposal submittal date, 2018 NCDOT *Roadway Standard Drawings*, or as superseded by detail sheets located at <https://connect.ncdot.gov/resources/Specifications/Pages/2018-Roadway-Drawings.aspx>, *Roadway Design Policy and Procedure Manual*, *Roadway Design Guidelines for Design-Build Projects*, 2018 NCDOT *Standard Specifications for Roads and Structures* and the 2011 AASHTO *Roadside Design Guide*, 4th Edition and 2015 *Errata*.
- If the NCDOT *Roadway Design Manual*, including all revisions, the 2011 AASHTO *A Policy on Geometric Design of Highways and Streets* and 2013 *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.

- 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, the Design-Build Team shall design and construct bridge rail offsets as indicated in the NCDOT *Roadway Design Manual* or that are equal to the approach roadway paved shoulders, whichever is greater. 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.
- Unless noted otherwise elsewhere in this RFP, the maximum allowable cut and fill slope shall be 2:1. (Reference the Geotechnical 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 web site.
- 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, removal of the existing embankments supporting all removed roadway sections.
- Unless noted otherwise elsewhere in this RFP, all guardrail / guiderail placement shall be in accordance with the 2018 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. The guardrail / guiderail design shall be submitted for review with the Preliminary 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.
- 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.
- The Design-Build Team shall submit Structure Recommendations and Design Criteria for NCDOT review and acceptance prior to the Preliminary Roadway Plans submittal. The Design-Build Team shall develop Structure Recommendations that adhere to the format noted in the March 25, 2003 and September 1, 2004 memos from Mr. Jay Bennett, PE, former State Roadway Design Engineer.
- 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 2011 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 Statutes mandate the speed limit as 55 mph, resulting in a 60 mph design speed.
- Within the vehicle recovery area, the Design-Build Team shall design and construct single face concrete barrier in front of all sound barrier walls, retaining walls, and all elements acting as retaining walls located on the outside shoulder. 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.
- At all -Y- Line / -Y- Line intersection radius points, including service roads, the minimum -Y- Line pavement width shall be 30 feet.
- 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-67 for the outside movement only and SU-30 for inside movement)
- 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 roundabouts, the Design-Build Team shall

provide a traffic analysis of the proposed roundabout(s) utilizing the highest design year build condition traffic volume for each movement, and SIDRA Intersection 5.1 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.
 - 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 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 five-inch keyed-in monolithic concrete islands for all roundabout approach / departure channelization islands, including the chicane islands.
 - When two or more roundabouts are located along a facility and separated by less than 800' (measured center to center along the facility), the Design-Build Team shall design and construct a minimum four-foot wide concrete median island with nine-inch offsets to each adjacent travel lane along the facility 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 10-foot berm or minimum four-foot full depth paved shoulders. The 2'-6" curb and gutter or four-foot full depth paved shoulder shall extend along all approach / departing roadways to the approach / departing curve radius point. At a minimum, the Design-Build Team shall design and construct minimum four-foot full-depth paved shoulders through the limits of the chicanes.
 - The Design-Build Team shall design and construct minimum 18-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 Design-Build Team shall design and construct 2'-6" curb and gutter 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. (Reference Roadway Standard Drawing No. 852.01)

- The minimum width of all grass covered islands / raised medians shall be eight feet, measured face to face from the surrounding mountable concrete curb and gutter or from edge of pavement to edge of pavement, as appropriate. All grass covered islands shall be 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 islands and / or raised 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 island 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 travelway.
- A sag vertical curve low point will not be allowed on any proposed bridge or approach slab.
- Excluding grades required to tie to existing, the minimum longitudinal grade shall be 0.30%.
- 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.
- 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 that 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.
 - Excluding grades required to tie to existing, the maximum driveway grade shall be 10%.
 - 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 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.
- Shoulder berm gutter shall not be installed in cut sections.
- At all locations with paved shoulders that extend beyond the typical width (i.e. to the face of single face barrier and 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)
- 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-5507 Categorical Exclusion (CE), R-0211EC Environmental Assessment (EA), R-0211EC Finding of No Significant Impact (FONSI), U-4714 EA, U-4714 FONSI, and 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. 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-5507 / R-0211EC / U-4714AB Design Map developed by the Department. The Design-Build Team is cautioned that the preliminary designs shown on this Map 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 the I-5507 / R-0211EC / U-4714AB electronic design files.
- The NCDOT will provide final pavement designs for I-5507 / R-0211EC / U-4714AB. 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-5507 / R-0211EC / U-4714AB. 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)

STRUCTURES SCOPE OF WORK (10-7-16)**Project Details**

The Design-Build Team shall be responsible for all structures necessary to complete the project, including but not limited to, the following:

- Direct Connector at Westinghouse Boulevard
- Direct Connector at Johnston Road
- Direct Connector Flyover at Johnston Road
- All reinforced concrete box culverts / reinforced concrete box culvert extensions 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 retaining walls required by the Design-Build Team's design

The Design-Build Team shall design, dispose of, and replace the following existing structures:

- Bridge No. 644 - SR 3649 (Elm Lane) over I-485
- Bridge No. 682 - SR 3626 (Ballantyne Commons Parkway) over I-485

In accordance with the *Asbestos Assessment for Bridge Demolition and Renovation Activities* Project Special Provision located on the Structures Management Unit's website, the Design-Build Team is cautioned that all the aforementioned bridges require an asbestos survey / inspection prior to demolition.

The Design-Build Team is cautioned that all the aforementioned bridges may be coated with red lead paint. In accordance with the 2018 NCDOT *Standard Specifications for Roads and Structures*, the Design-Build Team shall handle, remove, ship, and dispose of all red lead painted elements.

The Design-Build Team shall remove and dispose of the aforementioned structures in accordance with the 2018 NCDOT *Standard Specifications for Roads and Structures*.

The Design-Build Team shall widen and rehabilitate, as noted herein, the following structures:

- Bridge Nos. 640 and 641 - I-485 over SR 1128 (Westinghouse Boulevard)
- Bridge Nos. 670 and 671 - I-485 over McMullen Creek
- Bridge Nos. 672 and 673 - I-485 over McAlpine Creek
- Bridge Nos. 743 and 744 - I-485 over SR 3445 (Tilley Morris Road)
- Bridge No. 715 – SR 3468 (Weddington Road) over I-485
- Bridge Nos. 800 and 801 - I-485 westbound / eastbound over SR 1009 (East John Street / Old Monroe Road)
- Bridge Nos. 802 and 803 - I-485 westbound / eastbound over CSX Railroad (widen only)

The Design-Build Team shall design and construct approach slabs that adhere to the requirements noted below:

- All approach slabs constructed adjacent to an existing approach slab shall be designed and constructed to the length of the existing approach slab.
- All approach slabs that are not constructed adjacent to an existing approach slab shall be designed and constructed to adhere to the Department's current approach slab length requirements.
- In accordance with the Department's current approach slab length requirements, the Design-Build Team shall remove, dispose of, and replace both approach slabs at the existing structures noted below:
 - Bridge Nos. 743 & 744 - I-485 over SR 3445 (Tilley Morris Road)
 - Bridge Nos. 802 & 803 - I-485 Westbound / Eastbound over CSX Railroad (Outer)
- High early strength concrete shall not be used for any approach slab.
- During temporary traffic configurations only, a temporary asphalt approach slab may be utilized for widened bridges.

All bridges shall meet approved roadway typical sections and grades. Bridge geometry (width, length, skew, span arrangement, etc.) shall be in accordance with the accepted Structure Recommendations and / or the accepted Hydraulic Bridge Survey Reports prepared by the Design-Build Team.

The minimum vertical clearance for bridges constructed over all interstates, freeways, and arterials shall be 17'-0". The minimum vertical clearance for bridges constructed over all local roads and collector roads shall be 15'-6".

For minimum horizontal and vertical clearance requirements for bridges constructed over the CSX Transportation Railroad, reference the Railroad Coordination Scope of Work found elsewhere in this RFP.

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 and shall be 12'-0" for bridges over local roads and collector roads. Bridges over waterways shall be designed and constructed with spill through slopes. End bents and end slopes at each end of a bridge shall have the same appearance.

A live load rating chart for both existing and proposed girders shall be included with the bridge plans; and shall state design assumptions and methodology used in the load rating calculations. Regardless of the rating, existing girders will not need to be replaced. The load rating shall be in accordance with the NCDOT *Structures Management Unit Manual*, including Policy Memos, and the latest edition of the AASHTO's *Manual for Bridge Evaluation*.

The Design-Build Team shall obtain Structure Numbers from NCDOT for all new bridges. For existing and proposed bridges, the Design-Build Team shall include Structure Numbers on the applicable design layout sheets, all plans, and all correspondence with NCDOT pertaining to bridge work.

The Design-Build Team shall design and construct corrosion protection measures and minimum concrete cover that satisfies the requirements of the NCDOT *Structures Management Unit Manual*.

Mechanically Stabilized Earth (MSE) walls shall not be allowed for any structural bridge foundations and shall not be subjected to vertical loads.

The Design-Build Team shall design and construct bridges to have a minimum of 1'-6" overburden (cover) on tops of bridge substructure footings.

Unless noted otherwise elsewhere in this RFP, all bridge barrier rail shall adhere to the following requirements:

- All bridge barrier rail for new structures shall adhere to Standard Drawing CBR1
- Excluding Bridge No. 715, all bridge barrier rail that requires replacement solely due to bridge widening shall adhere to Standard Drawing CBR1.
- Bridge barrier rail for Bridge No. 715 shall adhere to Standard Drawings BMR5, BMR6 and BMR 7
- All bridge barrier rail for bridges that are replaced shall be equivalent to the existing bridge barrier rail.

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 barrier rails
- Empirical method for deck design
- Precast reinforced concrete box culverts, including but not limited to extensions
- Metal plate arch culverts
- Interior pile bents at roadway grade separations
- Monotube or cantilever DMS (if required on project) support structures
- Bridge attachments (e.g. ITS conduit, waterlines) in the overhang of bridge structures
- Casting of conduit in the bridge deck or barrier rail for roadway bridges
- Bridge piers adjacent to a roadway shoulder, excluding interior median piers
- Modular expansion joints
- Attachment of sign structures to bridges

New Bridges

All new bridge structures shall be designed and constructed to achieve a minimum design service life of 75 years.

The number of expansion joints for each structure shall be kept to a minimum. Structures shall be integral if the criteria listed in the NCDOT *Structures Management Unit Manual* is met. When required by the criteria in Section 6.2.3.2 of the NCDOT *Structures Management Unit Manual*, the Design-Build Team shall use expansion joints, except Bullets 3 and 4 in the aforementioned Section shall apply to all roadways.

For the design of the Direct Connector Flyover Structure, the bridge type / components will not be restricted to those typically used by NCDOT. If the Design-Build Team proposes a bridge type / components that are not typically used by NCDOT, the Design-Build Team shall list previous projects, including the description and similarity to the proposed bridge type / components, that were designed and constructed by the Design-Build Team in the Technical Proposal. The Design-Build Team will only be allowed to use bridge types / components that are not typically used by NCDOT if all the following items are achieved:

- The bridge type and / or components have been accepted for general use by the Federal Highway Administration (FHWA).
- The Design-Build Team can demonstrate, in the Department's sole discretion, that the bridge and component designs meet the functional requirements of the project.
- The Design-Build Team can demonstrate their successful experience in the design and construction of the proposed bridge type and / or components.

If the Design-Build Team elects to use box girders, the Design-Build Team shall design and construct box girders that are accessible for all inspection and maintenance activities without impacting traffic. The Design-Build Team shall size the inside steel depth, cast-in-place concrete or concrete segmental box girders with due consideration to interior inspection.

Bridges with concrete segmental box girders shall adhere to the AASHTO *Guide Specifications for Design and Construction of Segmental Bridges* requirements and the following requirements:

- If monolithically cast overlay is used as part of the deck protection system, fully engineered design guidelines shall be developed for the thickness of the monolithic concrete removed and replaced in a manner that keeps distress and changes in surface profile at the time of concrete removal to levels that do not reduce the structural integrity of the structure.
- All expansion joints shall be sealed or drained such that no water or contaminants penetrate the joints.
- The design, details and construction of segmental bridges shall provide for the addition of supplemental post-tensioning. AASHTO LRFD Bridge Design Specifications Article 5.14.2.3.8 shall apply and Diablos will not be permitted.

The Department prefers prestressed concrete for the design and construction of integral bents and straddle bents. The Design-Build Team shall design and construct integral bents and straddle bents that adhere to the following requirements:

- If the Design-Build Team elects to use concrete, the use of post-tensioning will be allowed in the pier caps.
- If the Design-Build Team elects to use steel pier caps, the Design-Build Team shall adhere to the following requirements:
 1. Stiffeners shall not be allowed on the outside of the cap.
 2. Single steel plate caps shall not be allowed.
 3. Provide an access opening for internal inspection of the bent with a minimum opening of 32" wide by 42" tall. The opening shall be properly weather-proofed to

prevent the infiltration of water and elements that may increase the potential for corrosion or other degradation.

- a. The hatch shall be sealed with a closed cell neoprene sponge material.
 - b. The hatch shall be positively secured with a latch that is accessible from both inside and outside the straddle-bent.
 - c. The hatch shall be lockable from the outside with a weather-proof lock.
- A bearing between the straddle bent pier cap and the supporting column(s) shall be provided.

If a straddle bent is proposed, the Design-Build Team shall demonstrate their successful experience in the design and construction of the type of straddle bent proposed. If the Design-Build Team proposes a straddle bent, the Design-Build Team shall list previous projects, including the description and similarity to the proposed type of straddle bent, that were designed and constructed by the Design-Build Team in the Technical Proposal. The Design-Build Team shall also specify the material proposed for all integral bents and straddle bents in the Technical Proposal.

For non-girder superstructures, integral substructures and straddle bent substructures, the Design-Build Team shall submit a bridge maintenance and inspection manual for review and acceptance.

Unless otherwise specified or approved by NCDOT in writing, the proposed replacement structures for existing bridges (Bridge No. 626 & 644) shall not reduce the width or span of the existing bridge, or the number and type of lanes, shoulders, and / or sidewalks on the existing bridge.

The minimum vertical clearance beneath all steel or post-tensioned concrete straddle bents shall be 18'-0".

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.

Bridge Widening and Rehabilitation

The Design-Build Team shall design and construct all new widened sections of existing bridges to achieve a minimum design service life of 75 years. For clarity, such 75-year design service life will only apply to the widened bridge section(s).

The Design-Build Team shall submit a Bridge Deck Rehabilitation Evaluation Plan for all bridges to be widened. Prior to the Design-Build Team performing any pavement widening and / or rehabilitation activities, including but not limited to bridge inspections, the Department will review and accept this Plan.

For bridges that are widened, the Design-Build Team shall overlay the existing and widened decks and approach slabs with latex modified concrete. (Reference the *Repair of Bridge Decks and Approach Pavement with Latex Modified Concrete* and *Latex Modified Concrete Project Special Provisions* found elsewhere in this RFP). The Design-Build Team shall mill or hydro-demolition the existing decks and approach slabs to perform Class I and Class IA Surface Preparation on all widened bridges. To allow the Department to complete a drag chain investigation immediately following the milling / hydro-demolition operation, the Design-Build Team shall provide written notification a minimum of 21 days prior to completing the milling operation. The Design-Build Team shall provide Class II and / or Class III Surface Preparation, for areas which are found to be unsound or delaminated, as determined by the Engineer. In such case, the Class II and Class III repairs 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 price of \$300 per square yard and \$700 per square yard, respectively.

The Design-Build Team may analyze the existing substructure and foundation elements using the design standards and specifications that were current at the time of the original design.

The Design-Build Team shall provide closure pours with cross-joint reinforcement / dowels. Intermediate diaphragms will not be required; and dowels will be acceptable in the closure bay of standard closure pour widths up to four feet. Closure pours wider than four feet may require alternate details. The Design-Build Team shall provide bent diaphragms in the closure bay; and the plans developed by the Design-Build Team shall reflect that these diaphragms be connected and bolts tensioned prior to the deck pour. Diaphragms for all other bays shall be included as per the NCDOT *Structure Design Manual* (including Policy Memos).

For bridges that are widened, the type of expansion joint in the widened section(s) shall match the existing expansion joint. The Design-Build Team shall remove the existing expansion joint seal glands and replace with new expansion joint seal glands that are continuous across the whole structure.

For existing bridge joints the existing hold-down plates may be re-used. If the existing hold-down plates are re-used, the Design-Build Team shall galvanize in accordance with the 2018 NCDOT *Standard Specifications for Roads and Structures* or metalize the existing hold-down plates.

The Design-Build Team shall repair and extend the existing concrete and / or rip rap slope protection completely across the widened section(s), forming continuous slope protection at all widened bridges. The slope protection shall extend up the slope to the end of end bent wings.

The Design-Build Team shall epoxy coat the top surfaces of existing and widened sections of existing substructure units in the locations of deck joints.

The Design-Build Team shall be responsible for all required railroad coordination to widen Bridge Nos. 802 and 803, including but not limited to securing Railroad Agreements. (Reference the Railroad Coordination Scope of Work found elsewhere in this RFP).

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 with the latest edition of the AASHTO *LRFD Bridge Design Specifications* and 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).

A live load rating chart for reinforced concrete box culverts and reinforced concrete box culvert extensions shall be included in the culvert plans. A live load rating chart will not be required for the existing section of reinforced concrete box culverts that are extended.

Sound Barrier Walls

The Design-Build Team shall design and construct all sound barrier walls required by the Design-Build Team's design. (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* with a minimum base wind pressure of 40 psf.

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)

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.

Excepted as allowed otherwise elsewhere in this RFP, designs shall be in accordance with the latest edition 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*.

Unless noted otherwise elsewhere 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*.

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.

PAVEMENT MANAGEMENT SCOPE OF WORK (1-12-17)

The pavement design for the mainline widening, mainline median paved shoulders, and mainline outside paved shoulders at locations where the existing outside paved shoulder is removed shall consist of one of the following alternates:

<u>Alternate 1</u>	<u>Alternate 2</u>	<u>Alternate 3</u>
3.0” S9.5D	3.0” S9.5D	3.0” S9.5D
4.0” I19.0D	4.0” I19.0D	4.0” I19.0D
8.5” B25.0C	4.0” B25.0C	3.0” B25.0C
Subgrade Stabilization	10.0” ABC	8.0” CTABC
	Subgrade Stabilization	Subgrade Stabilization

The pavement alternate chosen shall be used for the entire length of the project. The Design-Build Team shall specify pavement alternate that will be used in the Technical Proposal.

In accordance with the requirements noted below, the mainline subgrade stabilization shall consist of chemical stabilization or Class IV stabilization. The Design-Build Team shall specify the proposed mainline subgrade stabilization, or combination, with approximate limits of each type clearly noted in the Technical Proposal.

- Chemical stabilization shall be to a minimum depth of eight inches for lime and seven inches for cement. The type of subgrade stabilization and the amount of stabilizing agent shall be determined in accordance with the *Cement and Lime Stabilization of Subgrade Soils* Project Special Provision found elsewhere in this RFP.
- Class IV stabilization shall be in accordance with the *Class IV Subgrade Stabilization in Lieu of Chemical Stabilization* Standard Special Provision found elsewhere in this RFP.

Other pavement designs for this project shall be as listed in the table below:

Line	Surface	Intermediate	Base	Stabilization
-Y1DCA-	3.0" S9.5B	3.0" I19.0B	5.0" B25.0B	No
-Y2DCC- and -Y2DCD-	3.0" S9.5B	3.0" I19.0B	5.0" B25.0B	No
East Westinghouse Boulevard	3.0" S9.5C	4.0" I19.0C	4.0" B25.0C	No
Rea Road Ramps	3.0" S9.5B	2.5" I19.0B	3.0" B25.0B	Yes
Weddington Road	3.0" S9.5B	4.0" I19.0B	3.0" B25.0B	Yes
McKee Road, Fincher Farm Road, Plantation Center Drive, and Plantation Road	3.0" S9.5B	4.0" I19.0B	3.0" B25.0B	No
Weddington Road Loops	3.0" S9.5B	4.0" I19.0B	3.0" B25.0B	Yes
Weddington Road Ramps	3.0" S9.5B	2.5" I19.0B	3.0" B25.0B	Yes
East John Street	3.0" S9.5B	4.0" I19.0B	4.0" B25.0B	No
East John Street Ramps	3.0" S9.5B	2.5" I19.0B	3.0" B25.0B	Yes
East John Street Loops	3.0" S9.5B	4.0" I19.0B	3.0" B25.0B	Yes

For the -Y- Lines, ramps, loops and direct connections pavement designs noted in the table above, the Design-Build Team may substitute an ABC layer for an 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 layer thickness specified for the roadway.

The Design-Build Team shall mill the existing -L- Line pavement, including existing median paved shoulders that will remain in place, and all acceleration and deceleration lanes / ramps / loops to the back of the gore (12-foot width) to a depth of 2.5" and fill the milled area with 2.5" I19.0D. The Design-Build Team will not be required to mill existing outside paved shoulders that will remain shoulders in the final traffic configuration. (Reference the Roadway Scope of Work found elsewhere in this RFP)

The Design-Build Team shall resurface the existing -L- Line pavement, including all existing paved shoulders that will remain in place, and all acceleration and deceleration lanes / ramps / loops to the back of the gore (12-foot width), with a minimum 3.0" S9.5D. (Reference the Roadway Scope of Work found elsewhere in this RFP)

At the Johnston Road and Rea Road interchanges, the Design-Build Team shall resurface the entire length of the existing ramp / loop pavement that will remain in place, including all existing paved shoulders, with a minimum 3.0" S9.5C. (Reference the Roadway Scope of Work found elsewhere in this RFP)

Excluding the mainline outside paved shoulders constructed under TIP Project R-4902, the Design-Build Team shall remove and replace the mainline outside paved shoulders.

The Design-Build Team shall resurface the existing -Y2- pavement (US 521 south of I-485), including all existing paved shoulders that will remain in place, with a minimum 3.0" S9.5C. (Reference the Roadway Scope of Work found elsewhere in this RFP)

Throughout the construction areas that consist solely of pavement marking obliterations and / or revisions, the Design-Build Team shall uniformly overlay the existing pavement, including all paved shoulders, with 1.5" S9.5D.

Unless noted otherwise elsewhere in this RFP, the minimum narrow widened width shall be six feet. The minimum narrow widened width may be reduced to four feet only if the Design-Build Team demonstrates that their equipment properly compacts narrow widening and obtains prior written Department approval. Tapers that tie proposed pavement to existing pavement are excluded from the narrow widening requirements noted above.

In areas where the existing 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.

The Design-Build Team shall be responsible for the design of all temporary pavements, including but not limited to pavement for temporary breakdown areas, 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 duration, the Design-Build Team shall be responsible for upgrading the pavement to an acceptable level. Prior to placing traffic on existing shoulders, the Design-Build Team shall remove the existing rumble strips. Temporary pavements shall be designed in accordance with the NCDOT Pavement Design Procedure, AASHTO 1993 Method dated December 16, 2016. Using the Design-Build submittal process, temporary pavement designs and associated calculations shall be submitted for review and acceptance, prior to incorporation. The expected duration for traffic on temporary pavement must be included as part of the submittal.

In areas where the Design-Build Team's design requires an existing paved facility to accommodate projected traffic volumes other than the Department's projected traffic volumes, the Design-Build Team shall evaluate the existing paved facility regarding its suitability for carrying the Design-Build Team's projected traffic volumes. In the event that the existing paved facility is found to be inadequate, the Design-Build Team shall be responsible for upgrading the existing paved facility to an acceptable level or replacing the existing paved facility. Prior to incorporation, the Design-Build Team shall submit their evaluation and proposed use of the existing paved facility to the Design-Build Unit for review and acceptance or rejection.

On all ramps, loops and Direct Connections, the adjacent through lane pavement design shall extend to the back of the gore (12-foot width).

Surface course longitudinal joints shall not be located in the final traffic pattern wheel path. If applicable, the Design-Build Team shall indicate in the Technical Proposal where all underlying longitudinal joints will be located and demonstrate how the underlying longitudinal joint location will minimize reflective cracking.

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 or SF9.5A) and 8.0" 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 8.0" ABC.
- For existing asphalt driveways, use 1.5" S9.5B (or S9.5C or SF9.5A) and 8.0" ABC with prime coat
- For existing concrete driveways, use 6.0" jointed concrete reinforced with woven wire mesh.

The rate of application and the maximum and minimum thickness per application and layer shall be in accordance with the NCDOT Roadway Design Manual.

Excluding the high side of superelevated sections and the mainline section constructed under TIP Project R-4902, the Design-Build Team shall design and construct median and outside shoulder drains and outlets at the locations noted below:

- Throughout crest vertical curves located in cut sections
- Throughout all sag vertical curves
- Where the grade is less than 1%

Where installed on the outside shoulder, outlets shall be provided approximately every 300 feet. Where installed on the median shoulder, outlets increments shall not exceed 500 feet and all outlets shall be located at drainage structures. Shoulder drains shall be placed to drain the entire pavement structure. The shoulder drain design and outlet locations shall be submitted to the Design-Build Unit for review and acceptance.

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, including but not limited to all existing guardrail within the project limits to remain in place 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" B25.0B or 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 above pavement design for paving the shoulders to the face of the aforementioned features, the Design-Build Team may use the adjacent travel lane pavement design.

When a 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). 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, the Design-Build Team shall perform incidental milling for a minimum distance of 25 feet at bridges and six feet at curb sections. 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 that provide an alternate **mainline widening** pavement design will be considered subject to the following restrictions:

- ATCs on pavement design will only be permitted for the mainline widening and shall not be submitted until after issuance of the Second Industry Draft Request for Proposals.
- Unless noted otherwise elsewhere in this RFP, the pavement design in the ATC shall be determined using the methods noted below:
 - The NCDOT Pavement Design Procedure, AASHTO 1993 Method dated December 16, 2016 using a minimum 30-year design life.
- The mainline widening pavement design in the ATC shall adhere to the requirements noted below:

Asphalt Pavement

- In accordance with the requirements noted below, all asphalt pavement widening designs shall include subgrade stabilization that consists of chemical stabilization or Class IV stabilization:
 - Chemical stabilization shall be to a minimum depth of 8 inches for lime and 7 inches for cement. The type of subgrade stabilization and amount of stabilizing agent shall be determined in accordance with the *Cement and Lime Stabilization of Sub-grade Soils* Project Special Provision found elsewhere in this RFP.
 - Class IV stabilization shall be in accordance with the *Class IV Subgrade Stabilization in Lieu of Chemical Stabilization* Standard Special Provision found elsewhere in this RFP.
 - Only one subgrade stabilization alternate shall be used across the full typical section width, in a given direction, and shall be used for a minimum 1000-foot length.

- Full Depth Asphalt
 - Minimum 14” thickness
- Asphalt on ABC
 - Minimum 9.5” asphalt thickness
 - Minimum 8” ABC thickness
- Asphalt on CTBC
 - Minimum 8.5” asphalt thickness
 - 8” CTBC thickness – Cement treated base course shall be in accordance with the *Cement Treated Base Course* Project Special Provision found elsewhere in this RFP.
- The pavement design in the ATC must be sealed by a professional engineer who has experience in pavement design. The ATC submittal shall include a brief resume or description of the designer’s pavement design experience.
- For all incorporated ATC pavement designs, the Design-Build Team shall include in the Technical Proposal a minimum two-year extension of the three-year guarantee. (Reference the *Three-Year Guarantee* Project Special Provision found elsewhere in this RFP)

ATCs complying with the above restrictions will be evaluated by a technical review panel in accordance with the usual ATC process with the exception that the NCDOT reserves the right to engage a recognized pavement design expert to assist with the ATC evaluations. (Reference the *Alternative Technical Concepts and Confidential Questions* Project Special Provision found elsewhere in this RFP)

HYDRAULICS SCOPE OF WORK (11-27-2017)**Project Details**

- The Design-Build Team shall employ a private engineering firm 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 upon 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.
- All drainage system improvements shall be contained within the right of way. Where downstream systems outside the right of way are found to be hydraulically deficient during the design storm, the Design-Build Team shall provide an 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
- All frames and grates located within 30 feet of the Weddington Road travelway shall be bicycle and pedestrian safe.
- The Design-Build Team shall provide additional outlet protection at all pipe outlets with a ten-year partial flow velocity greater than 15 fps. The aforementioned outlet protection shall mitigate erosive velocities to receiving downstream channels.

Hydraulic Spread

- The hydraulic spread shall not encroach into any operational lane beyond the limits noted below:
 - 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*.
 - The hydraulic spread shall not encroach into an operational permanent or temporary through lane on a bridge. The hydraulic spread shall not encroach more than a distance that equals half the lane width or six feet, whichever is less, into an operational permanent or temporary exclusive turn lane on a bridge.
- The Design-Build Team shall analyze spread for all bridges identified in the Structures Scope of Work found elsewhere in this RFP 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). 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. If a closed drainage system is used on a bridge, the closed drainage system shall use 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 lanes or paved shoulders.
 - 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 utilize one of the following methods to perform the hydroplaning risk assessment:
 - *Hydraulic Engineering Circular 22*, 3rd Edition, 2009
 - *AASHTO Highway Drainage Guidelines*, 2007
 - *AASHTO Drainage Manual*, 2014
 - *GDOT Drainage Design for Highways*, 2017
 - *FDOT Hydroplaning Risk Analysis Design Guidance*, HP Program, 2014
- The Design-Build Team shall give particular attention to areas with zero super elevation in a crest and / or sag vertical curve, and 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 Stormwater Best Management Practices Toolbox and the NCDOT Post-Construction Stormwater Program, effective on the Technical Proposal submittal date, the Design-Build Team shall develop a Stormwater Management Plan that, at a minimum, demonstrates the following:
 - 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

increases in discharge due to the proposed project and take appropriate action to ensure that any increases are appropriately mitigated.

Drainage Structures

Throughout this RFP, the term *drainage structures* shall include box culverts, cross pipes and storm drainage systems.

- The Design-Build Team shall replace all existing corrugated metal pipes within the project construction limits.
- The Design-Build Team shall develop discharges for all drainage structures based upon the future build-out land use projections. 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 and / or areas without storm drainage systems. For drainage areas where impervious surfaces are greater than 50% and / or areas with storm drainage systems, routing will be allowed. EPA SWMM, USACE HMS, Win TR-20, HydroCADD or equivalent are acceptable programs for routing. A storm drainage duration of 24 hours shall be used in developing the hydrograph.
- Revise the Guidelines for Drainage Studies and Hydraulic Design as follows:
 - Table 7-2, Peak Discharge Method Selection
 - Rational Method is acceptable up to 80 acres.
 - Delete the NCDOT Hwy. Hydrologic Charts
 - Delete Appendix C – NCDOT Hydrologic 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. 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 1.2 HW/D shall be required for all existing and proposed box culverts and pipes (including all extensions) during the design year.
- All existing and proposed 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.

- Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall remove or fill with flowable fill all pipes not retained for drainage purposes.
- 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 location box culverts and cross pipes:
 - Station
 - Proposed drainage structure details
 - Drainage Area
 - Percent Impervious or “C” value 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
- Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall replace drainage features as directed by the *I-5507 December 14 2016 Maintenance Needs* electronic files provided by the Department. If the aforementioned *Maintenance Needs* document and the RFP contradict each other, the RFP requirements shall govern. The Design-Build Team shall investigate and replace all drainage structures defined in the aforementioned electronic files to ensure that the drainage system is fully functional. The removal and replacement of each of these existing drainage structures shall include, but not be limited to required excavation, foundation conditioning material, backfill, grading, and replacement of two joints or pipe(s) for each pipe line connected to each structure. All other work items required to perform the tasks above, including but not limited to shoring and traffic control, shall be considered incidental to the drainage structure replacement.
- The Design-Build Team shall verify all pipe replacement sizes defined in the aforementioned *I-5507 December 14 2016 Maintenance Needs* electronic files. The cover on all replacement pipes shall adhere to the appropriate NCDOT pipe class and cover requirements.
 - Excluding the drainage features to be replaced as directed by the *I-5507 December 14 2016 Maintenance Needs* electronic files provided by the Department, throughout the project limits, the Design-Build Team shall analyze all drainage structures for hydraulic and structural deficiencies within the existing / proposed right of way. The Design-Build Team will not be required to analyze drainage structures within -Y- line construction limits that consist solely of pavement marking obliterations / revisions. Using the hydraulic discharges for the future build-out land use projections, 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 requirement 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 or supplemental pipes and structures. For major hydraulic crossings (crossings with a conveyance greater than the capacity of a single 54-inch diameter pipe), the Design-Build Team shall 1) remove all hydraulically, or hydraulically and structurally, deficient box culvert(s) and or / pipe(s), and 2) replace the aforementioned box culvert(s) and / or pipe(s) with a cast-in-place or precast culvert. 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
 - Build-out Discharge (Design year and 100 year)
 - Hydraulically Deficient (Yes / No) for Build-out Discharge
 - Proposed Mitigation Structure(s) Details
 - HW/D for Build-out Discharge at Existing Structure without Mitigation
 - HW/D for Build-out Discharge at Existing Structure with Mitigation
 - Hydraulic Freeboard at Sag for Build-out Discharge at Existing Structure without Mitigation
 - Hydraulic Freeboard at Sag for Build-out Discharge at Existing Structure with Mitigation
 - HW/D for Build-out Discharge for Mitigation Structure(s)
 - Hydraulic freeboard at Sag for Build-out Discharge at Mitigation Structure(s)
 - Comments
- To ensure that all cross pipes that are retained for drainage purposes are structurally sound, the Design-Build Team shall provide appropriate documentation obtained from video inspections for the Department’s review and approval prior to any hydraulic design submittal. 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 Subarticle 104-8(A) of the 2018 NCDOT *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. Excluding drainage features noted in the *I-5507 December 14 2016 Maintenance*

Needs electronic files provided by the Department, structural mitigation, for structural deficiencies in box culverts and / or pipes, including but not limited to all repairs 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*.

Permit Coordination

- The Design-Build Team shall conduct an interagency hydraulic design review meeting and an interagency permit impacts meeting prior to submittal of the environmental permit applications. These meetings shall adhere to the Concurrence Point 4B and Concurrence Point 4C requirements, respectively, of the Merger Process used by the environmental agencies and the Department to obtain environmental permits. (Reference the Environmental Permits Scope of Work found elsewhere in this RFP.) All work resulting from the hydraulic design and permit review meetings shall be the Design-Build Team's responsibility. A minimum of five weeks prior to the appropriate interagency meeting, the Design-Build Team shall provide 1) hydraulic plans and 2) permit drawings, calculations, and impact sheets for the USACE 404 Permit and the NCDWR Section 401 Certification to the Design-Build Unit. The Design-Build Team shall take minutes of the interagency meetings 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 spanning structure shall be designed such that only 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 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) encroaches 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 Hydraulic 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
 - The NCDOT *Best Management Practices for Construction and Maintenance Activities*
 - The NCDOT *Stormwater Best Management Practices Toolbox*
 - The NCDOT *Post-Construction Stormwater Program*

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.

GEOTECHNICAL ENGINEERING SCOPE OF WORK (01-24-18)**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 at:

<https://partner.ncdot.gov/VendorDirectory/default.html>

The prequalified geotechnical firm shall prepare foundation design recommendation reports for use in designing structure foundations, roadway foundations, retaining walls, sound barrier foundations, and 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 2 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. If employing shallow foundation-supported end bents at an abutment wall, the subsurface investigation shall be expanded to include in-situ soil modulus measurements and settlement analyses at multiple locations and depths within the foundation soils below an abutment retaining wall.

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

- Key in spread footings of structures crossing streams a minimum of full depth below the 100-year scour elevation and provide scour protection in accordance with the scour protection detail in the NCDOT *Structures Management Unit Manual*.
- Shallow foundations that derive bearing resistance within the backfill above and behind MSE abutment retaining walls may be employed for bridges. However, shallow foundation-supported end bents shall not be employed when the abutment

wall is subject to scour, when the bridge carries a railway, or when integral abutments are utilized.

- 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 10 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 or flatter. All end bent cut slopes shall be 2:1 or flatter. For 1.5:1 fill slopes, extend end bent slope protection from the toe of slope to berm and to 1.75:1 (H:V) slope or to the limits of the superstructure. For end bent cut slopes and for 2:1 or flatter end bent fill slopes, extend end bent slope protection from the toe of slope to berm and to the limits of the superstructure.
- 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.
- 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.
- Add steel pile points to all piles with an estimated embedded length of 20’ or less.

B. Roadway Foundations

- Unless noted otherwise herein, all unreinforced proposed fill slopes, except bridge end bent slopes (Reference Section A – Structure Foundations), shall be 2:1 (H:V) or flatter. Unless the slopes are designed with adequate reinforcement to provide

the required stability, all proposed soil cut slopes shall be 2:1 (H:V) or flatter. Except as allowed below, rock cuts shall be 1:1 (H:V) or flatter. Rock cuts steeper than 1:1 (H:V) and reinforced soil slopes 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.

- Reinforced soil fill slopes shall only be used to minimize impacts to existing structures, and / or cultural, historical or otherwise protected landmark or topographic features.
- Calculate and report estimated settlement and rate of settlement at bridge approach embankments. Add wait periods, settlement monitoring, and soil improvement techniques to keep long term settlements equal to or less than ½ inch after fine grading of the subgrade. Soil improvement techniques to mitigate long term settlement problems or to 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.
- If the top half of a new embankment, including but not limited to a widened embankment section, that is at least ten feet high and 200 feet long is constructed with material that has more than 50%, by weight, passing the No. 200 sieve, the Design-Build Team shall add a high strength geotextile to the pavement structure design in accordance with the Geotextile for Pavement Stabilization Project Special Provision found elsewhere in this RFP. The aforementioned “top half” and ten-foot height shall be measured below the pavement structure and vertically from the toe of the embankment to the top of the outer edge of pavement, respectively.

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 Standard Drawing, 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 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 2:1 (H:V) or flatter.
- 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.
- A fence or handrail shall be required on top of the facing, coping, or barrier, or immediately behind the wall when a slope does not exist as a final condition behind the wall.

Abutment retaining walls shall be designed to satisfactorily resist the additional loading from the foundation(s).

- 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 submitted to the NCDOT for review and acceptance 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. CONSTRUCTION REQUIREMENTS

- The Design-Build Team shall investigate, propose, and submit proposed remedial measures to the NCDOT Geotechnical Engineering Unit for review and acceptance (prior to incorporating recommended remedial measures into the project) for any construction problems related to the following.
 - 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 acceptance prior to beginning construction. Hammer approvals should be submitted prior to performing any pile driving and should be performed using GRLWEAP Version 2010 or later.
- The prequalified geotechnical firm which prepares the original foundation designs is 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 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 1018 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 one pile for each pile size, pile type (material or shape) and pile driving hammer combination. Additional PDA tests may be required based upon the AASHTO LFRD Bridge Design Specifications. If the bridge length with driven pile foundations is longer than 400 feet, perform an additional PDA test at every 400 feet interval. Provide additional PDA testing for any revisions to pile type, size or hammer previously approved.
- The PDA Consultant should perform PDA testing, provide PDA reports, and develop pile driving inspection charts or tables. All recommendations should be submitted to NCDOT for review and acceptance prior to driving any production piles at the applicable bridge.
- 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.
- When settlement monitoring is necessary the prequalified geotechnical firm which prepares the foundation designs shall review the settlement monitoring data a minimum of once a month and issue a letter for review prior to releasing the embankment or approach fill from monitoring. Monitoring may not be ended until less than 0.10 inch of settlement is measured over a period of four weeks. The settlement monitoring data should be submitted to the Design-Build Unit prior to issuing the release letter.
- Embankment settlement monitoring shall be required when a waiting period of more than one month is recommended in the foundation design recommendation reports. When embankment monitoring is required, construct the embankment and approach fill to the proposed roadway grade prior to monitoring. In the absence of embankment settlement monitoring, monitor approach fill settlement after the construction of the approach fill and prior to construction of the approach slab when the approach fill height exceeds 25% of total fill height. Approach fill height is defined as difference between proposed grade and bottom of cap elevations. Use an appropriate method to monitor settlement across the length of the embankment (from toe to toe) such as settlement gauges, surveyed stakes on finished subgrade or other methods but submit documentation describing the method and procedures to the NCDOT Geotechnical Engineering Unit, via the Transportation Program Management Director, for review and acceptance prior to construction of the embankment.
- A minimum of two embankment settlement gages are 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 first lift of the embankment.

- Send copies of any inspection forms related to foundations, settlement, sound barrier walls, or retaining wall to the NCDOT for review.

GEOENVIRONMENTAL SCOPE OF WORK (8-24-16)**I. DEFINITION**

For the purpose of this scope of work, contamination / contaminants shall be defined as any substance that when discharged in any quantity may present an imminent and substantial danger to the public health or welfare. Petroleum shall be defined as any petroleum-derived product of any kind and in any form, including but not limited to, crude oil, diesel fuel, fuel oil, gasoline, lubrication oil, oil refuse, oil mixed with other waste, oil sludge, petroleum related products or by-products, and all other liquid hydrocarbons, regardless of specific gravity, whether occurring singly or in combination with other substances.

II. DESCRIPTION OF WORK

Sites of concern are identified in the *I-5507 Updated GeoEnvironmental Report for Planning*, dated December 7, 2015, the *R-0211EC Hazardous Materials Report*, dated April 6, 2009, and the *U-4714 GeoEnvironmental Report for Planning – Hazardous Materials Report*, dated March 12, 2014. After submittal of the Right of Way / 60% Roadway Plans developed by the Design-Build Team, the Design-Build Team shall hold a right of way consultation with the Department's GeoEnvironmental staff, Design-Build Unit, and key members of the Design-Build Team.

Sites of concern within the proposed right of way that are noted in the aforementioned *GeoEnvironmental Reports for Planning and Hazardous Materials Report*, and any other sites identified during the right of way consultation with the Design-Build Team, will be investigated by the Department. The Department will require 90 days from the date of the aforementioned consultation to investigate and provide Right of Way Recommendations. Prior to the Design-Build Team making offers to purchase the right of way on these sites of concern, the Department will provide the Right of Way Recommendations to the Design-Build Team.

The Design-Build Team shall notify the Design-Build Unit, in writing, of any underground storage tanks (UST's) containing fuel, chemicals, or heating oil tanks discovered during property appraisals. The Department will require 90 days from the date of written notification to investigate and provide Right of Way Recommendations. Prior to the Design-Build Team making offers to purchase the right of way on sites containing UST's, the Department will provide the Right of Way Recommendations to the Design-Build Team.

The Design-Build Team shall adhere to all Right of Way Unit procedures regarding the acquisition of contaminated property and all Right of Way Recommendations provided by the Department. (Reference the Right of Way Scope of Work found elsewhere in this RFP.)

After the parcels with identified contamination and / or underground storage tanks (USTs) are acquired and cleared of all above ground structures, the Department will 1) remove from the right of way UST's identified in the *Hazardous Material Reports* and

discovered during property appraisals and 2) remove all associated contaminated soil anticipated to require excavation to complete the project. The Department will remove the aforementioned UST's and contaminated soil within 60 days of written notification that the above-ground structures have been removed. All contaminated soil not required for removal to complete the project shall be left in place and undisturbed.

In the case where in-ground hydraulic lifts are present, the demolition shall exclude the concrete floor slab until the Department removes the hydraulic lifts. These hydraulic lifts will be removed within 60 days of written notification.

In the event contaminated soil is encountered by the Design-Build Team, the Design-Build Team shall excavate the contaminated soil to the limits necessary to complete the construction project. In accordance with the Standard Stockpile Containment Detail, the Design-Build Team shall stockpile all excavated contaminated soil from a parcel in a location within the property boundaries of the source parcel. Contaminated soil shall only be handled by HAZWOPR certified personnel. The Department will remove the stockpiled contaminated soil within two weeks of written notification. All remaining contaminated soil shall be left in place and undisturbed. It is important to note that petroleum contaminated soil may be encountered during any earthwork activities on this project.

III. INFORMATION PROVIDED BY NCDOT

- I-5507 Updated GeoEnvironmental Report for Planning, December 7, 2015
- R-0211EC - Hazardous Materials Report, April 6, 2009
- R-4902 GeoEnvironmental Pre-Scoping Report (PDEA 1W), July 17, 2006
- R-4902 Updated GIE (GeoEnvironmental Impact Evaluation) for Expanded Corridor, November 23, 2011
- R-4902 Dry-Cleaning Solvent Contamination – NCDENR Communication (9101 Pineville-Matthews Rd., Pineville, NC), December 5, 2011
- U-2509 GeoEnvironmental Report for Planning – Hazardous Materials Report, July 7, 2016
- U-4714 GeoEnvironmental Report for Planning – Hazardous Materials Report, March 12, 2014
- I-5507_GEO_env.dgn file

IV. UNKNOWN CONTAMINATED SITES

The Design-Build Team shall immediately notify the Department if the Design-Build Team's operations encounter or expose any abnormal condition that may indicate the presence of a hazardous, contaminated, and / or toxic material not previously identified. If the Engineer elects to have the Design-Build Team remove and dispose of contaminated material, the removal and disposal of this material shall be performed as extra work in accordance with Article 107-25 of the 2018 NCDOT *Standard Specifications for Roads and Structures*.

TRANSPORTATION MANAGEMENT SCOPE OF WORK (1-25-17)**I. Laws, Standards and Specifications**

The Design-Build Team shall design the Transportation Management Plans (TMP) in accordance with the requirements of this RFP and the version of the standards listed below that are effective at the time of the Technical Proposal submittal.

- *NCDOT Standard Specifications for Roads and Structures*
- *NCDOT Roadway Standard Drawings*
- *NCDOT Supplement to the Manual on Uniform Traffic Control Devices (NCSMUTCD)*
- *FHWA Manual on Uniform Traffic Control Devices (MUTCD)*
- *NCDOT Roadway Design Manual*
- *Americans with Disabilities Act of 1990 (ADA)*
- *AASHTO A Policy on Geometric Design of Highways and Streets* and all Errata
- *AASHTO Roadside Design Guide*
- *FHWA Standard Highway Signs*
- *NCDOT Guidelines for Preparation of Traffic Control and Pavement Marking Plans for Design-Build Projects*
- *NCDOT Design-Build Submittal Guidelines*
- *FHWA Rule on Work Zone Safety and Mobility 23 CFR 630 Subpart J*
- *Transportation Research Board (TRB) Highway Capacity 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 Transportation Management Plans (TMP).

<https://connect.ncdot.gov/projects/WZTC/>

Transportation Management Plans

The Design-Build Team shall prepare Transportation Management Plans (TMP) that include Temporary Traffic Control Plans (TCP), an Incident Management Plan (IMP), a Traffic Operations Plan (TOP), the requirements of which are included in this Scope of Work, and a Public Information Plan (PIP) through coordination with the Department and in accordance with the Public Information Scope of Work found elsewhere in this RFP.

The Design-Build Team shall produce TMP for each phase of work that impacts road users. The TMP 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 TMP that include procedures to

communicate TMP information to the public about road and travel conditions within the work zone and affected roadway network.

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 (ROW). 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 and acceptance prior to any future phasing submittals.

The Design-Build Team shall select a Private Engineering Firm (PEF) that has experience developing TMP on comparable projects for the North Carolina Department of Transportation (NCDOT) and shall list these comparable projects in the Technical Proposal.

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.

General Requirements

When lane and / or shoulder closures are not in effect, maintain the existing number of travel lanes, including but not limited to, auxiliary lanes and collector distributor lanes on all roads. For existing travel lanes that are 11-foot wide or wider, maintain a minimum of 11-foot travel lanes at all times. For existing travel lanes that are narrower than 11-foot, maintain the existing travel lane widths at all times. Maintain four-foot wide inside and outside paved shoulders in each direction of I-485 unless temporary barrier is placed on the paved shoulder or guardrail is adjacent to the paved shoulder. Under structures only, maintain a minimum two-foot wide paved shoulder adjacent to I-485 through lanes and a minimum one-foot wide paved shoulder adjacent to auxiliary lanes / ramps. Unless permitted otherwise elsewhere in this RFP, maintain existing shoulder widths (paved and unpaved).

The Design-Build Team shall maintain positive median cross-over protection for the entire I-485 project limits. The Design-Build Team shall indicate in the Technical Proposal the type of positive protection proposed and replacement / resetting requirements.

All traffic control devices, including bridge barrier rails, shall be placed / located a minimum two-foot offset (shy distance) from the edge of an open travel lane.

Placement of temporary barrier systems shall be shown on the Transportation Management Phasing Concept. Temporary barrier systems shall be designed in accordance with the following requirements:

- Determine the need for temporary 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 on 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 possible deflection of the proposed temporary barrier system in accordance with NCHRP-350 *Recommended Procedures for the Safety Performance Evaluation of Highway Features* deflections from crash testing. Providing less than the minimum deflection distance shall require the use of anchored temporary barrier systems in accordance with the 2018 NCDOT *Standard Specifications for Roads and Structures*.
- When temporary barrier is used continuously on one or both sides of a direction of I-485 travel for a distance greater than one mile, the Design-Build Team shall provide a paved motorist breakdown area on the right side of the mainline (I-485) travel way every mile, unless the outside paved useable shoulder width (clear distance between edge of travel lane and face of barrier) is ten feet or greater. All breakdown areas shall be a minimum of one thousand feet long and fourteen feet wide, ten feet of which shall be pavement. Prior to incorporation, the Design-Build Team shall submit a temporary pavement design for the breakdown areas. (Reference the Pavement Management Scope of Work found elsewhere in this RFP)
- The Design-Build Team shall not place temporary barrier systems utilized for traffic control on unpaved surfaces.

The design speed for temporary alignments of Interstate, US, 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.

The *Roadway Standard Drawing* No. 1101.11 shall be used to calculate the length of temporary merges for lane closures and temporary traffic shifts. 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.

Temporary traffic shifts requiring vertical grades shall be considered a temporary alignment. All temporary alignments shall adhere to the NCDOT *Roadway Design Manual*, AASHTO *A Policy on Geometric Design of Highways and Streets* and the TRB *Highway Capacity Manual*.

Maintain access to all residences, schools, bus stops, mass transit facilities (park and ride lots), emergency services and businesses at all times. Prior to incorporation, obtain written approval from the Engineer on method to maintain access.

At all times, maintain pedestrian facility access, provide temporary pedestrian facilities (concrete, asphalt, or other suitable material as approved by the Engineer), and / or provide a pedestrian detour at all locations where the open pedestrian travelway has been closed and /

or removed by the Design-Build Team's construction operations. Prior to incorporation, all pedestrian detours shall receive Department written approval.

Through traffic traveling in the same direction shall not be split. (i.e. separation by any type of barrier, bridge piers, existing or proposed median, etc.).

Prior to incorporation, obtain written approval from the Engineer for all road closures.

The Design-Build Team shall not place I-485 traffic on an off-site detour.

Prior to incorporation, all offsite detour routes shall receive Department written approval and shall adhere to the following requirements:

- The Design-Build Team shall be responsible for investigating all detour routes, including but not limited to, analyzing traffic capacity, investigating impacts to emergency services and schools, analyzing design characteristics to ensure the design supports the traffic volumes (existing traffic volumes plus detoured traffic volumes) and investigating pavement structural adequacy, including but not limited to any bridge postings on the detour route. The Design-Build Team shall submit recommendations resulting from the aforementioned investigations / analyses for the Department's review and acceptance.
- As determined by the Engineer, the Design-Build Team shall determine and provide 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.
- 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)
- Submit detour routes and all associated sign designs for review and acceptance prior to incorporation.
- Unless approved otherwise by the controlling government entity, in writing, use only State maintained roads for offsite detour routes.

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 entail, but is not 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 on proposed overhead structures and providing the minimum clear widths as follows:

Roadway	Minimum Clear Width
I-485 (including collector distributors, ramps and loops) and US 521 (Johnston Rd.)	20 feet
All other roadways	18 feet

The Design-Build Team shall coordinate with the Division Operations Engineer and Division Traffic Engineer 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 be limited to, providing notification of planned lane or road closures, traffic detours, public information, traffic management, access management, incidents, etc.

The Design-Build Team shall provide and utilize Changeable Message Signs (CMS) as follows:

- The Design-Build Team shall provide CMSs that have the functionality to be operated locally in the field and controlled remotely from the STOC. All CMSs provided must be fully NTCIP compliant and operate with full functionality via remote communications from the STOC. All CMSs must be able to be controlled remotely using the existing software utilized by the STOC staff at the time of deployment. No vendor specific or third party software will be allowed. CMSs must be approved for use in ITS operations and freeway incident management before they are deployed. STOC staff will operate all devices displaying travel information to the public. The Design-Build Team shall not begin any construction that involves lane closures on any road until all CMSs and all other devices are installed and communicating with the STOC.
- For traffic control purposes during construction, the Design-Build Team shall provide and operate a minimum of one CMS per direction on I-40 that provides general information about the construction activities within the project limits. This CMS shall be in addition to any other CMSs required by the Roadway Standard Drawings or required for incident management use.
- The Design-Build Team shall provide and operate a minimum of 12 CMSs to display alternate route information ahead of the project detour points for incidents on I-40. The positioning of these incident management CMSs shall be coordinated with the STOC and the Engineer. These CMSs shall be in addition to any other devices provided by the Department and operated by the STOC. The Design-Build Team shall coordinate with the STOC when alternate route information needs to be displayed. In the event of an incident, STOC will take remote control of the applicable CMSs to provide incident management information to motorists. Upon incident clearance and resumption of normal traffic flow, STOC will allow the Design-Build Team to regain control of the CMS boards.
- The Design-Build Team shall coordinate on 24 hour basis with the STOC to provide relevant and timely travel information throughout the work zone and along alternate routes.
- The Design Build Team will be responsible for ensuring the alternate routes are signed with either existing stationary alternate route signing or provide temporary stationary alternate route signing to guide detoured motorists along the alternate route

back to the original road. The Design-Build Team shall provide a plan for STOC and NCDOT approval that shows the STOC's alternate routes with the approximate locations of the CMSs to be used for incident management, along with their respective messages, and the approximate locations of the existing stationary alternate route signing and temporary stationary alternate route signing.

- The Design-Build Team shall fabricate, install, relocate, and maintain the CMSs and stationary signs during the project duration. Upon completion of the project, or completion of their usefulness, the Design-Build Team shall remove the CMSs and stationary signs.
- The plan for all incident management CMSs and temporary stationary signing for alternate routes shall be approved by STOC and NCDOT and installed before beginning any construction.

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 Transportation Management Plans. 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 provide a smooth pavement surface for traffic at all times. The Design-Build Team shall not place traffic on pavement containing rumble strips.

The Design-Build Team shall take steps to minimize disruptions to existing roadway facilities during construction and shall demonstrate how the traffic control phasing, minimizes inconvenience to motorists on all roads

Lane Closure Notice (LCN)

The Design-Build Team shall issue a Lane Closure Notice (LCN) to NCDOT and affected government entities a minimum of twenty-one (21) 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 Transportation Management Plans,

The Design-Build Team shall issue a Road Closure Notice (RCN) to NCDOT and affected government entities a minimum of twenty one (21) 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, 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.

II. Project Operations Requirements

The following are Time Restrictions and notes that shall be included with the Transportation Management Plan General Notes, unless noted otherwise elsewhere in this RFP:

A. Time Restrictions

1. Intermediate Contract Times #1 and #2 for Lane Narrowing, Lane Closure, Holiday and Special Event Restrictions.

The Design-Build Team shall maintain the existing traffic pattern and shall not close or narrow a lane of traffic during the times below.

Road Name	Day	Time Restrictions
One-lane closure on I-485 (including all collector distributors, ramps and loops) One-lane closure on US 521 (Johnston Road)	Monday through Sunday	6:00 a.m. to 9:00 p.m.
Two-lane closure on I-485 (including all ramps / loops) Two-lane closure on US 521 (Johnston Road)	Monday through Sunday	6:00 a.m. to 11:00 p.m.
Westinghouse Boulevard, Tilley Morris Road, Weddington Road, East John Street / Old Monroe Road, Elm Lane, and Ballantyne Commons Parkway	Monday through Friday	6:00 a.m. to 9:00 a.m. and 4:00 p.m. to 7:00 p.m.

The Design-Build Team shall not install, reset and / or remove any traffic control device during the times listed above.

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:

- (a) For New Year's between the hours of 6:00 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 from 9:00 p.m. the following Tuesday.
- (b) For Easter, between the hours of 6:00 a.m. Thursday and 9:00 p.m. Monday.
- (c) For Memorial Day, between the hours of 6:00 a.m. Friday and 9:00 p.m. Tuesday.
- (d) For Independence Day, between the hours of 6:00 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 6:00 a.m. the Thursday before Independence Day and 9:00 p.m. the Tuesday after Independence Day.
- (e) For Labor Day, between the hours of 6:00 a.m. Friday and 9:00 p.m. Tuesday.
- (f) For Thanksgiving Day, between the hours of 6:00 a.m. Tuesday and 9:00 p.m. Monday.
- (g) For Christmas, between the hours of 6:00 a.m. the Friday before the week of Christmas Day and 9:00 p.m. the following Tuesday after the week of Christmas Day.
- (h) For any NASCAR event at Charlotte Motor Speedway, between the hours of 6:00 a.m. the Wednesday before the 1st track event until 9:00 p.m. the day after the last track event.
- (i) For any Carolina Panthers game played in Charlotte, from five (5) hours before the game to five (5) hours after the game.
- (j) For the Charlotte AutoFair, between the hours of 6:00 a.m. the Wednesday of the week of the Fair until 9:00 p.m. the following Monday after the Fair.
- (k) For the 2019 ACC Tournament in Charlotte, between the hours of 6:00 a.m. the Tuesday of the week of the Tournament until 9:00 p.m. the following Monday after the Tournament.

Liquidated Damages for Intermediate Contract Time #1 for the above lane narrowing, lane closure, holiday and special event time restrictions for I-485, including all collector distributors, ramps and loops; and US 521 (Johnston Road) are \$2,500.00 per 15-minute period or any portion thereof.

Liquidated Damages for Intermediate Contract Time #2 for the above lane narrowing, lane closure, holiday and special event time restrictions for Westinghouse Boulevard, Tilley Morris Road, Weddington Road, East John Street / Monroe Road, Elm Lane and Ballantyne Commons Parkway are \$1,500.00 per 15 minute period or any portion thereof.

2. Intermediate Contract Times #3 and #4 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 restriction. 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-485 and US 521 will be allowed for the purpose of bridge demolition, and girder, overhang, and falsework installation and / or removal during the times set forth below. 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 45 mph or higher design speed for I-485 and a 35 mph or higher design speed for US 521. 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.

Road Name	Day	Time Restrictions
I-485 including all ramps and loops and US 521 (Johnston Road)	Monday through Sunday	5:00 a.m. until 12:00 a.m. (midnight)
Westinghouse Boulevard, Tilley Morris Road, Weddington Road, Elm Lane, Ballantyne Commons Parkway and East John Street /Old Monroe Road	Monday through Friday Saturday and Sunday	6:00 a.m. to 9:00 p.m. 9:00 a.m. to 9:00 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, or approved I-485 median crossover, the roadways listed may be closed from 12:00 a.m. (Midnight) to 5:00 a.m. 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
- Traffic shifts to complete tie-in work and placement of pavement markings

Proposed road closures for any road within the project limits shall be approved by the Engineer, in writing, prior to incorporation in the Transportation Management Plans.

Liquidated Damages for Intermediate Contract Time #3 for the above road closure time restrictions for I-485 and I-485 ramps and loops, and US 521 are \$5,000.00 per 15-minute period or any portion thereof.

Liquidated Damages for Intermediate Contract Time #4 for the above road closure time restrictions for Westinghouse Boulevard, Tilley Morris Road, Weddington Road, Elm Lane, Ballantyne Commons Parkway and East John Street are \$2,500.00 per 15-minute period or any portion thereof.

B. Hauling Restrictions

The Design-Build Team shall adhere to the hauling restrictions noted in the 2018 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.
- The Design-Build Team shall not haul during the holiday time and special events time restrictions listed in ICT #1 and ICT #2, unless the hauling operation occurs completely behind temporary traffic barrier or guardrail and does not impact traffic operations.
- All entrances and exits for hauling to and from the work zone shall conform to the 2018 NCDOT Roadway Standard Drawings.
- All hauling entrances, exits, and crossings shall be shown on the Transportation Management Plans.

- Haul vehicles shall not enter and / or exit an open travel lane at speeds more than 10 mph below the posted speed limit.
- Hauling access to the I-485 median will be allowed at the beginning and end of the project. Additional hauling access points to the I-485 median shall be at locations chosen by the Design-Build Team. The Design-Build Team shall coordinate the selection of the hauling access points with the Division, who has final approval of the locations selected.
- Hauling operations that perpendicularly cross a roadway shall require Transportation Management Plans and shall be subject to the time restrictions, and holiday, holiday weekend and special event time restrictions listed in ICT #1 and ICT #2.

The Design-Build Team shall address how hauling will be conducted in the Technical Proposal, including but not limited to, hauling of any materials to and from the site and hauling material within the NCDOT right of way.

Excluding hauling operations that are conducted entirely behind a temporary traffic barrier or guardrail, single vehicle hauling shall not be allowed ingress and egress from any open travel lane during the following time restrictions:

For Single Vehicle Hauling

Road Name	Day	Time Restrictions
I-485, I-485 ramps and loops and US 521 (Johnston Road)	Monday through Friday	6:00 a.m. to 9:00 a.m. and 4:00 p.m. to 7:00 p.m.

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:

For Multi-Vehicle Hauling

Road Name	Day and Time	Restrictions
All Roads	Monday through Friday	6:00 a.m. to 9:00 a.m. and 4:00 p.m. to 7:00 p.m.

C. Lane and Shoulder Closure Requirements

The Design-Build Team shall not install more than two (2) miles of lane closures 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 multilane facilities, the Design-Build Team shall not install more than two (2) simultaneous lane closures in any one direction, and shall provide a minimum of two (2)

miles between lane closures, measured from the end of one closure to the first sign of the next lane closure.

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 project, measured from the beginning of the merger taper to the end of the lane closure.

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.

When barrier is placed on the roadway shoulder, the Design-Build Team shall install shoulder closure signs and devices in advance of the barrier using 2018 NCDOT *Roadway Standard Drawings*.

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 2018 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 2018 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 2018 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 minimum, close the lane using the 2018 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 travel way when work is being performed behind a lane closure on the opposite side of the travel way.

D. Pavement Edge Drop off Requirements

The Design-Build Team shall backfill at a 6:1 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 that exceed 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 with 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.

E. Traffic Pattern Alterations

The Design-Build Team shall notify the Engineer, in writing at least twenty-one (21) calendar days prior to any traffic pattern alteration. (Reference the Public Information Scope of Work found elsewhere in this RFP for public information requirements)

F. Signing

The Design-Build Team shall install advance work zone warning signs when work is within 40 feet from the edge of travel lane and no more than three days prior to the beginning of 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 within and off the project limits when a detour is not in operation.

The Design-Build Team shall ensure proper signing (including but not limited to guide signs) is in place at all times during construction, as required by the *MUTCD*. All temporary signing shall be shown on the Traffic Management Plans or a Temporary Signing Plans to be reviewed and approved by the NCDOT Work Zone Traffic Control Section and / or the NCDOT Signing and Delineation Unit prior to incorporation.

G. Traffic Barrier

The Design-Build Team shall use only an NCDOT approved temporary traffic barrier system and adhere to the following requirements:

- Install temporary traffic barrier system a maximum of two (2) weeks prior to beginning work in any location. Once the temporary traffic barrier system is

installed at any location, proceed in a continuous manner to complete the proposed work in that location.

- Place all temporary barrier used for traffic control directly on an asphalt or concrete surface.
- Temporary barrier used for traffic control shall not act as a retaining wall.
- Once the temporary traffic barrier system is installed and no work has been or will be performed behind the temporary traffic barrier system for a period longer than two (2) months, remove / reset the temporary traffic barrier system unless the barrier is protecting traffic from a hazard.
- Excluding water filled barrier, protect the approach end of temporary traffic barrier system at all times during the installation and removal of the barrier by either a truck mounted impact attenuator (maximum 72 hours) or a temporary crash cushion.
- Excluding water filled barrier, protect the approach end of temporary traffic barrier system from oncoming traffic at all times by a temporary crash cushion unless the approach end of 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

- 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.
- Install drums to close or keep closed tangent sections of the roadway until the temporary traffic barrier system can be placed or after the temporary barrier system has been removed. The distance, in feet, between drums shall be no greater than twice the posted speed limit (mph).
- The Design-Build Team shall minimize the presence of portable concrete barrier along acceleration ramps / loops. Thus, justification, in the Department's sole discretion, shall be provided in the TMP for the placement of portable concrete barrier along acceleration ramps / loops. At acceleration ramps / loops, the Design-Build Team shall install temporary traffic barrier system in a manner that provides a minimum of 200 feet from the end of the pavement marking taper to the beginning of the barrier taper.
- The Design-Build Team shall be responsible for providing proper connection between the existing bridge rail and the temporary barrier system and include this information in the appropriate plans.

H. 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 Approved Product List shall require written approval from the Department prior to incorporation.

Channelizing device spacing shall not exceed a distance in feet equal to twice the posted speed limit. Channelization devices shall be spaced ten feet on-center in radii. Channelization devices shall be three (3) 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 2018 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 to allow for ingress or egress.

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.

Portable changeable message signs should be placed off the shoulder of the roadway and behind a traffic barrier, if practical. Where a traffic barrier is not available to shield the portable changeable message sign, it should be placed off the shoulder and outside of the clear zone. If a portable changeable message sign must be placed on the roadway shoulder or within the clear zone, it should be delineated with retro reflective temporary traffic control (TTC) devices. When portable changeable message signs are not being used to display TTC messages, they should be relocated such that they are outside of the clear zone or shielded behind a traffic barrier and turned away from traffic. If relocation or shielding is not practical, the portable changeable message signs shall be delineated with retro reflective TTC devices.

I. High Visibility Traffic Control Devices

For I-485, including all ramps and loops, the Design-Build Team shall furnish and install High Visibility Drums, Stationary Work Zone Signs, and Stationary Portable Work Zone Signs for the purpose of enhancing the conspicuity of both devices and workers, as well as to have higher performance of these devices throughout the project construction. (Reference the *High Visibility Traffic Control Devices* Project Special Provision found elsewhere in this RFP.)

J. Temporary Pavement Markings, Markers, Delineation, and Pattern Masking**I-485, INCLUDING ALL RAMPS, LOOPS, AND STRUCTURES**

The Design-Build Team shall show temporary pavement markings on the Transportation Management Plans that meet the requirements of the *Guidelines for Preparation of Traffic Control and Pavement Marking Plans for Design-Build Projects*, the *Work Zone Performance Pavement Markings*, and the *Work Zone Traffic Pattern Masking Project Special Provisions* found elsewhere in this RFP.

The Design-Build Team shall install temporary pavement markings and markers in accordance with the *Work Zone Performance Marking Project Special Provision* and the *Work Zone Traffic Pattern Masking Project Special Provision*, found elsewhere in this RFP, the 2018 NCDOT *Standard Specifications for Roads and Structures*, and in accordance with the manufacturer's procedures and specifications.

Prior to shifting traffic to a new pattern, the Design-Build Team shall mask / conceal all conflicting markings in accordance with the *Work Zone Traffic Pattern Masking Project Special Provision* found elsewhere in this RFP. The Design-Build team shall also remove all conflicting markers and snowplowable marker castings.

The Design-Build Team shall tie proposed pavement marking lines to existing pavement marking lines.

By the end of each day's operation, the Design-Build Team shall mask / conceal all conflicting markings in accordance with the *Work Zone Traffic Pattern Masking Project Special Provision*, replace all damaged markings, and remove / replace all conflicting / damaged markers.

The Design-Build Team shall not place temporary markings on the final asphalt pavement surface unless the temporary markings are placed in the exact location of the final pavement markings.

Temporary pavement markings on the final concrete surface shall only be removed by hydro blasting.

ALL OTHER ROADS AND STRUCTURES

The Design-Build Team shall show temporary pavement markings on the Transportation Management Plans that meet the requirements of the RFP and the *Guidelines for Preparation of Traffic Control and Pavement Marking Plans for Design-Build Projects*.

The Design-Build Team shall 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 Department 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.

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 as required for the final pavement markings in the Pavement Markings Scope of Work found elsewhere in this RFP.

The Design-Build Team shall install temporary pavement markings and temporary pavement markers on the interim surface or temporary pattern as follows:

Road	Marking	Marker
All Roads and Structures except I-485 ramps and loops	Any Marking on the Approved Product List	Raised Temporary

The Design-Build Team may use any type of pavement markings on the NCDOT Approved Products List for temporary patterns. However, the Design-Build Team shall maintain a minimum retroreflectivity for pavement markings (existing and temporary markings) at all times during construction, as follows:

White:	125 mcd / lux / m ²
Yellow:	100 mcd / lux / m ²

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 1250.01, Sheet 1 of 3.

The Design-Build Team shall tie proposed pavement marking lines to existing pavement marking lines.

By the end of each day's operation, the Design-Build Team shall remove / replace all conflicting markings, replace all damaged markings, and remove / replace all conflicting / damaged markers.

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 removal and / or before installation.

The Design-Build Team shall not place temporary markings on the final asphalt pavement surface unless the temporary markings are placed in the exact location of the final pavement markings

Temporary pavement markings on the final concrete surface shall only be removed by hydroblasting.

Prior to shifting traffic to a new pattern, the Design-Build Team shall remove / replace all conflicting markings and remove all conflicting markers and snowplowable marker castings

Unless noted otherwise in this RFP, removal of the temporary pavement markings on asphalt surfaces shall be done by an NCDOT approved system to minimize damage to the road surface. Temporary pavement markings, on all roads except I-485, shall not be obliterated 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 of the pavement surface.

K. Temporary Traffic Signals

Use the following notes if the Design-Build Team proposes temporary traffic signals for maintenance of traffic:

- 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.

L. Traffic Control Supervisor

The Design-Build Team shall furnish a Traffic Control Supervisor for the project who is knowledgeable of Transportation Management Plan design, devices and application, and has full authority to ensure traffic is maintained in accordance with the plans and specifications developed by the Design-Build Team.

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:

- (1) A minimum 24 months of On-the-Job Training in supervision and work zone set up and implementation on similar projects.
- (2) Be certified by responsible party (contractor or NCDOT) to have the required experience and training and is qualified to perform the duties of this position. If certified by the Contractor, a notarized certification letter shall be furnished to the Engineer at the preconstruction meeting. The letter shall state the Traffic Control Supervisor is qualified, and state that the Traffic Control Supervisor has the authority to ensure traffic is maintained in accordance with the contract documents.

The Traffic Control Supervisor for the project shall perform the following:

- (1) 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.
- (2) 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 setup is maintained throughout the project at all times, including periods of construction inactivity.
- (3) Coordinate and cooperate with NCDOT Statewide Operations Center (STOC) and/or NCDOT Metrolina Traffic Management Center (MRTMC). Provide real time information about changes in the traffic operations within the work zone to ensure proper messages are displayed on the CMSs and DMSs. Changes in traffic operations could be a result of construction activities and/or incidents within the work zone.
- (4) Provide the STOC and MRTMC with the most up to date TMPs on a monthly basis. The TMPs shall show up to date information for breakdown areas and/or detour route locations and associated signing.
- (5) Monitor traffic delays and backups within the work zone and the network that is affected by the presence of the work zone. Provide the STOC and MRTMC records of delays, incidents, and crashes that occurred within the work zone on a monthly basis.
- (6) Coordinate with Law Enforcement, first responders, and other city and state agencies during emergencies.
- (7) Conduct conference calls as needed to update STOC, MRTMC, and the NCDOT Communication Office personnel of construction activities.
- (8) Provide traffic control setup that ensures safe traffic operations and workers' safety throughout the construction area.
- (9) Attend all scheduled traffic control coordination meetings, as required by the Engineer.
- (10) Monitor traffic delays and backups within the work zone.

M. Lighting

Provide portable temporary construction and equipment lighting to conduct night work in accordance with the 2018 NCDOT *Standard Specifications for Roads and Structures*.

Work Zone Presence Lighting and Sequential Flashing Warning Lights

In addition to the requirement above, the Design-Build Team shall furnish and install Work Zone Presence Lighting to supplement the portable construction and equipment lighting for the purpose of alerting motorist to the existence of an active work zone and to encourage compliance with the work zone speed limit. Also, the Design-Build Team shall furnish and install Sequential Flashing Warning Lights on drums used for merging tapers to assist motorist in determining which direction to merge and to decrease late lane merging. (Reference the *Work Zone Presence Lighting* and *Sequential Flashing Warning Lights* Project Special Provisions found elsewhere in this RFP.)

N. Work Zone Speed Limits

All speed limits are to be ordinated by the State Traffic Engineer in order to have a lawfully enforceable speed limit; therefore, 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.

Work Zone Variable Speed Reduction and \$250 Speeding Penalty Ordinances

A Work Zone Variable Speed Reduction is intended to temporarily reduce the speed within the work zone at spot locations of short duration (1 day up to 30 days) where the temporary traffic control is usually to be removed within the same day. A Work Zone “Variable” Speed Limit cannot be in operation continuously (24/7) for a period exceeding 30 calendar days.

Prior to commencing work activities on I-485, The Design-Build Team shall submit both a formal Work Zone “Variable” Speed Reduction Ordinance and a \$250 Speeding Penalty Ordinance request to the Design-Build Manager for approval. The request shall state why the ordinances are needed (reference the criteria listed in the NCDOT Work Zone Traffic Control Guidelines). Upon receipt of the formal requests, the Design-Build Team shall allow six weeks for the Work Zone “Variable” Speed Limit Reduction Ordinance and \$250 Speeding Penalty Ordinance to be approved.

When work requires significant alterations to the existing traffic pattern such as but not limited to those listed below, and if ordinated by the State Traffic Engineer, implement a Work Zone “Variable” Speed Limit Reduction of either 55 mph or 60 mph as stated in the ordinance:

- Temporary Lane Closures
- Temporary Median Cross-overs
- Temporary On-Site Detours
- Temporary “All Exit” road closures
- Temporary Road Closures that require stopping traffic

The Design-Build Team will be responsible for coordinating with the Engineer when the Work Zone “Variable” Speed Limits are to be changed and will have to seek approval by the Engineer before the Speed Limit is changed.

When the variable speed limit reductions are in effect, cover any existing speed limit signs located within the active work area that conflict with the variable speed limit reduction.

The speed limit shall be returned to 65 mph or 70 mph when the lane closure is removed and traffic is returned to the existing pattern.

Digital Speed Limit Signs (DSLS)

The Design-Build Team shall furnish and install Work Zone Digital Speed Limit Signs (DSLS) to continuously display the work zone speed limit. (Reference the *Work Zone Digital Speed Signs* Project Special Provision found elsewhere in this RFP.)

Long Term Work Zone Speed Reduction Ordinance

If, at the Department's sole discretion, the Design-Build Team can justify that the TMPs cannot be designed to adhere to the existing I-485 posted speed limit requirements, the Design-Build Team shall submit a formal Work Zone Speed Limit Reduction Ordinance request to the Design-Build Manager for approval. The request shall state why the ordinance is needed and why the TMPs cannot be designed to avoid the need. The request shall also include an Engineering Study that justifies the need for a Work Zone Speed Limit Reduction Ordinance. (Reference the criteria listed in the NCDOT Work Zone Traffic Control Guidelines) Upon receipt of the formal request, the Design-Build Team shall allow six weeks for the Work Zone Speed Limit Reduction Ordinance to be approved. The Design-Build Team shall provide and install proper signing for all approved Work Zone Speed Limit Reduction Ordinances. The Design-Build Team shall identify the need for a Work Zone Speed Limit Reduction Ordinance in the Technical Proposal.

O. Law Enforcement

Law enforcement officers may be used to maintain traffic through the work area and / or intersections. 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, which are 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. Law Enforcement vehicles shall not be parked within the buffer space of a lane closure. The Design-Build Team shall address where and how law enforcement officers will be used in the Technical Proposal.

P. Temporary Shoring for the Maintenance of Traffic

The Design-Build Team shall be responsible for all required temporary shoring, including but not limited to designing, providing, installing, maintaining and removing. Temporary shoring for the maintenance of traffic is 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 identify locations where temporary shoring for maintenance of traffic will be required on the Transportation Management Phasing Concept. The Design-Build Team shall install temporary traffic barrier as shown on a detail available from Work Zone Traffic Control that provides design information on the temporary traffic barrier location in relation to the temporary shoring and traffic location. The NCDOT Geotechnical Engineering Unit and Work Zone Traffic Control websites have more information on temporary shoring. (Notes related to Temporary Shoring are not required in the General Notes sheet for the Transportation Management Plans.)

The Design-Build Team shall adhere to the additional shoring requirement located on the Work Zone Traffic Control and Geotechnical Engineering Unit websites:

<https://connect.ncdot.gov/projects/WZTC/Pages/default.aspx>

<https://connect.ncdot.gov/resources/Geological/Pages/default.aspx>

The Design-Build Team shall identify on the appropriate traffic control details where temporary shoring will be used by providing station limits, offsets, cut sections, the type of shoring and where temporary traffic barrier will be located if needed.

Q. No Parking / Tow Away Zone Ordinance

Prior to construction, the Department will obtain a No Parking / Tow Away Zone Ordinance on I-485. The Design-Build Team shall provide and install proper signing for the No Parking / Tow Away Zone Ordinance as follow:

1. 1000 feet in advance of the "Begin Road Work" signs
2. On all on-ramps within the project limits
3. A minimum of every 3000 feet in each direction

R. On-Call Towing

The Design-Build Team shall provide an on-call towing service for all disabled vehicles within the project limits and one mile outside of the Begin and End Project Limits on I-485.

The towing service shall relocate disabled vehicles to secure pre-arranged locations outside of the project limits and off the NCDOT right of way.

The towing service shall provide tow vehicles capable of towing automobiles and light trucks (up to 10,000 pound gross vehicle weight) and medium and heavy-duty trucks (greater than 10,000 pound gross vehicle weight). All tow vehicles shall be able to tow using the "wheel lift" method and the conventional boom lift method.

The Design-Build Team shall immediately place a lime green Tow Sticker (provided by the Department) on all disabled vehicles. The Design-Build Team shall provide pertinent information on the sticker, including the designated tow location and the signature and agency of the person authorizing the tow.

The towing service shall tow a disabled vehicle within 20 minutes of placement of the lime green Tow Sticker. The towing service shall only tow vehicles displaying a lime green Tow Sticker.

For all vehicles towed, the Design-Build Team shall keep a record of the approximate disabled vehicle location, vehicle type, including make and color, and the vehicle license plate number. The Design-Build Team shall also maintain a record of the information on the lime green Tow Stickers, including the exact time the vehicle was removed and the exact location of where the vehicle was towed. The Design-Build shall immediately give all the aforementioned information to the Resident Engineer.

Within 30 minutes of a vehicle being towed, the Design-Build Team shall contact the Law Enforcement Agency that is responsible for enforcement on I-485 and provide them with the information necessary for their Database. The towing service shall commence the date construction begins and shall operate 24 hours a day, seven days a week until the project is completed.

Prior to any construction activity, the Design-Build Team shall arrange and attend a towing coordination meeting. The Design-Build Team shall coordinate this meeting with the Division and the Transportation Program Management Director. During this meeting, the locations where vehicles will be towed will be determined, the towing requirements will be confirmed and the process by which specific towing information will be conveyed to the appropriate personnel will be determined.

The towing service base of operation shall have a publicly accessible published telephone number that shall be manned, or have call forwarding to an employee on call, during the aforementioned towing service operation times.

The Design-Build Team shall coordinate placement of the towing operation information on the project website with the NCDOT Communications Office. (Reference the Public Information Scope of Work found elsewhere in this RFP) This information shall include, but not be 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.

S. Miscellaneous

Provide proper drainage for all temporary alignments and/or traffic shifts.

The Design-Build Team shall coordinate with all Contractors and NCDOT Resident Engineers in charge of any project in the vicinity of this project for any work that may affect the construction, traffic operations, and placement of temporary traffic control

devices (including advance warning signs) on all roads within the project limits and associated with this project.

The Design-Build Team shall coordinate with the Charlotte Area Transit System (CATS) for all traffic control phasing that will affect existing transit stops or transit routes.

SIGNING SCOPE OF WORK (2-5-18)**Project Description**

Unless noted otherwise elsewhere in this RFP, 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.

Unless noted otherwise on the I-485 Express Lane Alt. 2C Schematic dated February 13, 2018, the Design-Build Team may retain existing signing that was installed under TIP Project R-4902 that is not damaged, either prior to or during construction; and is required by the Design-Build Team's design.

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>

- 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) including addendum, memos and revisions:

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>

- *LRFD Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals* (AASHTO):

https://bookstore.transportation.org/Item_details.aspx?id=2369

- *Guidelines for Preparation of Signing 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.

The Design-Build Team shall prepare Signing Plans in accordance with the I-485 Express Lane Alt. 2C Schematic dated February 13, 2018. The Design-Build Team shall use the I-485 Express Lane Alt. 2C Schematic, in conjunction with all applicable standards, to develop the Signing Plans. To minimize right of way, utility, drainage and / or jurisdictional impacts, or to install a sign behind existing guardrail, the Design-Build Team will be allowed to shift signs shown on the aforementioned Signing Schematic a maximum of 100 feet. Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall replace all existing signs affected by the project, as well as provide all required additional signs not shown on the aforementioned Signing Schematic. In accordance with the roadway design developed by the Design-Build Team, the Design-Build Team shall develop a signing concept that adheres to the aforementioned Signing Schematic requirements. Any changes from the I-485 Express Lane Alt. 2C Schematic dated February 13, 2018 shall be at the Department's sole discretion.

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.

Signing and Pavement Marking Plans Submittal Requirements

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, F and reference mile marker signs and supports (including overhead sign structures) required through the construction limits of the mainline (I-485), as well as all -Y- Lines, ramps and loops. Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall design, fabricate and install all signs required beyond the construction limits of the mainline, as well as all -Y- Lines, ramps and loops to ensure adequate advance signage and spacing is provided.

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 and all loops, 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, locate and install all Type E signs (warning and regulatory) and Type F signs. All Toll Route Signs shall be Type B assemblies with 36" high route markers.

Along the mainline, the Design-Build Team shall design, fabricate and install two enhanced reference mile markers mounted back to back at 2/10-mile intervals on the median barrier and a single mile marker on the outside shoulders. The Design-Build Team shall install each reference mile marker on one three-pound U-channel post. For reference mile markers installed on the outside shoulders, 1) the reference mile marker shall be located at the outside shoulder point or a maximum of 15' from the edge of travel lane, and 2) the bottom of the reference mile marker shall be four feet above the edge of travel lane (edgeline) elevation. The reference mile marker designs shall be in accordance with the Intermediate Enhanced Reference Location Signs (D10-5) referenced in the *Standard Highway Signs* (2004 Edition and the 2012 Supplement to the 2004 Edition). The Department will provide reference mile marker numbers.

Enhanced ramp reference markers will not be required on ramps or loops.

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. At a minimum, the advisory speed signing shall include W13-6, W13-7, W1-11R, W13-1P and E13-1P signs.

The Design-Build Team shall design, fabricate and install 30" x 36" Chevron Alignment signs (W1-8) along all interchange exit loops. Each Chevron Alignment sign shall be:

- installed on two U-channel posts spaced 24” apart with cross bracing
- located and installed so the bottom of the sign is four feet above the outside edge of the travel lane elevation

The first Chevron Alignment sign shall be installed as close as practical after the exit gore sign (approximately 20’ from the exit gore sign), and shall not interfere with or block the exit gore sign. The first five Chevron Alignment signs shall be spaced approximately 40’ apart and oriented to optimize the view of approaching motorists. After these first five Chevron Alignment signs, or beyond the midpoint of the curve, Chevron Alignment sign spacing shall adhere to the MUTCD requirements.

The Design-Build Team shall install a two-inch by four-foot high red retroreflective sheeting strip on sign posts for Wrong Way and Do Not Enter signs located on all ramps, loops and Direct Connections impacted by the Design-Build Team’s design and / or construction. (Reference Sections 2A.15 and 2A.21 of the MUTCD)

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 and toll rate signs.

Toll Rate And Dynamic Module Signs

The Design-Build Team shall design toll rate signs for surface-mounted electronic dynamic toll rate modules. Cut outs in the toll rate signs will not be allowed for the electronic dynamic toll rate modules.

The Design-Build Team shall design, furnish and erect the static element of the toll rate sign and the supporting overhead sign structure. The Design-Build Team shall design, furnish and install drop conduit from the ITS trunk line to a cabinet provided and installed by the Toll Systems Integrator and drop conduit from the cabinet to the edge of the toll rate sign closest to the vertical member of the overhead sign structure (reference the NCTA ITS Standard Details dated October 7, 2014). The Design-Build Team shall design, furnish and install power drop conduit to the cabinet location and from the cabinet location to the edge of the toll rate sign closest to the vertical member of the overhead sign structure. All vertical conduit shall be contained within the vertical support of the overhead sign structure.

The Toll Systems Integrator shall be responsible for specifying, furnishing and installing the toll rate module, the erection of the module to the static sign, conduit from the edge of the sign to the module, communication cables from the main NCTA I-5507 ITS trunk line, conductor cable from the provided electrical service to the cabinet and to the toll rate module, the toll rate module controller cabinet, and the pole and foundation for the controller cabinet. The Design-Build Team shall coordinate with the Toll Systems Integrator regarding the size, weight, and installation of the dynamic modules.

Logo Signs (Blue Service Signs with Specific Business Panels)

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 or the business panels during construction and / or installation, 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, arrows, NCTA Pictographs, and all Interstate, US and NC route shields. 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-485) shall be 70 mph.

Interstate, US, and NC Route Designation

Interstate, US and NC highway routing shall be coordinated within the Traffic 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.

Unless depicted otherwise in the I-485 Express Lane Alt. 2C Schematic dated February 13, 2018, the Design-Build Team shall provide a minimum of two advance 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 prior to fabrication.

Erection of signs on Toll Gantries will not be allowed.

Ground Mounted Sign Supports

The Design-Build Team shall locate, 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, in writing, 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.

All ground mounted signs with tolling information, including but not limited to toll collection and interoperable signs, shall be on breakaway supports regardless of the existence of positive protection.

Unless noted otherwise elsewhere in this RFP, all Type D, E and F signs and sign assemblies 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, E and F signs and sign assemblies shall be installed on a maximum of two U-channel posts.

Type B route sign assemblies shall be mounted on steel support(s) with foundation(s) designed with the latest support design software.

The Design-Build Team shall design all ground mounted sign supports on concrete median barriers.

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 as shown in the I-485 Express Lane Alt. 2C Schematic dated February 13, 2018, 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 multi-lane exit or freeway / ramp split (use Arrow Per Lane signs)
- A freeway ends and “All Traffic Exit”
- A freeway lane ends (freeway lane drop)
- Three or more lanes on a freeway ramp

The wind speed for the overhead sign structure and foundation designs 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

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 NCDOT Roadway Standard Drawing No. 854.05.

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.

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.

Proposed Overhead Wind Load Area

Overhead sign structures shall be designed for proposed and future signs. The designer 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 according to 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 wind load areas do 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

Existing Overhead Structures

Prior to modifying an existing overhead sign assembly to accommodate proposed signs that exceed the original windload area, the Design-Build Team shall perform a structural analysis of the overhead sign structure. 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 windload 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 windload area does not require a structural analysis, the Design-Build Team shall remove and dispose of the existing overhead signs that shall be replaced in accordance with the I-485 Express Lane Alt. 2C Schematic dated February 13, 2018. 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 windload area, and 8) confirmation that the proposed windload area does not exceed the original windload area.

The Design-Build Team shall remove and dispose of lighting systems and walkways on all existing overhead sign structures that require sign modification(s) and are retained. In accordance with the *Cutting of Steel Sign Hangers on Overhead Signs* Project Special Provision found elsewhere in the RFP, the Design-Build Team shall remove excess sign hangers.

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.

Pedestal Overhead Sign Structures

Pedestal mounted overhead signs will not be allowed.

Shop Drawings for Overhead Sign Structures

The Design-Build Team shall prepare a shop drawing for each proposed or modified overhead sign structure for the Department's review and approval. For shop drawing design and submittal requirements, see *Guidelines for Preparation of Signing Plans for Design-Build Projects and Standard Specifications for Roads and Structures*.

Guardrail or other Positive Protection for Overhead Sign Supports

Except as allowed 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 barrier. 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 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 projectection 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 2018 *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.

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.

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.

PAVEMENT MARKING SCOPE OF WORK (1-11-17)**General**

The Design-Build Team shall prepare Final Pavement Marking Plans in accordance with the edition of the *Manual on Uniform Traffic Control Devices (MUTCD)* effective on the Technical Proposal submittal date, the 2018 NCDOT Roadway Standard Drawings, *Guidelines for Preparation of Traffic Control and Pavement Marking Plans for Design-Build Projects*, the *Design-Build Submittal Guidelines*, and the requirements contained herein.

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)*.

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 with guidance from the 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 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. The Design-Build Team shall install all pavement markings and markers located within and outside the project limits, resulting from the project construction.

Pavement Markings, Markers and Delineation

The Design-Build Team shall not place any final pavement markings or markers until the Final Pavement Marking Plans are reviewed and accepted by the Department.

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 Product 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.

The Design-Build Team shall install pavement markings and pavement markers on the final surface as follows:

Road	Marking	Marker
I-485 and I-485 Ramps / Loops / Direct Connections	Thermoplastic with Highly Reflective Elements	Snowplowable
-Y- Lines	Thermoplastic with Highly Reflective Elements	Match existing
Concrete bridge decks	* Cold Applied Plastic Type II or Type III	Raised

* On concrete surfaces, the Design-Build Team shall install Cold Applied Plastic Type II or Type III for edge-lines / center-lines, stop bars, symbols, characters, crosswalks and diagonals. The Design-Build Team shall install 1.5" black contrast borders at all skips, mini-skips, symbols and characters.

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 lines, edge lines and skips) for the final pavement marking. The Design-Build Team shall install gore lines that are twice the edge line width

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.

Using approved methods, the Design-Build Team shall remove residue and surface laitance on concrete bridge decks prior to placing final pavement marking materials.

Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall remove temporary pavement markings using water blasting, grinding, shot blasting or another NCDOT approved system that minimizes damage to the road surface. The Design-Build Team shall not remove temporary pavement markings from asphalt surfaces using water blasting.

Between express lanes and general purpose lanes, the Design-Build Team shall install Tubular Markers - Fixed. The Tubular Markers shall be 36" in height and spaced approximately eight feet apart. The Department shall approve all Tubular Markers prior to installation. For additional guidance on the required separation treatment between express lanes and general purpose lanes, the Design-Build Team shall reference the English Standard Drawing for *Toll Pavement Markings* located on the Signing and Delineation Unit's website.

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.

ENVIRONMENTAL PERMITS SCOPE OF WORK (1-31-18)**General**

The Design-Build Team shall be responsible for preparing all documents necessary for the Department to obtain the environmental permits required for the project construction. Permit applications shall be required for the: US Army Corps of Engineers (USACE) Section 404 Permit and NC Department of Environmental Quality (DEQ) Division of Water Resources (DWR) Section 401 Water Quality Certification.

The Design-Build Team shall not begin ground-disturbing activities, including utility relocation in jurisdictional areas, until the environmental permits have been issued (this does not include investigative borings covered under a Nationwide Permit No. 6 and utility relocation work outside jurisdictional resources noted below).

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 within jurisdictional resources, provided all of the Nationwide Permit No. 6 General Conditions are followed.

The Design-Build Team may begin utility relocation work prior to obtaining the aforementioned permits provided that (1) the Department is notified in writing prior to these activities; (2) such activities are outside jurisdictional resources; (3) a meeting is held with the NCDOT and permitting agencies prior to beginning work, if necessary; and (4) the Design-Build Team submits a Preconstruction Notification for the Department to forward to the environmental agencies, if necessary.

There will be no 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 Natural Environment Section (NES) - Environment Coordination and Permitting Group (ECAP), the Department's NES - Biological Surveys Group (BSG), or the Division's Environmental Officer present. A representative from the Design-Build Unit shall be included on all correspondence.

Project I-5507 / R-0211EC / U-4714AB is not in the Merger Process used by the environmental agencies and the Department to obtain environmental permits. On Non-Merger Projects, the Department has committed to coordination efforts with the environmental agencies. Thus, the Design-Build Team shall participate and present information for an interagency hydraulic design review meeting and an interagency permit impacts meeting. These meetings shall adhere to the Concurrence Point 4B and Concurrence Point 4C requirements of the Merger Process used by

the environmental agencies and the Department to obtain environmental permits. Specifically, the Design-Build Team shall follow the appropriate details on the Merger Information website referenced below:

<https://connect.ncdot.gov/resources/Environmental/Pages/Merger.aspx>

Any variations in the Department's proposed design and / or construction methods that nullify 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 honor any requests for additional contract time or compensation associated with this additional coordination.

Unless stipulated otherwise in the Technical Proposal, the Department will schedule the interagency hydraulic design review meeting and the interagency permit impacts meeting for February 2019 and May 2019, respectively. The Design Build Team shall clearly identify in their Technical Proposal what months they would like the Department to schedule these meetings. Failure on the part of the Design-Build Team to meet these dates shall place all responsibility for delays resulting from missing these dates solely in the hands of the Design-Build Team.

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 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

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 aforementioned interagency hydraulic design review meeting and interagency permit impacts meeting, and from the project as designed by the Design-Build Team. Further, it shall be the Design-Build Team's responsibility to provide these permit impact sheets (drawings) depicting the design and construction details to the Department as part of the permit application. 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
- Minutes from the interagency hydraulic design review meeting and interagency permit impacts 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
- Completed forms (Section 404 ENG 4345, etc.) appropriate for impacts
- Division of Mitigation Services Acceptance Letter

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.

Direct coordination between the Design-Build Team, the Design-Build Unit, Resident Engineer, Division Environmental Officer (DEO) and the Department’s Natural Environment Section (NES) shall be necessary to ensure proper permit application development. Upon completion of the permit application package, the Design-Build Team shall concurrently forward the package to the Design-Build Unit, Resident Engineer, Division Environmental Officer (DEO), Hydraulics Unit and NES for review and approval. After all revisions are complete, the Department will subsequently forward the package to the appropriate environmental agencies.

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 NES prior to the interagency hydraulic design review meeting and the interagency permit impacts meeting; and resolved with the environmental agencies during the aforementioned meetings.

The Design-Build Team shall clearly indicate the location of 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. 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 interagency hydraulic design review meeting and the interagency permit impacts 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.

Requests made for modifications to the permits obtained by the Design-Build Team shall only be allowed if the Engineer determines it to be in the best interest of the Department and shall be strongly discouraged. The Design-Build Team shall not take an iterative approach to hydraulic design issues. The hydraulic design shall be complete prior to permit application.

Permit Timeframe

The Design-Build Team should expect it to take up to 11 months to accurately and adequately complete all designs necessary for the permit application, submit the application package to the Department, and obtain permit approvals from the environmental agencies. Environmental Agency review time will be approximately 120 days from receipt of a "complete" package. No requests for additional contract time or compensation will be allowed if the permits are obtained within this 11-month period. With the exception of location and survey work, utility relocation work outside jurisdictional resources that adhere to the aforementioned requirements, permitted investigative borings covered under a Nationwide Permit No. 6 and / or Preconstruction Notification secured by the Design-Build Team, no mobilization of personnel, materials, or equipment for site investigation or construction of the project shall occur prior to obtaining the permits (either within the 11-month period or beyond the 11-month period). The Department will not honor any requests for additional contract time or compensation, including idle equipment or mobilization or demobilization costs, for the Design-Build Team mobilizing personnel, materials (or ordering materials), or equipment prior to obtaining all permits. The Department will consider requests for contract time extensions for obtaining the permits only if the Design-Build Team has pursued the work with due diligence, the delay is beyond the Team's control, and the 11-month period has been exceeded. If time were granted, it would be only for that time exceeding the 11-month period. This 11-month period is considered to begin on the Date of Availability as noted elsewhere in the RFP.

The Design-Build Team is advised herein that the approximate timeframes listed above for the NCDWR and the USACE to review a permit application begin only after a fully complete and 100% accurate submittal.

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 has acquired the compensatory mitigation for unavoidable impacts to wetlands and surface waters due to the project construction from the NC Division of Mitigation

Services. This amount of mitigation acquired was based on impacts, as identified in the Department's Preliminary Plans.

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 revised design 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 and before construction may commence. 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 all costs associated with acquiring additional mitigation from the NC Division of Mitigation Services or an approved compensatory mitigation banking resource.

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 an 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 resources surveys in these areas. The environmental consultant shall obtain concurrence through NES 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, identify the amount of time beyond the aforementioned 11-month period, 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 interagency hydraulic

design review meeting and the interagency permit impacts meetings, 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-5507 Categorical Exclusion (CE), the R-0211EC Environmental Assessment (EA), the R-0211EC Finding of No Significant Impact (FONSI), the U-4714 Environmental Assessment (EA), the U-4714 Finding of No Significant Impact (FONSI), Right of Way / Construction Consultations, all permits, all interagency meetings, and all site visits.

If the Design-Build Team discovers any previously undocumented historic or archaeological resources while conducting the authorized work, they shall immediately suspend activities in that area and notify, in writing, the NCDOT Archaeology Supervisor and NCDOT Project Development Engineer, as listed below, who will initiate any required State / Federal coordination after a timely initial assessment. The Design-Build Team shall also immediately notify a representative from the Design-Build Unit. 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 Mr. Matthew Wilkerson, NCDOT Archaeology Group Leader at (919) 707-6089, or Angela Sanderson, NCDOT Project Development Engineer at (919) 707-6042.

EROSION AND SEDIMENTATION CONTROL SCOPE OF WORK (9-28-16)

The NCDOT Roadside Environmental Unit shall review and accept all Erosion and Sedimentation Control Plans. Clearing & Grubbing and Final Grade Release for Construction (RFC) Erosion Control Plans shall be submitted 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 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 August 1, 2016 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 August 1, 2016 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. 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.
6. Take into account topography and show existing contour lines on Clearing & Grubbing Plans only.
7. 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-B's in proposed TSD's and temporary diversions (TD).
8. 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.
9. Sediment basins shall be sized to provide adequate silt storage for 3600 cubic feet per disturbed acre with surface area equal to 435 square feet per cubic foot per second (cfs) of the peak inflow rate, Q10, using 10-year peak rainfall data (NCDEQ - *Erosion and Sediment Control Planning and Design Manual* or NOAA's National Weather Service website <http://dipper.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.
10. Skimmer Basins shall be sized to provide adequate silt storage for 1800 cubic feet per disturbed acre with surface area equal to 325 square feet per cubic foot per second (cfs) of the peak inflow rate, Q10, using the 10-year peak rainfall data (NCDEQ - *Erosion and Sediment Control Planning and Design Manual* or NOAA's National Weather Service website <http://dipper.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) = Q10 (cfs) * 435.
 - b. Volume requirement shall be 1800 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. The minimum and maximum length to width ratio of all Sediment Basins shall be 2:1 and 6:1, respectively.

13. 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.
14. 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 shall require a construction sequence. Prior to installation of pipes smaller than 48 inches in jurisdictional areas, 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.
15. During construction, provide temporary sediment basins that dewater from the surface at all permanent stormwater devices.
16. Utilize Coir Fiber Wattles with Polyacrylamide (PAM) and / or TRSC-As with Matting and PAM in temporary and permanent, existing and proposed ditches at a spacing of 50 feet 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.
17. Place a device utilizing PAM at all sediment basin inlets.
18. At a maximum spacing of 200 feet, and as directed, utilize Special Sediment Control Fence drainage breaks in silt fence.
19. Do not place erosion control devices that require excavation (i.e. sediment basins, silt ditches, etc.) in wetlands.
20. Within the entire project limits, provide disturbed and undisturbed drainage areas in MicroStation Format.
21. 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.
22. Excluding perimeter 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-B's or wattles to reduce velocity in existing and proposed ditches with spacing of 250 feet divided by percentage of ditch grade. Also utilize TRSC-B's in proposed TSD's and TD's.
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 3600 cubic feet per disturbed acre with surface area equal to 435 square feet per cubic foot per second (cfs) of the peak inflow rate, Q10, using 10-year peak rainfall data (NCDEQ - *Erosion and Sediment Control Planning and Design Manual* or NOAA's National Weather Service website <http://dipper.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 1800 cubic feet per disturbed acre with surface area equal to 325 square feet per cubic foot per second (cfs) of the peak inflow rate, Q10, using the 10-year peak rainfall data (NCDEQ - *Erosion and Sediment Control Planning and Design Manual* or NOAA's National Weather Service website <http://dipper.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) = Q10 (cfs) * 435.
 - b. Volume requirement shall be 1800 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. Provide matting for erosion control in all ditch lines, including but not limited to temporary ditch lines (TDs) utilized to divert offsite runoff around construction areas, where the velocity is greater than 2.0 feet / sec, and the shear stress is 1.55 psf or less. For ditch lines with a shear stress above 1.55 psf, Permanent Soil Reinforcement Mat or Rip Rap shall be utilized.
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. Along all slopes (cut and fill) that are 30 feet or higher, place parallel rows of 12-inch Excelsior Wattles at a spacing height of 20 feet.
15. The minimum and maximum length to width ratio of all Sediment Basins shall be 2:1 and 6:1, respectively.
16. 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.
17. During construction, provide temporary sediment basins that dewater from the surface at all permanent stormwater devices.
18. Utilize Coir Fiber Wattles with Polyacrylamide (PAM) and / or TRSC-As with matting and PAM in temporary and permanent, existing and proposed ditches at a spacing of 50 feet 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 a device utilizing PAM at all sediment basin inlets.
20. At a maximum spacing of 200 feet, and as directed, utilize Special Sediment Control Fence drainage breaks in silt fence.
21. Do not place erosion control devices that require excavation (i.e. sediment basins, silt ditches, etc.) in wetlands.
22. Within the entire project limits, provide disturbed and undisturbed drainage areas 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. All perimeter Sediment Basins shall be placed outside of fill slopes.

C. Intermediate Phase

Intermediate Erosion Control Plans shall only 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. Intermediate 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 and permanent soil reinforcement 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:

http://www.ncdot.gov/doh/operations/dp_chief_eng/roadside/soil_water/special_provisions/
- 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. 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. 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:

http://www.ncdot.gov/doh/operations/dp_chief_eng/roadside/soil_water/pdf/ConcreteWashoutStructuresdetail.pdf

- G. 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 Provision 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:

http://www.ncdot.gov/doh/operations/dp_chief_eng/roadside/fieldops/downloads/Files/ContractedReclamationProcedures.pdf

- H. 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.
- I. An accepted Erosion and Sedimentation Control Plan shall not exempt the Design-Build Team from making every effort to contain sediment onsite.
- J. Any Erosion Control Design revision made during the construction of the project shall be submitted to NCDOT Roadside Environmental Unit by the 15th of the month via the Design-Build Unit. At any time 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.
- K. The Design-Build Team shall comply with the North Carolina Administrative Code *Title 15A Environmental Quality* Chapter 4, Sedimentation Control.

- L. 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 NCDOT Roadside Environmental Unit. Erosion and Sedimentation Control Plan submittals shall only be reviewed and accepted by 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.
- M. 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.
- N. 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.
- O. 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. When the project conditions no longer warrant, in the sole discretion of the Department, inspections by the erosion and sedimentation control designer may cease.

P. 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

Q. Erosion & Sediment Control / Stormwater Certification shall be required according to the Project Special Provision found elsewhere in this RFP.

R. Prior to installation of any erosion control devices, the Design-Build Team shall verify boundaries of jurisdictional areas in the field and delineate with Safety Fence or flagging. For guidance on Safety Fence and flagging in jurisdictional areas, see:

http://www.ncdot.gov/doh/operations/dp_chief_eng/roadside/fieldops/downloads/

S. 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.

T. 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)

U. 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.

V. In accordance with the requirements noted herein, the Design-Build Team shall be responsible for erosion control design, plans, 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, plan implementation and / or maintenance of erosion control measures do not conflict with the erosion control design, 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.

W. 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 August 1, 2016. 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 August 1, 2016 NCG-010000 General Construction Permit.

X. 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:

August 1 - June 1

50# Rye Grain
500# Fertilizer
4000# Limestone

May 1 - September 1

50# German or Browntop Millet
500# Fertilizer
4000# Limestone

At the Engineer's sole discretion, the use of limestone on sandy soils that require topsoil for stabilization may be eliminated. 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:

Shoulder and Median Areas

August 1 – June 1

20# Kentucky Bluegrass Cultivars *
75# Hard Fescue Cultivars **
25# Rye Grain
500# Fertilizer
4000# Limestone

May 1 – September 1

20# Kentucky Bluegrass Cultivars *
75# Hard Fescue Cultivars **
10# German or Browntop Millet
500# Fertilizer
4000# Limestone

Riparian and Wetland Locations

August 1 – June 1

18# Creeping Red Fescue Cultivars ***
6# Indiangrass
8# Big Bluestem
4# Switchgrass
35# Rye Grain
500# Fertilizer
4000# Limestone

May 1 – September 1

18# Creeping Red Fescue Cultivars ***
6# Indiangrass
8# Big Bluestem
4# Switchgrass
25# German or Browntop Millet
500# Fertilizer
4000# Limestone

Areas Beyond the Mowing Pattern, Waste and Borrow Areas

August 1 – June 1

100# Tall Fescue Cultivars ****
15# Kentucky Bluegrass Cultivars *
30# Hard Fescue Cultivars **
25# Rye Grain
500# Fertilizer
4000# Limestone

May 1 – September 1

100# Tall Fescue Cultivars ****
15# Kentucky Bluegrass Cultivars *
30# Hard Fescue Cultivars **
10# German or Browntop Millet
500# Fertilizer
4000# Limestone

*** Approved Kentucky Bluegrass Cultivars**

4-Season	Blue Velvet	Gladstone	Quantum Leap
Alexa II	Blueberry	Granite	Rambo
America	Boomerang	Hampton	Rhapsody
Apollo	Brilliant	Harmonie	Rhythm
Arcadia	Cabernet	Impact	Rita
Aries	Champagne	Jefferson	Royce
Armada	Champlain	Juliet	Rubicon
Arrow	Chicago II	Jump Start	Rugby II
Arrowhead	Corsair	Keeneland	Shiraz
Aura	Courtyard	Langara	Showcase
Avid	Delight	Liberator	Skye
Award	Diva	Madison	Solar Eclipse
Awesome	Dynamo	Mercury	Sonoma
Bandera	Eagleton	Midnight	Sorbonne
Barduke	Emblem	Midnight II	Starburst
Barnique	Empire	Moon Shadow	Sudden Impact
Baroness	Envicta	Moonlight SLT	Total Eclipse
Barrister	Everest	Mystere	Touche
Barvette HGT	Everglade	Nu Destiny	Tsunami
Bedazzled	Excursion	NuChicago	Unique
Belissimo	Freedom II	NuGlade	Valor
Bewitched	Freedom III	Odyssey	Voyager II
Beyond	Front Page	Perfection	Washington
Blacksburg II	Futurity	Pinot	Zinfandel
Blackstone	Gaelic	Princeton 105	
Blue Note	Ginney II	Prosperity	

**** Approved Hard Fescue Cultivars**

Aurora II	Eureka II	Oxford	Scaldis II
Aurora Gold	Firefly	Reliant II	Spartan II
Berkshire	Granite	Reliant IV	Stonehenge
Bighorn GT	Heron	Rescue 911	
Chariot	Nordic	Rhino	

***** Approved Creeping Red Fescue Cultivars**

Aberdeen	Boreal	Epic	Cindy Lou
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****** Approved Tall Fescue Cultivars**

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

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.

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.

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.

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.

Supplemental Seeding

For all supplemental seeding, the kinds of seed and proportions shall be the same as specified above for *Long Term Stabilization*. 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

The minimum mowing height shall be six 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 *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.

**ALL-ELECTRONIC TOLLING (AET) TOLL ZONE FACILITIES INFRASTRUCTURE
SCOPE OF WORK** (01-02-18)

General

This All-Electronic Tolling (AET) Toll Zone Facilities Infrastructure Scope of Work includes design, engineering, fabrication, delivery and erection of gantries, concrete pads, electrical work, equipment cabinets, conduit duct banks and associated junction boxes necessary for the infrastructure of the AET tolling system. The Scope of Work also includes a Wrong-Way Detection System for alerting vehicles traveling the wrong way down the Westinghouse Direct Connector.

The Design-Build Team shall design and construct the AET Toll Zones in conformance with the February 1, 2018 North Carolina Turnpike Authority (NCTA) *AET Standard Drawings* provided by the Department.

The Department will procure a Toll Systems Integrator (TSI), to design, develop, install, test and operate the roadside toll AET equipment for the project.

The Design-Build Team shall coordinate with the Department in the final design and construction of the AET Toll Zone to readily accommodate the TSI's components and to achieve the NCTA tolling performance requirements. Some information contained within this Scope of Work and the NCTA AET Standard Drawings is conceptual and may not identically match the specific tolling system provided by the TSI. The Design-Build Team shall consider all local conditions and proposed tolling equipment and produce a complete and comprehensive design for conduits, boxes, pads and other infrastructure to support the integration of the roadside toll AET equipment. However, based upon coordination with the TSI there may be a modification of items indicated within this Scope of Work in the final design of the AET Toll Zone, which if accepted and approved by the Department will result in compensation adjustments, either additions or deletions, in accordance with the 2018 NCDOT *Standard Specifications for Roads and Structures*.

At the completion of work, the Design-Build Team shall provide electronic as-built plans that indicate all infrastructure elements installed with their accurate locations.

The Design-Build Team shall provide the NCTA, via the Design-Build Unit, one complete binder containing equipment installation / maintenance manuals, warranty information, etc. for all installed equipment. The Design-Build Team shall also provide electronic (soft) copies of all material on a USB memory stick with the binder.

The Design-Build Team shall be responsible for design, construction, construction drawings, as-built plans, details, and specifications described within this Scope of Work of, unless noted otherwise elsewhere in this RFP. The Design-Build Team shall provide all details and plans consistent with industry standards and professional requirements; drawings relevant to this Scope of Work shall be signed and sealed by a North Carolina registered professional engineer.

AET Toll Zone Location

The Design-Build Team shall locate each AET Toll Zone at the general locations indicated on the February 1, 2018 NCTA ITS Concept Plans provided by the Department. The Design-Build Team shall coordinate the final site location for the AET Toll Zones with the Department and the TSI. The Department shall approve the final location prior to the Design-Build Team proceeding with final design drawings.

The Design-Build Team shall locate AET Toll Zones away from sources of Electro Magnetic Interference (EMI), such as high voltage electric lines, electrical power supply transformers, motors, Magnetic Resonance Imaging (MRI) and X-ray equipment, radio transmitters, radar transmitters, and induction heating devices in order to minimize interference with future communications cabling.

Prior to developing the final design, the Design-Build Team shall provide GPS coordinates of the preliminary design toll zone locations to the Department for the spectrum analysis.

A Radio Frequency (RF) Spectrum Analysis will then be performed by the Department to determine whether or not the proposed AET Toll Zone is free from electromagnetic conditions that may cause interference with the Radio Frequency Identification (RFID) technology. If interference is found, the Design-Build Team shall re-locate the AET Toll Zone.

The Design-Build Team shall locate all AET Toll Zones in roadway areas where lane changing and weaving would not be expected. The Design-Build Team shall not locate AET Toll Zones under structures, on structures, or within 100 feet of a structure.

The Design-Build Team shall not construct drainage (or other) pipes within 25 feet of any AET gantry(s), conduit or junction box. The design and construction shall ensure that surface stormwater is intercepted and directed away from all in-ground junction boxes and equipment pads. The Design-Build Team shall closely coordinate the AET Toll Zone design with the roadway design. If needed, shoulder berm gutter and / or curb shall be designed and constructed to assure stormwater is directed away from the junction boxes and equipment pads.

As shown in the NCTA *AET Standard Drawings*, the Design-Build Team shall protect all gantry columns within the clear zone with barrier wall or guardrail.

AET Toll Zone Location Geometric Design

The Department prefers that the AET Toll Zone be located in a minimum 250-foot long horizontal tangent section, with limits of 125 feet before and after, in each direction, the AET gantry structure centerline.

In the event the AET Toll Zone cannot be located in a horizontal tangent section, it may be located in a horizontal curve with a radius of 2,000 feet or greater.

The Design-Built Team shall locate AET Toll Zones between at least 350 feet but no more than 2,640 feet (one-half mile), from the express lane entry or exit point.

For tolled direct connector ramps, the Design-Build Team shall locate AET Toll Zones a minimum of 350 feet from the roadway gore point.

The Design-Build Team shall locate AET Toll Zones in roadway areas where uniform vehicle speeds above 35 mph are expected.

Gantry Design Requirements

The Design-Build Team shall design, engineer, fabricate, transport and erect watertight gantry structures to which the TSI will attach the tolling equipment. The gantries shall be designed in accordance with the 2015 AASHTO Load and Resistance Factor Design (*LRFD*), *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, 1st Edition, using a minimum wind speed of 90 miles per hour.

The Design-Build Team shall provide a single gantry structure at each AET Toll Zone. The Design-Build Team shall custom design each gantry to span the Express Lane width as indicated on the February 1, 2018 NCTA AET Concept Plans provided by the Department. The gantries shall be designed and constructed to ensure that the line of sight for cameras, camera lights, and overhead profilers / separators are not obstructed by the structure.

Sample loads for a typical express lane tolling design are shown on the NCTA *AET Standard Drawings*. The Design-Build Team shall coordinate with the TSI and the Department for final toll gantry loading and design.

In accordance with the NCTA *AET Standard Drawings*, the Design-Build Team shall provide vertical clearance that maintains proper clearances for the gantry and all toll collection equipment.

As shown in the NCTA *AET Standard Drawings*, the Design-Build Team shall design and construct an equipment-mounting frame to be used for the installation of the toll collection equipment. The gantry structure, equipment mounting frame, and overhead scanner frame shall be designed and constructed to support the equipment shown in the NCTA *AET Standard Drawings* without detrimental vibration from wind forces or drafts from vehicles passing under the gantry. Detrimental vibration is defined as the amount of vibration that would prevent the structure from meeting the fatigue design and serviceability requirements as defined in the 2015 AASHTO *LRFD Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*, 1st Edition.”

The Design-Build Team shall provide internal conduits / raceway terminating above the equipment frame and at the equipment cabinets and / or at-grade control / junction boxes at the base of the gantry as shown in the NCTA *AET Standard Drawings*.

The Design-Build Team shall design gantry to accommodate a minimum 18" cable bend radius on top and bottom at entry points.

The Design-Build Team shall provide a 12” by 12” divided cable tray along the top of the gantry as shown in the NCTA *AET Standard Drawings*.

As shown on the NCTA *AET Standard Drawings*, the Design-Build Team shall locate hand-holes, stub-outs, junction boxes, or control boxes, for access to equipment cabling and electrical wiring located in cabinets.

Foundation / Concrete Maintenance Pad

As shown in the NCTA *AET Standard Drawings*, the Design-Build Team shall construct Class B concrete pads that will serve as equipment cabinet foundations. The equipment cabinet foundations shall be a minimum of eight inches thick and two inches (minimum) to four inches (maximum) above grade. The Design-Build Team shall design and grade the site so water flows away from the equipment pads. The top of the equipment pads shall be at an elevation that equals the elevation of any adjacent curbs or higher, as necessary, to facilitate drainage.

The concrete pads shall have a broomed finish.

The Design-Build Team shall ensure that the pad around all cabinets extends at least three feet out from the cabinet. If there is an adjacent slope, handrails shall be installed as needed and / or as required by safety guidelines / policies for fall protection.

Conduit and Junction Boxes

The Design-Build Team shall design and construct required conduits and cabling infrastructure necessary to establish the communications path between fiber-optic trunk line, AET Toll Zone gantries, cabinets, and junction boxes. The Design-Build Team shall install the number and size of conduits, boxes and related equipment specified in the ITS Scope of Work found elsewhere in this RFP and the NCTA *AET Standard Drawings*.

The Design-Build Team shall coordinate with the Department throughout the conduit and junction box design and installation.

As specified in the NCTA *AET Standard Drawings* and in accordance with the NFPA-70 (National Electric Code), the Design-Build Team shall provide separation between power and communications conduit.

The Design-Build Team shall provide an 18” wide Class B concrete apron (a minimum of four inches thick) around all ground-mounted junction boxes. The apron shall be one inch above grade.

The Design-Build Team shall furnish conduits with plastic bushings (or comparable material) stubbed out at all concrete pads to prevent cables from being damaged when being pulled through conduits or shifting during use. The Design-Build Team shall clearly label each end of the conduits and include conduit plugs, pull line in each conduit, and tracer wire (if needed) per Article 1091-3 of the 2018 NCDOT *Standard Specifications for Roads and Structures*.

The Design-Build Team shall provide galvanized metallic conduit (GMC) in above-ground installations to protect from damage, per NEC 352.

Electrical Service

The Design-Build Team shall provide electrical service to each AET Toll Zone, as follows:

- Electrical service to the AET Toll Zones shall be 120/240V single-phase service.
- Provide an operating voltage of 120/240V, at a minimum, 60 amps at the AET Toll Zone, unless otherwise approved.
- Provide an electrical power panel in a conventional NEMA 1 surface mount panel board enclosure if located in a NEMA 3R cabinet mounted on an H-Frame at the tolling location, which supplies power to the electronic toll equipment. Power shall be located to supply power to all components in the proximity of the power drop.
- Provide, at a minimum, a 100 amp main breaker with a minimum of 24 circuits.
- Provide, at a minimum, one (1) two-pole breaker for UPS, coordinated with the TSI, and 20% installed spare breakers at 20 amps rated, at a minimum, 18K AIC.
- Provide a main ground bus bar connected to the tolling system grounding array with a maximum of 20 ohms resistance.

The above requirements are for a single AET Toll Zone for one direction of travel. If AET Toll Zones are co-located for both directions, the above requirements apply separately to each direction.

The Design-Build Team shall coordinate with the TSI and the Department in the design of the electrical loading, ampere capacity rating, circuit poles, etc. for the final power panel design.

The Design-Build Team shall coordinate with the local utility company(ies), make application(s) in the name of the NCDOT, and pay all deposit fees to provide necessary electrical and communication services for the AET Toll Zones. The Design-Build Team shall be responsible for all application and connection fees. The Design-Build Team shall be responsible for any utility service installation from the power meter to the AET Toll Zone power panels. The Design-Build Team will not be responsible for paying the monthly power bills.

Grounding System

The Design-Build Team shall provide a master grounding system at all new AET Toll Zone Gantry locations, unless otherwise specified. In addition to the National Electrical Code (latest edition) requirements, the Design-Build Team shall test grounding electrode resistance at the connection point to the electrical service ground bus for a maximum of 20 ohms. The Design-Build Team shall furnish and install additional ground rods to grounding electrode system as necessary to meet test requirements. The Design-Build Team shall submit a completed Grounding Test Results form to the Engineer. A length of marker tape 12-inches below finished grade directly over grounding electrodes and conductors shall be provided.

Lightning Protection System

The Design-Build Team shall design and install Lightning Protection System for the AET Toll Zone Gantries and cabinets in conformance with, and certified by, the Lightning Protection Institute (L.P.I.) Installation Code LPI-175. Products shall comply with Underwriters Laboratories, Inc. Master Label Code 96A and NFPA 780. The lightning protection system installer shall submit a UL Master Label or L.P.I. system certification upon completion of the

work. The Design-Build Team shall design the Lightning Protection System taking into account all tolling equipment to be installed on the gantry. The Design-Build Team shall coordinate with the TSI on the actual equipment to be installed.

Communication

The Design-Build Team shall coordinate design of communication infrastructure and conduit with the ITS design to provide complete communication paths needed for a fully functional system.

LED BLANK-OUT SIGNS

When the eastbound express lanes are closed or not otherwise in operation, the system shall be designed to activate a pair of LED blank-out signs located on Westinghouse Drive and shown on the February 1, 2018 NCTA AET Concept Plans provided by the Department. When the express lanes are open and in normal operation, the signs shall be dark (i.e. no message).

The Design-Build Team shall determine the best location and mounting point for the signs, subject to the Department's approval.

Reference the *LED Blank-Out Signs* Project Special Provision found elsewhere in this RFP for detailed material specifications and construction requirements.

To activate and de-activate the LED Blank-out Signs, the Design-Build Team shall provide a standard 2070 controller and cabinet.

WRONG-WAY DETECTION SYSTEM HARDWARE

Description

The Design-Build Team shall design and construct the Wrong-Way Detection System to alert motorists traveling the wrong way on the Westinghouse Direct Connector exit ramp. The Wrong-Way Detection System shall be a "free-standing" system that shall not be interfaced with the tolling system in any way.

Functional Requirements

When the detection mechanism detects a vehicle traveling the wrong way on the Direct Connector exit ramp, an enhanced "wrong way" sign with flashers shall be activated. Reference the *Installation of Wrong Way Driver Sign(s) & Radar Equipment* Project Special Provision found elsewhere in this RFP for detailed material specifications and construction requirements.

The Wrong-Way Detection System shall have built-in detection devices located near the intersection. The built-in detection system shall be supplemented by the Microwave Vehicle Detection System devices located further up the ramp. Reference the *Microwave Vehicle*

Detection System – Multiple Detection Zones Project Special Provision found elsewhere in this RFP for detailed material specifications and construction requirements.

INTELLIGENT TRANSPORTATION SYSTEM (ITS) SCOPE OF WORK (01-19-2018)

**** NOTE** The ITS Concept Plans referenced throughout this RFP have been provided to the Design-Build Team to guide their design. The conduit and device icons / symbology locations in the aforementioned plans are not absolute. Instead, the ITS Concept Plans have been provided to ensure that NCDOT device functionality goals are met, and to ensure connectivity to the ITS network. Reasonable deviations from the ITS Concept Plans, in terms of device location and connectivity to the network, that are backed by sound engineering judgment and approved by NCDOT, will be allowed.**

GENERAL REQUIREMENTS**(A) DESCRIPTION****1. Summary of Work**

This scope of work will provide the NCDOT with intelligent transportation system (ITS) devices and communications infrastructure.

The ITS component, shown in the ITS Concept Plans dated February 1, 2018, includes, but is not limited to:

- Approximately 2.0 miles of new tolls trunkline in existing conduit
- Approximately 5.7 miles of new tolls and ITS trunkline in existing conduit
- Approximately 9.4 miles of new tolls and ITS trunkline in new conduit
- Lateral and drop conduit for the toll collection and ITS communications network
- CCTV cameras, poles and foundations for traffic management of general purpose lanes and express lanes
- DMS for traffic management for general purpose lanes and express lanes
- Detection system consisting of microwave radar sensors
- Toll Rate DMS Panels (for toll rate display and speed/travel time signs)
- Communications networking equipment
- Integration of certain devices (described in the responsibility matrix below) of the ITS system into the Metrolina Regional Transportation Management Center (MRTMC) traffic management network

The Design-Build Team shall repair all damage to any existing ITS infrastructure and shall re-establish communications and full device functionality to damaged ITS infrastructure within 24 hours of the discovery of the damage by NCDOT.

The Design-Build Team is responsible for providing meter service assemblies for ITS and toll devices/sites.

The communications infrastructure shall consist of an underground conduit system including conduit, tracer wire, junction boxes and heavy-duty junction boxes.

As described herein, the Design-Build Team shall design and install the complete conduit system to service all ITS devices and toll facilities within or affected by the project.

The Design-Build Team shall locate and design the DMS to maintain MUTCD required sign spacing and sight distances. The Design-Build Team shall adhere to the MUTCD edition effective on the Technical Proposal submittal date and the contract requirements contained within the RFP.

All communications between the proposed ITS field devices and the local hub shall utilize Ethernet technology over single-mode fiber-optic cable. The Design-Build Team shall furnish and install Ethernet edge switches and related equipment.

The Design-Build Team shall furnish and install fiber-optic cable as described elsewhere in this Scope of Work and as shown in the ITS Concept Plans dated February 1, 2018, and/or as allowed otherwise by approved plan deviations.

The Design-Build Team shall furnish and install fiber-optic splice/termination centers for both the tolls and ITS systems cabinets.

A responsibility matrix is shown below:

	Feature								
	Splice Enclosure in Splice Box	Pole or Structure	Comms Drop Conduit and FO Drop Cable	Cabinet	Ethernet Switch	Furnish, Install & Locally Test Device(s)	Electrical Service, Power Drop Conduit & Meter Panel	Integration ³	
Device or System	DMS for Traffic Management	DBT	DBT	DBT	DBT	DBT ²	DBT	DBT	DBT
	DMS Panel for Toll Rates ¹	DBT	DBT	DBT	DBT	TSI	DBT	DBT	TSI
	Toll Rate Camera	DBT	DBT	DBT	DBT	TSI	DBT	DBT	TSI
	NCDOT Traffic Management Camera	DBT	DBT	DBT	DBT	DBT ²	DBT	DBT	DBT
	Express Lanes Traffic Management Camera	DBT	DBT	DBT	DBT	DBT ²	DBT	DBT	DBT
	Microwave Detectors and Poles	DBT	DBT	DBT	DBT	TSI	DBT	DBT	TSI
	Wrong Way Detection System	DBT	DBT ⁴	DBT	DBT	TSI	DBT	DBT	TSI
	AET Toll Zone	DBT	DBT	DBT	TSI	TSI	TSI	DBT	TSI
Note 1: Includes Speed/Travel Time DMS Panel signs									
Note 2: Ethernet edge and hub switches to be furnished by NCDOT and installed by DBT.									
Note 3: Integration provides a fully functional/operational end-to-end system									
Note 4: Includes LED blank-out signs									

The Design-Build Team shall determine the exact location of the ITS devices, junction boxes and conduit hub and receive approval of the Department (thru the Communications Cable & Conduit Routing Plans submittal and approval process) prior to construction. The Design-Build Team shall furnish and install conduit, tracer wire, junction boxes, heavy-duty junction

boxes, and develop and implement test and coordination procedures for the conduit. The basis of the design shall be the ITS Concept Plans dated February 1, 2018 provided by NCDOT.

The Design-Build Team shall deliver any existing ITS equipment that is removed to the MRTMC at 2327 Tipton Drive, Charlotte, NC. The Design-Build Team shall schedule delivery of the ITS equipment by calling (704) 342-6814.

Upon completion of the work, the Design-Build Team shall conduct field-testing using an approved test plan of the local communications system and the ITS devices, and maintain the devices and communications system until final acceptance by the Department.

2. Backhaul to MRTMC

The I-485 Express Lanes networks shall communicate with the ITS and toll head-end equipment located at the MRTMC. The Design-Build Team shall coordinate with the ITS staff of the MRTMC to allocate existing fiber-optic cable for the field devices to the nearest NCDOT hub building and the backhaul to the MRTMC. The path of this backhaul is shown in the ITS Concept Plans dated February 1, 2018 and shall adhere to the following requirements:

- All proposed NCDOT traffic management devices (CCTV and DMS) shall be connected to the existing Cisco 3760 NCDOT Ethernet hub switch in Hub Building 1.
- Expand the existing Cisco 3760 NCDOT hub switch to provide additional fiber-optic ports as required to support the added traffic management devices.
- All field and backhaul communications circuits shall use four strands to provide redundant communications.
- Tolls and ITS devices shall use separate fiber-optic strands between the field devices and Hub Building 1.
- In Hub Building 1, connect, with fiber-optic jumpers, the assigned fiber-optic strands to the proposed Layer 3 Ethernet switch for the toll network to be supplied by the TSI.
- Redundant communications from the project shall be routed along I-485, I-77 and I-85 to the MRTMC.
- The primary and redundant paths of the communications cable shall proceed from Hub Building 1 through Node Cabinet 20 at the interchange of I-77 and I-485 where it shall be cross connected to cable going west on I-485 to Hub Building 6 located at the interchange of I-85 and I-485 on the west side of Charlotte.
- At Hub Building 6, the primary and redundant communications path separate. One path shall be from Hub Building 6 along I-85 to the MRTMC. The other path shall be north along I-485 through Hub Building 4 at I-77 and then south on I-77 to the MRTMC.
- In Hub Building 6, cross-connect, with fiber-optic jumpers, the assigned fiber-optic cables to facilitate the above paths to the MRTMC.
- In Hub Building 4, cross connect with fiber-optic jumpers the I-485 and I-77 fiber-optic cables to facilitate the path to the MRTMC.

At the MRTMC, the Design-Build Team shall:

- Install a Layer 3 Ethernet switch (provided by NCDOT) for the traffic management devices. The traffic management devices shall connect to the NCDOT network.
- Connect the assigned fiber-optic cable to the proposed Layer 3 Ethernet switch in the MRTMC.
- Install an expansion chassis for the existing Jupiter Catalyst Fusion 4000 video switch.
- Install four IP-based quad HD video cards in the Jupiter Catalyst Fusion 4000 video switch to provide additional IP-based HD video streams to the video wall.

3. Standard Specifications

The Design-Build Team shall conform to this Scope of Work, the ITS Project Special Provisions, the 2018 NCDOT *Standard Specifications for Roads and Structures*, the 2018 NCDOT *Roadway Standard Drawings*, and the ITS Concept Plans dated February 1, 2018 and/or approved plan deviations (which also include the ITS Standard Details). Conform also to *All-Electronic Tolling (AET) Standard Drawings* and the All-Electronic Tolling (AET) Toll Zone Facilities Infrastructure Scope of Work found elsewhere in this RFP. The Design-Build Team shall conform to the regulations and codes described in Section 1700 of the 2018 NCDOT *Standard Specifications for Roads and Structures*.

In the event of conflict between the resources noted above, this Scope of Work shall govern.

The 2018 NCDOT *Standard Specifications for Roads and Structures* shall be revised as follows:

- **Subarticle 1098-1(H)** - In the second paragraph, add, “use 200-amp meter base for underground electrical service”.

Reference is made to the *Project Special Provisions for Signals and Intelligent Transportation Systems*. The document can be found at the following link:

<https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx>

This document is continually updated. The version that governs the Design-Build Team shall be Version 18.1.

4. Other Codes and Standards

All communication conduit system materials must conform to the latest version of the applicable standards of the National Electric Manufacturer's Association (NEMA), the Underwriters' Laboratories, Inc. (UL), the Electronic Industries Association (EIA), the National Electrical Code (NEC), the International Municipal Signal Association (IMSA), and the National Electrical Safety Code (NESC). All materials and workmanship must conform to the standards of the American Society for Testing and Materials (ASTM) and American National Standards Institute (ANSI). The Design-Build Team shall comply with all federal

laws, state laws, and city codes in accordance with the 2018 NCDOT *Standard Specifications for Roads and Structures*.

5. Information Technology Requirements

The Design-Build Team shall conform to the NCDOT and NC Statewide IT Policies and Standards as described at:

<https://www.scio.nc.gov/mission/itPoliciesStandards.aspx>

The architecture of the IT modules must be approved by NCDOT IT and the NC Office of Information Technology architecture groups.

(B) MATERIALS

1. Qualified Products

The Design-Build Team shall furnish new equipment, materials, and hardware unless otherwise required. Inscribe the manufacturer's name, model number, serial number, and any additional information needed for proper identification on each piece of equipment housed in a case or housing.

Certain categories of signal and communications equipment, material, and hardware shall be pre-approved on the latest version of the QPL by the date of installation. These categories are defined in this Scope of Work.

2. Observation Period

The Design-Build Team shall conduct a 30-day observation period as described in the Project Special Provisions found elsewhere in this RFP.

3. Wire and Cable

The Design-Build Team shall furnish wire and cable on reels. When requested by the Department, the Design-Build Team shall furnish samples of wire and cable to the Department at no additional cost.

4. Three -Year Guarantee

The ITS scope of work shall include a three-year guarantee. If the Design-Build Team proposes a longer warranty as part of their Technical Proposal, the longer warranty shall also apply to the ITS equipment.

Warranty periods that are required by the ITS Project Special Provisions that exceed the period(s) mentioned above will govern.

(C) CONSTRUCTION COORDINATION

1. Introduction

This section addresses coordination issues that may affect this project.

2. Toll System Integrator (TSI)

The Design-Build Team shall coordinate with the Toll System Integrator for design and construction issues and to schedule training of Toll System Integrator personnel.

3. Regulations and Codes

Furnish material and workmanship conforming to the *National Electrical Code* (NEC), *National Electrical Safety Code* (NESC), Underwriters Laboratories (UL), or other listing agencies approved by the North Carolina Department of Insurance and all local safety codes in effect on the Technical Proposal submittal date. Comply with Article 4, Chapter 87 of the *North Carolina General Statutes* (Licensing of Electrical Contractors). Comply with all previously referenced specifications, and all applicable local ordinances and regulations before and during all stages of the electrical work.

When required by the local ordinances and governmental agencies, upon completion of the work, the Design-Build Team shall have all systems inspected and approved in writing by the authorized governmental electrical inspector for the area and furnish written certification of the authorized inspector's approval to the Engineer. Inspection by the authorized governmental electrical inspector shall neither eliminate nor take the place of the inspections by the Engineer. Upon the Engineer's receipt of written certification and the Design-Build Team's written request for a final inspection of the installations, the Engineer will perform a final inspection.

Where required, the Design-Build Team shall conform to AASHTO and ASTM standards in effect on the Technical Proposal submittal date.

The Design-Build Team shall notify the Engineer, local traffic enforcement agency, local utility company, and affected railroad companies seven business days before operational shutdowns to coordinate connection or disconnection to an existing utility or system.

The Design-Build Team shall furnish and install meter bases and service disconnects as required by the NESC, NEC, local utility companies, and local ordinances.

4. Utility Services

The Design-Build Team shall coordinate all work to ensure electrical power of proper voltage, phase, frequency, and ampacity is available to complete the work. The Design-Build Team shall use electrical services cables with THWN insulation.

The Design-Build Team shall provide electrical and telecommunication service as described in this Scope of Work, contact the utility company and make application to ensure all work can be completed. The Design-Build Team shall obtain authorization for service in NCDOT / NCTA's name for NCDOT / NCTA-owned locations. The Design-Build Team shall make application for service in NCDOT / NCTA's name for NCDOT / NCTA-owned locations.

The Design-Build Team shall be responsible for all expenses associated with utility installation costs, hookups, etc., from the power meter/electrical service tap to the facilities/device being provided power. Once installed, NCDOT (or specifically, NCTA, for toll-related devices) will be responsible for monthly utility company usage charges prior to final acceptance.

5. REQUIREMENTS FOR CABLES CROSSING RAILROADS

Copies of all executed railroad agreements and related correspondence may be obtained from the Engineer upon request.

Railroad Crossings

Do not commence cable routings over or under railroad-owned facilities until notification and coordination with Engineer and the appropriate railroad company has occurred. As shown on the Plans, six (6) crossings affected railroad facility on this project are owned by CSX Transportation (CSXT), herein called the Railroad Company. Install fiber optic communications cable as shown on the Plans and comply with CSXT guidelines.

Requirements for Insurance

The Design-Build Team will be required to provide coverage conforming to the requirements of the Federal-Aid Policy Guide outlined under 23 CFR 646A for all work to be performed on the Railroad right(s) of way under the terms of the contract by carrying insurance of the following kinds:

Design-Build Team's General Liability and Railroad Liability Insurance

- Furnish a certificate of general liability insurance and railroad protective liability insurance evidencing a combined single limit of a minimum of \$5,000,000.00 per occurrence of general liability insurance naming CSX Transportation as the certificate holder and as an additional insured party on the insurance policy.
- If any part of the work is sublet, similar insurance and evidence thereof in the same amounts as required of the Design-Build Team, shall be provided by the subcontractor to cover his operations on railroad right of way. As an alternative, the Design-Build Team may provide for the subcontractor by means of separate and individual policies.
- Certificates shall make reference to the project, milepost, and county. Certificate description and project designation to include the following information: Installation of fiber optic communications cable under tracks of CST Transportation, Mecklenburg County (include Railroad milepost) identified as NC Project I-5507 / R-0211EC / U-4717AB.
- Use the address below for the Certificates of Insurance holder:
 - CSX Transportation
 - Risk Management (C-907)
 - 500 Walter Street
 - Jacksonville, FL 32202
- All policies and certificates shall contain a clause requiring that thirty (30) days written notice be given to the Department of Transportation and the Railroad Company prior

to cancellation or change. The notices shall make reference to the project, milepost, and county.

NOTICE TO:

CSX Transportation
Risk Management (C-907)
500 Walter Street
Jacksonville, FL 32202

COPY NOTICE TO: NCDOT Resident Engineer

- Carry all insurance herein specified until the final inspection and acceptance of this project, or that portion of the project within railroad right of way, by the Department of Transportation or, in the case of subcontractors, until the Design-Build Team furnishes a letter to the Engineer stating that the subcontractor has completed his subcontracted work within railroad right of way to the satisfaction of the Design-Build Team and the Design-Build Team will accomplish any additional work necessary on railroad right of way with his own forces. It is understood that the amounts specified are minimum amounts and that the Design-Build Team may carry insurance in larger amounts if he so desires. As to “aggregate limits” if the insurer establishes loss reserves equal to or in excess of the aggregate limit specified in any of the required insurance policies, immediately notify the Department and cease all operations until the aggregate limit is reinstated. If the insurer establishes loss reserves equal to or in excess of one-half of the aggregate limit, arrange to restore the aggregate limit to at least the minimum amount stated in these requirements. Any insurance policies and certificates taken out and furnished due to these requirements shall be approved by the Department and the Railroad Company as to form and amount prior to beginning work on railroad right of way.
- No extra allowance will be made for the insurance required hereunder. The entire cost shall be included in the unit contract bid price for other pay items.
- Furnish evidence of insurance as required above for review to the Engineer.

Delays Caused by Operations of Others

Neither the Department nor the Railroad Company 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 the Railroad Company for any inconvenience, delay, or additional cost incurred by him on account of such operations by others.

Cooperation with Others

Cooperate with others participating in the construction of the project to the end that all work may be carried on to the best advantage.

Authority of Railroad Engineer

The authorized representative of the Railroad Company hereinafter referred to as the Railroad Engineer, shall have the final authority in all matters affecting the safe maintenance of railroad traffic of his company.

Interference with Railroad Operations

Arrange and conduct work so that there will be no interference with railroad operations including train, signal, telephone, and telegraphic services, or damage to the property of the Railroad Company or to the poles, wire, and other facilities of tenants on the rights of way of the Railroad Company. Wherever 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.

Should conditions arising from or in connection with the work, require that immediate and unusual provisions be made to protect train operations and property of the Railroad Company, it shall be a part of the required services by the Design-Build Team to make such provisions and if, in the judgement of the Railroad Engineer such provisions is insufficient, the Railroad Engineer or the Department, may require or provide such provisions as may be deemed necessary.

Storage of Materials

Materials and equipment shall not be stored where they will interfere with railroad operations, nor on the right of way of the Railroad Company without first having obtained permission from the Railroad Engineer, and such permission will be with the understanding that the Railroad Company 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.

Flagging Protection or Watchman Service

The Design-Build Team shall give two (2) weeks advance notice to the Railroad Company in order that flagging service can be arranged and provided. No work shall be undertaken until the flagman is at the job site. No extra allowance will be made for all costs associated with the scheduling and compensation of flagmen. The entire cost shall be included in the unit contract bid price for other pay items.

Completion and Acceptance of Work

Upon completion of the work, remove from within the limits of the railroad right of way all machinery, equipment, surplus materials, or rubbish and leave said rights of way 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 Company, the Department will be notified of the Railroad Company's acceptance in writing by the Railroad Company.

Completion and Acceptance of Work

There will be no direct payment for work covered in this section. Payment will be incidental to the overall conduit and cable installation prices in the contract and these Project Special Provisions.

(D) TIME RESTRICTIONS

1. Intermediate Contract Time #5 for Failure to Maintain and / or Repair Toll / ITS Devices and Restore Communication

The Design-Build Team shall ensure that an IMSA certified, or equivalent, Level II traffic qualified technician is standing by to provide emergency maintenance services whenever any electrical work is performed. Standby status shall be defined as being able to arrive, fully equipped, at the work site within two hours and ready to provide maintenance services.

The Design-Build Team shall furnish the Engineer with the name, office telephone number, cellular (mobile) telephone number, and pager number of the supervisory employee who will be responsible for maintenance and repair of equipment during all hours.

The Design-Build Team shall maintain and repair all ITS devices and toll/ITS communications related equipment installed by the Design-Build Team within and/or outside the project construction limits from the time of installation until final project acceptance.

For all failures, malfunctions, or damages to equipment, the Design-Build Team shall begin necessary repairs within 12 hours of written notification by email by NCTA/NCDOT. The Design-Build Team shall complete repairs within 24 hours of notification. The inability to contact the supervisory employee or prearranged alternate shall not extend repair time requirements.

The Design-Build Team shall remove and replace all ITS devices and toll/ITS communications related equipment that fails.

Except for damages and malfunctions caused by the Design-Build Team's work activities, the Design-Build Team will not be held responsible for pre-existing conditions reported to the Engineer before starting any work at the specific location. The Design-Build Team shall assume responsibility for all maintenance and emergency services necessary once work has begun at an existing device location until the final project acceptance by the Department.

In the event the Design-Build Team fails to perform within the timeframe specified in accordance with the plans developed by the Design-Build Team and this Scope of Work, the Department reserves the right to perform maintenance and emergency service necessary to ensure continuous operation. Further, all expenses incurred by the Department in implementing this option shall be deducted from payment due the Design-Build Team.

The Design-Build Team shall maintain system equipment until the receipt of written notification from the Engineer of final acceptance of the project.

Liquidated Damages for Intermediate Contract Time #5 for failure to repair and/or maintain the toll/ITS devices and restore communication including, but not limited to, communications with the Metrolina Transportation Management Center, within the timeframes specified herein are \$2,500 per occasion, per toll/ITS device, per 24-hour period or any portion thereof, until corrected. (Note – Liquidated Damages for Intermediate Contract Time #5 shall be calculated separately for the toll and ITS communications cable/conduit.)

UNDERGROUND CONDUIT

The Design-Build Team shall furnish and install conduit for underground installation with tracer wire, miscellaneous fittings, delineator markers, all necessary hardware, marker tape, conduit plugs, sealing putty, pull lines, backfill, graded stone, paving materials, and seeding and mulching.

The Design-Build Team shall provide conduit as needed to interconnect the ITS devices and toll facilities.

Reference the *Underground Conduit* Project Special Provision found elsewhere in this RFP for detailed material specifications and construction requirements.

JUNCTION BOXES

The Design-Build Team shall furnish and install junction boxes (pull boxes) with covers, graded stone, grounding systems, and all necessary hardware.

Reference the *Junction Boxes* Project Special Provision found elsewhere in this RFP for detailed material specifications and construction requirements.

FIBER-OPTIC CABLE

The Design-Build Team shall furnish and install single-mode fiber-optic (SMFO) communications cable and drop cable assemblies with grounding systems, communications cable identification markers, and all necessary hardware.

The Design-Build Team shall provide two 144-strand single-mode fiber-optic cables in separate conduits, one for ITS and one for toll operations as shown in the ITS Concept Plans dated February 1, 2018.

The Design-Build Team shall provide 12-strand single-mode fiber-optic drop cables for ITS and toll devices.

The Design-Build Team shall determine the exact location of conduit and junction boxes. Prior to construction, the Department shall approve the conduit and junction box locations.

After installation, the Design-Build Team shall conduct OTDR tests on both the ITS and toll operations fiber-optic cable, and correct any defects revealed by the testing. Conform to Section 1730, and especially, Sections 1731-3(A) and (F), of the 2018 NCDOT *Standard Specifications for Roads and Structures*.

Following successful testing of the toll operations fiber-optic cable, the Design-Build Team shall coil and store cable in the splice box adjacent to the AET toll zone.

The Toll System Integrator will energize the Tolls designated cable and connect equipment to it after acceptance.

Reference the *Fiber-Optic Cable* Project Special Provision found elsewhere in this RFP for detailed material specifications and construction requirements.

FIBER-OPTIC SPLICE CENTERS

The Design-Build Team shall furnish and install fiber-optic interconnect centers, fiber-optic splice enclosures, and all necessary hardware.

Reference the *Fiber-Optic Splice Centers* Project Special Provision found elsewhere in this RFP for detailed material specifications and construction requirements.

ELECTRICAL SERVICE

The Design-Build Team shall install new electrical service to new ITS, toll cabinets and devices, and to toll gantry sites. Where the electric service is shared for ITS and a toll device the Design-Build Team shall provide all electrical service assemblies for both toll and ITS devices, this also includes the Toll Rate DMS Panels. The TSI will run power service conduits to these electric service assemblies.

All new electrical services within the NCDOT right of way shall be underground, as shown in the ITS Standard Details. The Design-Build Team shall request approval from the Department before placing wood poles for power service; wooden poles shall only be approved for extenuating circumstances.

Reference the *Electrical Service* Project Special Provision found elsewhere in this RFP for detailed material specifications and construction requirements.

CCTV FIELD EQUIPMENT

The Design-Build Team shall furnish, install, test, integrate, and make fully operational CCTV field equipment, cabinets and local camera control software as described in this Section.

The Design-Build Team shall test the Toll Rate CCTV cameras under local control only. The cameras will be centrally tested and integrated by the TSI using their network and software.

NCTA/NCDOT will monitor the testing and sign-off on the results.

Reference the *High Definition CCTV Metal Pole and Field Equipment* Project Special Provision found elsewhere in this RFP for detailed material specifications and construction requirements.

METAL POLES

The Design-Build Team shall furnish and install new metal poles, grounding systems, and all necessary hardware, for detection points and CCTV cameras.

Reference the *High Definition CCTV Metal Pole and Field Equipment* Project Special Provision found elsewhere in this RFP for detailed material specifications and construction requirements.

DYNAMIC MESSAGE SIGNS

The Design-Build Team shall furnish, install, test, integrate, and make fully operational the new traffic management DMS at locations shown in the ITS Concept Plans dated February 1, 2018.

The Design-Build Team shall relocate, test, integrate and make fully operational the existing traffic management DMS as shown on the ITS Concept Plans dated February 1, 2018.

NCTA/NCDOT will monitor the testing and sign-off on the results.

Reference the *Dynamic Message Signs* Project Special Provision found elsewhere in this RFP for detailed material specifications and construction requirements.

Relocation of DMS

The Design-Build Team shall remove the DMS from the existing location(s) shown on the ITS Concept Plans dated February 1, 2018 and reinstall on a new overhead DMS assembly at the new location shown in the aforementioned ITS Concept Plans according to the following work sequence:

- Erect the new DMS structure at the proposed location, construct the DMS cabinet foundation, and establish the new electrical service to the DMS cabinet.
- Prior to deactivation of the DMS at its existing location, install a trailer mounted solar powered changeable message sign (CMS) and establish dial-up communications with the MRTMC. Locate the portable CMS in the vicinity of the existing DMS at a location approved by the Engineer. Assist the Department with the integration of the portable CMS and establishing communications with the CMS.
- Prior to deactivating and removing the existing DMS, test the functionality of the existing DMS to verify all existing equipment is in satisfactory working order. Report all defective and damaged equipment to the Engineer so as not to be held responsible for said defects or damage. Prior to disconnecting any field wiring, identify, label and take digital photographs of all field wiring in the existing DMS cabinet to facilitate reinstallation at the new location.

- Activate portable CMS, then deactivate existing DMS and disconnect electrical power service. Remove the existing DMS, DMS cabinet, and DMS equipment housed therein and package for transporting. Do not deactivate or remove the existing DMS until the portable CMS is fully integrated and communicating effectively with the MRTMC.
- Reinstall the existing DMS on the new DMS structure, reinstall the DMS equipment cabinet on a new foundation and connect all wires and cables, per the original installation, to restore operation of the DMS. Connect the DMS to the fiber-optic communications network.
- Retest the completed DMS sign, sign controller and other equipment as described in the "DMS Testing Requirements" section of the Project Special Provisions found elsewhere in this RFP.
- If the DMS cannot be immediately reinstalled after being removed from its existing location, transport the removed DMS, DMS equipment cabinet and all equipment housed therein to a storage facility provided by the Design-Build Team. Provide a secure, indoor storage facility that protects the removed and stored equipment from inclement weather, theft and vandalism.
- Maintain the CMS during the period the existing DMS is out of service.
- Remove and dispose of the existing DMS structure, DMS foundations and the DMS cabinet foundation.
- Deliver the complete portable changeable message sign to the MRTMC and transfer ownership to the Department.
- The Design-Build Team shall repair or replace all existing components that become damaged, defective, or inoperable while the equipment is in the Design-Build Team's care from the time the DMS is removed until the final acceptance of the project.

TOLL RATE DYNAMIC MESSAGE SIGN PANELS

The Design-Build Team shall furnish, install, and test the new Toll Rate DMS Panels at locations shown in the ITS Concept Plans dated February 1, 2018. Such panels shall also be used for the "Speed/Travel Time" signs at each end of the project, but are referred to herein as "Toll Rate DMS Panels".

The Design-Build Team shall furnish operating pedestal mount DMS systems consisting of, but not limited to, the following:

- Full Matrix, 8 character (18" high) 20 mm pixel spacing color LED DMS
- DMS mounting hardware
- DMS controllers, Uninterruptible Power Supplies (UPS), cabinets and accessories with interconnect and power cabling and conduit
- All other equipment and incidentals required for furnishing, installing, and testing the Toll Rate DMS Panels

The Design-Build Team shall use only UL listed and approved electronic and electrical components in the DMS system.

The Design-Build Team shall test the Toll Rate DMS Panels under local control only. NCTA/NCDOT will monitor the testing and sign-off on the results. The panels will be centrally tested and integrated by the TSI using their network and software.

For the Toll Rate DMS Panels, reference the requirements for the Type B signs in the *Dynamic Message Signs* Project Special Provision found elsewhere in this RFP for detailed material specifications and construction requirements.

DETECTION POINTS

The Design-Build Team shall furnish, install, and test the equipment required for microwave radar vehicle detection at locations shown in the ITS Concept Plans dated February 1, 2018.

Microwave radar vehicle detection shall consist of the following elements:

- For mainline sites:
 - Detection in general purpose lanes and express lanes (one sensor for each direction of travel)
- For ramp sites:
 - Detection of all ramp lanes

Reference the *Microwave Vehicle Detection System – Multiple Detection Zones* Project Special Provisions, found elsewhere in this RFP, for detailed material specifications and construction requirements.

The Design-Build Team shall test the microwave radar vehicle detection technology locally (only). NCTA/NCDOT will monitor the testing and sign-off on the results. The microwave radar vehicle detection technology will be centrally tested and integrated by the TSI using their network and software.

ETHERNET CABLE

The Design-Build Team shall furnish and install copper Ethernet cable, for interconnecting various hardware in an Ethernet network.

Reference the *Ethernet Cable* Project Special Provision found elsewhere in this RFP for detailed material specifications and construction requirements.

COMMUNICATIONS HARDWARE

The Design-Build Team shall furnish and install fiber-optic communications hardware, including Layer 3 Ethernet switch, Ethernet edge switches, and network management software.

(A) Layer 3 Ethernet Hub Switch

The Design-Build Team shall install a stackable Layer 3 Hub Ethernet switch (provided by NCDOT) in the MRTMC for the additional traffic management devices. The Design-Build Team shall expand the existing Cisco 3760 NCDOT Layer 3 switch to provide additional fiber-optic ports as required to support the added traffic management devices. The Design-Build Team shall ensure that the Layer 3 Ethernet hub switches provide Ethernet connectivity at transmission rates of 1000 megabits per second from each remote ITS device location to the MRTMC.

(B) Ethernet Edge Switch

The Design-Build Team shall install field Ethernet edge switches (hereafter “edge switch”) (provided by NCDOT) for field devices at locations as shown in the ITS Concept Plans dated February 1, 2018. The Design-Build Team shall ensure that the edge switch provides Ethernet connectivity at transmission rates of 1000 megabits per second from each remote ITS device location as shown in the ITS Concept Plans dated February 1, 2018 through a Layer 3 Ethernet hub switch to the existing Layer 3 Ethernet switch at the MRTMC.

(C) Network Management Software

The Design-Build Team shall add the proposed traffic management devices to the existing NCDOT network management software.

(D) Hub Cabinet

The Design-Build Team shall furnish and install a Type 333 (minimum size) air-conditioned cabinet at locations as shown in the ITS Concept Plans dated February 1, 2018 to house Layer 3 Ethernet hub switches and fiber-optic splice enclosures described herein. Size the cabinet appropriately to fit all the equipment installed within the cabinet at the particular location. 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.

(E) UPS

The Design-Build Team shall furnish and install uninterruptible power supply (UPS) units for the Layer 3 Ethernet hub switch at field locations as shown in the ITS Concept Plans dated February 1, 2018. The UPS shall also include any ancillary equipment or incidental items, such as required mounting hardware and cabling.

Reference the *Communications Hardware* Project Special Provision found elsewhere in this RFP for detailed material specifications and construction requirements.

INTEGRATION WITH MRTMC

(A) DESCRIPTION

The Design-Build Team shall ensure all proposed traffic management devices are connected and viewable on the NCDOT network. Integrate the CCTV cameras into the Jupiter video wall system. Integrate the DMS into the MRTMC DMS control system.

(B) MATERIALS

Reference the *Central Video Equipment* Project Special Provision found elsewhere in this RFP for detailed material specifications and construction requirements.

(C) CONSTRUCTION METHODS

Reference the *Central Video Equipment* Project Special Provision found elsewhere in this RFP for detailed material specifications and construction requirements.

Reference the *Integration and Configuration* Project Special Provision found elsewhere in this RFP for detailed requirements.

ITS SUBMITTAL DATA AND DOCUMENTATION

(A) DESCRIPTION

The Design-Build Team shall provide project submittal data and documentation as described below.

(B) SUBMITTALS

1. General

The Design-Build Team shall comply with NCTA Design-Build Submittal Guidelines. All written documentation will be either 11" x 17" or 8½" x 11" format. Documentation shall not be smaller or larger than these formats. Except for standard bound manuals, the Design-Build Team shall bind all 8 1/2" x 11" documentation, including 11" x 17" drawings folded to 8½" x 11", in logical groupings in either three-ring or plastic slide-ring loose-leaf binders. Permanently label each grouping of documentation.

All materials and equipment used on the project shall be submitted for review and approval prior to use on the project. Items on the Department's QPL will be approved by manufacturer and part number reference. Items not on the Department's QPL shall have catalog cut sheets submitted and approved that verify compliance with the 2018 NCDOT *Standard Specifications for Roads and Structures*, 2018 NCDOT *Roadway Standard Drawings*, ITS Concept Plans dated February 1, 2018 and this Scope of Work. All submittals will be reviewed and approved by the Department prior to incorporation. The absence of comment will not grant approval.

2. Qualified Products

The Qualified Products List (QPL) is available on the Department's website. Certain signal and communications equipment, material, and hardware shall be pre-approved on the QPL by

the date of installation. Equipment, material, and hardware that is not pre-approved will not be allowed on the project. The Design-Build Team shall consult the QPL website to obtain pre-approval procedures.

3. Submittal Requirements

When requested by the Department, the Design-Build Team shall provide additional certifications from independent testing laboratories and sufficient data to verify an item meets applicable specifications. The Design-Build Team shall ensure additional certifications state that the testing laboratory is independent of the material manufacturer and neither the laboratory nor the manufacturer has a vested interest in the other.

The intent of submittals is to show the materials meet the requirements of the ITS Concept Plans dated February 1, 2018 and this Scope of Work and how the Design-Build Team intends to construct or configure the materials. The Design-Build Team shall clearly demonstrate in the submittals that the desired materials meet or exceed the requirements of the ITS Concept Plans dated February 1, 2018 and this Scope of Work. Each submittal shall be sufficiently complete and detailed for the Department to review and approve. For submittals with surge protection devices (SPDs), the submittal shall include a block diagram that clearly indicates the purpose of each SPD (data, power, comms, etc.) and the placement of the SPD in the path of data/power flow. If the Department deems the submittal insufficient in detail or completeness for review or approval, the submittal will be returned for corrections. Additional compensation and / or contract time will not be granted for re-submittals.

Before material submittal data begins, the Design-Build Team shall provide the Department, for approval, a list of all submittals with approximate submittal dates. It is incumbent upon the Design-Build Team to schedule reviews in a timely manner that will not delay their schedule.

Certain groups of materials are related in function and operate as a subsystem together. To ensure individual and subsystem compliance with the project requirements, materials shall be submitted in the following packages:

Submittal Package	Description
CCTV Field Equipment	CCTV camera and camera pole
Testing Plans	Detailed test plans, procedures and testing schedule
Electrical	Meter bases and disconnects
Dynamic Message Signs (including Toll Rate DMS Panels)	DMS sign, sign controller and sign controller cabling between sign and controller, DMS controller cabinet
Detection	Microwave radar sensor, detection controller and cabinet, microwave sensor pole.
Field Equipment Cabinets	Cabinet layout and wiring diagrams

Submittal Package	Description
Fiber-optic Cable	Fiber-optic cable, drop cable assemblies, interconnect centers and splice enclosures
Field Infrastructure	Conduit, risers, junction boxes, heavy-duty junction boxes/cabinets, and misc. hardware

The Design-Build Team shall submit cabinet layout and wiring diagrams for all cabinets.

The Design-Build Team shall identify all proprietary parts in furnished material. The Department reserves the right to reject material that uses proprietary components not commercially available through electronic supply houses.

For furnished material listed on the QPL, the Design-Build Team shall furnish submittals in the format defined by the QPL.

For furnished material not on the QPL, the Design-Build Team shall furnish the equipment list including catalog cuts. Identify proposed material on catalog cuts by a reproducible means. The Design-Build Team shall ensure material lists contain material description, brand name, manufacturer's address and telephone number, stock number, size, identifying trademark or symbol, and other appropriate ratings. For submittals showing a variety of models and parts available from the manufacturer, the Design-Build Team shall clearly identify by circles, marking or other means the specific materials for which approval is requested.

The Design-Build Team shall not fabricate or order material until receipt of the Department's approval. All submittals will be returned as either "Approved (AC)" (as submitted), "Approved as Noted (AN)" or "Returned for Correction (RC)". The Design-Build Team may proceed with fabrication or ordering for items marked "Approved" or "Approved as Noted" without any stipulation for re-submittal. For any other notations, the Design-Build Team shall revise the submittal, address comments and resubmit for approval.

4. Documentation

In addition to the requirements in Section 109 of the 2018 NCDOT *Standard Specifications for Roads and Structures*, the Design-Build Team shall furnish the Department two copies of the following materials prior to acceptance: warranty materials, and serial and model numbers of all equipment furnished. All equipment and appurtenances shall be furnished and identified by name, model number, serial number, technical support, and warranty telephone numbers, and any other pertinent information required to facilitate equipment maintenance. The Design-Build Team shall provide all configuration data for each device in electronic and printed form.

Reference the *Dynamic Message Signs* Special Provision found elsewhere in this RFP for detailed submittal requirements for the DMS.

TRAINING

(A) DESCRIPTION

The Design-Build Team shall provide training for the installation, operation, and maintenance of:

- CCTV field equipment
- Communications hardware
- Detection system
- Fiber-optic communications
- DMS

(B) MATERIALS

1. General

The Design-Build Team shall provide training in the installation, operation, maintenance, troubleshooting, and repair of all equipment and software. The Design-Build Team shall prepare training outline, agenda, training manuals, training exercises, instructor resumes and any other teaching aids for approval by the Department. For exercises requiring computers, the Design-Build Team shall furnish enough computers to have one computer per two students.

The Design-Build Team shall provide draft training material to the Department for review and approval at least 60 days prior to the scheduled training. Provide adequate time for review and revision of the draft training materials. The Design-Build Team shall furnish audio-visual equipment, demonstration equipment, and "hands-on" equipment in support of the envisioned training. Each training participant shall receive a copy of course materials including both comprehensive and presentation manuals. Assume there will be 12-15 students in the class. The Design-Build Team shall provide two additional copies of all documents to the Department.

The Design-Build Team shall utilize training personnel well versed in the subject matter and with extensive field experience dealing with real world problems. The Design-Build Team shall utilize training personnel that have been certified by the respective manufacturers.

The Design-Build Team shall video record the entire training on digital video disc (DVD) and provide the DVD(s) to the Department for later use. The Design-Build Team shall ensure lighting and sound quality are sufficient upon replay of the DVD(s). The Design-Build Team shall not schedule or conduct a second training session until the Department approves and accepts DVDs from the first training session.

The training shall be conducted locally by the Design-Build Team after the completion of all system integration tests. The Department shall provide the training facility. The Design-Build Team shall provide the Department with a 30-day written notification to carry out the training so that arrangements can be made for attendance. The Design-Build Team shall coordinate a mutually agreeable date, time, and location with the Department. The Engineer shall approve the training schedule time and location.

The Design-Build Team shall develop the course content specifically for the products supplied for this project. The course shall include the following topics:

- Introductory-level briefing to familiarize attendees
- Terminology
- Theory of operation
- Installation
- Hardware and software configuration
- Operating procedures and capabilities
- Testing, diagnostics and troubleshooting
- Software applications
- Use of the system documentation to operate, diagnose, maintain, and expand the system
- “Hands-on” use of the system, laptop computer and software, system test equipment, and any other system equipment supplied

The Design-Build Team shall provide course lengths and specific training described below:

2. CCTV Field Equipment

Provide training for the CCTV field equipment and the local CCTV camera software as described below:

Course	Type of Training	Length (Days)
Operations	Lecture	1
Theory of operation	Lecture and Demonstration	
Local camera programming (Camera addresses, presets, privacy zones, tours, other features)	Lecture, Demonstration and Hands-on	
Maintenance (Routine maintenance, testing, troubleshooting)	Lecture, Demonstration and Hands-on	

3. Communications Hardware

The Design-Build Team shall provide training for the Ethernet communications hardware as described below:

Course	Type of Training	Length (Days)
Ethernet Switches		1
Introduction	Lecture	
Configuration and programming	Lecture	
Review of Maintenance Manual	Lecture and Hands-on	
Review of Operations Manual	Lecture and Hands-on	
Maintenance (Routine, troubleshooting procedures, testing, system restart and recovery)	Lecture, Demonstration and Hands-on	

4. Fiber-Optic Communications

The Design-Build Team shall provide training using the test and repair equipment furnished for the project. The Design-Build Team shall provide training for the fiber-optic system for the following categories and for the minimum number of hours shown:

Course	Type of Training	Length (Days)
Fiber-Optic Cable System		
Safety	Lecture	1
Introduction to fiber-optics, theory, and principals	Lecture	
Fiber and cable types	Lecture and Hands-on	
National Electrical Code considerations	Lecture and Hands-on	
Outdoor cable, etc.	Lecture	
Introduction to terminating hardware, end equipment, and applications	Lecture, Demonstration and Hands-on	
Connectors (ST, SC, etc.)	Lecture	
Splice enclosure, splice trays, and connector panels	Lecture	
Cable placement techniques	Lecture	
Cable handling and preparation (sheath removal, grip installation, etc.)	Lecture, Demonstration and Hands-on	
Splicing and terminating methods	Lecture, Demonstration and Hands-on	
Mechanical splicing using various techniques	Lecture	
Fusion splicing	Lecture, Demonstration and Hands-on	
Field termination of connector types	Lecture, Demonstration and Hands-on	
Introduction to cable plant testing procedures	Lecture, Demonstration and Hands-on	
Proper usage of optical light generator and power meter	Lecture, Demonstration and Hands-on	
Class project (build working system using cables / connectors made by attendees)	Lecture, Demonstration and Hands-on	0.5
Cable system maintenance and restoration	Lecture	
Class project -- Testing and troubleshooting	Lecture, Demonstration and Hands-on	

5. DMS Signs

The Design-Build Team shall provide one session in the basic theory and operation of the DMS (including Toll Rate DMS Panels) equipment, cabinets, and other related equipment. The Design-Build Team shall include in this training lecture and hands-on exercises in the use of the sign controller software. The training shall include the following sessions specific to the DMS signs:

Course	Type of Training	Length (Days)
Operations	Lecture	0.5
System overview	Lecture and Demonstration	
System software	Lecture and Demonstration	
Routine maintenance, UPS, troubleshooting, testing	Lecture, Demonstration and Hands-on	0.5

6. Detection System

The Design-Build Team shall provide one session in the basic theory and operation of the detection equipment, cabinets, and other related equipment. The Design-Build Team shall include in this training lecture and hands-on exercise in the use of the controller software. The training shall include the following sessions specific to the detection points:

Course	Type of Training	Length (Days)
Operations	Lecture	0.5
Microwave radar detection system software	Lecture and Demonstration	
Routine maintenance, troubleshooting, testing	Lecture, Demonstration and Hands-on	0.5

TRAFFIC SIGNALS AND SIGNAL COMMUNICATIONS SCOPE OF WORK (11-4-16)**I. GENERAL**

This project includes both NCDOT traffic signals and Charlotte DOT traffic signals. The Design-Build Team shall be responsible for the design and installation of the NCDOT traffic signals. Charlotte DOT will be responsible for the design and installation of the CDOT traffic signals. Refer to each section for the specific requirements.

II. GENERAL – NCDOT SIGNALS

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 into a standalone Closed Loop Signal System along SR 3468 (Weddington Road). This work shall include, but not be limited to, the preparation of Traffic Signal Plans, Closed Loop Signal System Timing Plans, Electrical and Programming Details, Utility Make-Ready Plans, Fiber Optic Communication and Splicing Plans, and Project Special Provisions. These plans shall be prepared in accordance with the *Design-Build Submittal Guidelines* and the *Guidelines for Preparation of ITS & Signal Plans by Private Engineering Firms* available on the Design-Build 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 ITS & Signal Plans for NCDOT on comparable projects. The Technical Proposal shall list projects, including description and similarity to the subject project, for which the PEF has developed ITS & Signal Plans.

A pre-design meeting shall take place between the NCDOT ITS & Signals Unit, the Design-Build Team, the Division Traffic Engineer, the Regional Traffic Engineer, and any other pertinent NCDOT personnel before ITS & Signal designs begin. ITS & Signal Plan submittals shall only be reviewed and accepted by the NCDOT ITS & Signals Unit after this pre-design meeting. All ITS & Signal Plans shall be accepted by the ITS & Signals Unit prior to beginning traffic signal construction and / 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 and the ITS & Signals Unit. 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 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. If necessary, temporary traffic signal designs and implementation shall include, but not be limited to, new local controller, signal timing, cables, poles, signal span, controllers, cabinets, and / or signal heads.

Throughout the project construction, the Design-Build Team shall maintain full actuation of the traffic signals located within the roadway construction project limits, unless allowed otherwise by the Engineer in writing.

Unless allowed otherwise elsewhere in this RFP, the Design-Build Team shall incorporate all traffic signals on this project into a standalone closed loop signal system. To connect sidewalk networks, the Design-Build Team shall provide crosswalks and pedestrian signal heads for all approaches, as appropriate, based on field conditions.

Unless noted otherwise below, all new final signal installations shall utilize **wood poles** for support. All temporary signal installations, and existing signals with wood poles for support, may utilize wood poles for signal supports. All plans and associated design material and specifications shall be reviewed and accepted by NCDOT prior to installation.

The Design-Build Team shall deliver all existing cabinets and contents, including but not limited to fiber and telephone modems, that are not reinstalled on this project to the Division 10 Traffic Services Office located at 903 Coble Avenue, Albemarle, NC 28001. The Design-Build Team shall dispose of and / or retain ownership of all other traffic signal equipment.

The Design-Build Team shall be responsible for a safe and economical design for the public. The Design-Build Team shall prepare all plans and designs in accordance with the current ITS & Signals Unit 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 Roadway Standard Drawings*
- *ITS & Signals Unit Project Special Provisions*
- *ITS & Signals Unit Design Manual*
- *Manual on Uniform Traffic Control Devices (MUTCD)*
- *North Carolina Supplement to the Manual on Uniform Traffic Control Devices (NCMUTCD)*
- *Guidelines for Preparation of Projects ITS & Signal Plans by Private Engineering Firms*
- *Traffic Systems Operations Project Special Provisions - (Special Provisions for the Preparation of Coordinated Traffic Signal System Timing Plans – Version 2011.1)*

Links to additional ITS & Signals Unit design standards and aides are available on the website noted below:

<http://www.ncdot.gov/doh/preconstruct/traffic/ITSS/>

III. TRAFFIC SIGNALS – NCDOT SIGNALS

Unless allowed otherwise elsewhere in this RFP, the Design-Build Team shall provide two (2) new traffic signals and revise three (3) existing traffic signals. Unless allowed otherwise elsewhere in this RFP, all of the aforementioned signals shall be interconnected. (Reference Section IV for the system interconnection requirements) The vehicle detection for the final traffic patterns shall be inductive loop detection. The Design-Build Team may provide video detection only for temporary traffic patterns during construction. The required traffic signal work and signal communications for each intersection are listed below:

NCDOT – Existing Signal to be Upgraded (1) – Weddington Road		
Signal Inventory Number	Intersection Description	Work Requirements
10-1449	SR 3468 (Weddington Road) at SR 3440 (McKee Road)	<p>The Design-Build Team shall modify / upgrade this existing traffic signal to match all temporary construction phasing and the proposed final traffic pattern. This may require signal phasing changes, signal head changes, closed loop system detectors and / or system interconnections equipment.</p> <p>The Design-Build Team shall incorporate this signal into a NEW closed loop signal system along SR 3468 (Weddington Road).</p> <p>Upon placing other signals on this project in operation (including all temporary operations), the Design-Build Team shall install the required system communication equipment as described in Section IV.</p>

NCDOT – Existing Signals to be Upgraded (2) – East John Street Interchange		
Signal Inventory Number	Intersection Description	Work Requirements
10-1874	SR 1009 (East John Street) at I-485 Westbound Ramps	<p>The Design-Build Team shall modify / upgrade these existing traffic signals to match all temporary construction phasing and the proposed final traffic pattern. This may require signal phasing changes, signal head changes, closed loop system detectors and / or system interconnections equipment.</p> <p>The Design-Build Team shall incorporate these signals into the existing closed loop signal system along the John Street Corridor of the NC 71 (Matthews Township Pkwy) – US 74 Closed Loop System.</p>
10-1745	SR 1009 (East John Street) at I-485 Eastbound Ramps	<p>Upon placing other signals on this project in operation (including all temporary operations), the Design-Build Team shall install the required system communication equipment as described in Section IV.</p>

NCDOT – Proposed Signals (2)		
Signal Inventory Number	Intersection Description	Work Requirements
10-2230	SR 3468 (Weddington Road) at I-485 Westbound Ramps / Plantation Road	<p>At these locations, the Design-Build Team shall design and install new, fully actuated traffic signals with a 2070 controller operating OASIS software, including base extenders, in a 170 cabinet.</p> <p>The Design-Build Team shall use Flashing Yellow Arrow signal heads at all protected / permissive left turns. The Design-Build Team shall coordinate all Flashing Yellow Arrow signal recommendations with the NCDOT Division Traffic Engineer and the NCDOT Regional Traffic Engineer prior to final design and installation.</p> <p>The Design-Build Team shall use wood poles as the signal supports for the final traffic patterns.</p>
10-2231	SR 3468 (Weddington Road) at I-485 Eastbound Ramps / Plantation Center Drive	<p>The Design-Build Team shall install pedestrian signals at each traffic signal. Prior to installation, the pedestrian signals shall be reviewed and approved by the Division Traffic Engineer and the Regional Traffic Engineer.</p> <p>The Design-Build Team shall incorporate these signals in into a NEW closed loop signal system along SR 3468 (Weddington Road).</p> <p>Upon placing these signals in operation (including all temporary operations), the Design-Build Team shall install the required system communication equipment as described in Section IV.</p>

IV. SIGNAL COMMUNICATION PLANS – NCDOT SIGNALS

The Design-Build Team shall design, install, and maintain a fiber optic communications network for two (2) Closed Loop Signal Systems. The Closed Loop Signal Systems shall utilize fiber optic cable (24 fibers) as the communications medium. All fiber splicing shall take place in aerial and / or underground slice enclosures with 12 fiber drop cables routed to the cabinets. The signals for the two (2) Closed Loop Signal Systems are listed below:

SR 3468 (Weddington Road) – New System		
24 Fiber Cable - Trunk Line (New)		
SIGNAL INVENTORY NUMBER	INTERSECTION	COMMENTS
10-2230 (New)	SR 3468 (Weddington Road) at I-485 Westbound Ramps / Plantation Road	Install new 24 fiber cable
10-2231 (New)	SR 3468 (Weddington Road) at I-485 Eastbound Ramps / Plantation Center Drive	Install new 24 fiber cable
10-1449 (Existing)	SR 3468 (Weddington Road) at SR 3440 (McKee Road)	Install new 24 fiber cable

SR 1009 (East John Street) - Part of an Existing System		
24 Fiber Cable - Trunk Line (New)		
SIGNAL INVENTORY NUMBER	INTERSECTION	COMMENTS
10-1874	SR 1009 (East John Street) at I-485 Westbound Ramps	Install new 24 fiber cable between traffic signal 10-1874 and 10-1745. Maintain radio communications link from traffic signal 10-1874 to 10-0256 (John Street @ Trade Street). Upgrade the existing radio equipment at traffic signal 10-1874. Ensure new radio equipment is compatible with the existing radio system equipment. Return the removed radio equipment to the Engineer. Test radio link to ensure communications is functioning properly from traffic signal 10-0256 to 10-1874.
10-1745	SR 1009 (East John Street) at I-485 Eastbound Ramps	Install new 24 fiber cable. Return the removed radio equipment to the Engineer.

Communications Plans, Conduit Routing Plans and Project Special Provisions

Prior to construction, the Design-Build Team shall provide a detailed set of Project Special Provisions, and Communications Plans or Conduit Routing Plans, as required above for the Department's and Division's review and acceptance. With regards to the East John Street System additional work shall be required on the Communications Plans to maintain the radio communications link to signal 10-0256. No construction related to the installation of the communications or conduit system shall begin until NCDOT has accepted the RFC Plans and Project Special Provisions.

The Communications or Conduit Routing Plans shall consist of the three (3) major items listed below:

- Communications Plans including Splice Plans or Conduit Routing Plans and radio link
- Project Special Provisions
- Catalog Cut Sheets

Utility Make-Ready Plans

In conjunction with the development of the Traffic Signal Plans, and the Communications Cable Plans and / or Conduit Routing Plans, the Design-Build Team shall also develop, if applicable, a set of Utility Make-Ready Plans.

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.

V. SIGNAL SYSTEMS TIMING – NCDOT SIGNALS

The Design-Build Team shall develop and implement all temporary and final coordinated Signal System Timings Plans for the SR 3468 (Weddington Road) Closed Loop Signal System (CLS) and the John Street Corridor of the NC 51 (Matthews Township Parkway) – US 74 Closed Loop System, during and immediately after the entire project construction period. The Design-Build Team shall design, implement and fine-tune all signal system timing, and evaluate the final operational benefits associated with work performed on the project. The Signal System Timing Plans shall be designed to address all possible traffic needs along the corridor, including but not limited to:

- Weekday peak / non-peak traffic periods (i.e. a.m., p.m., noon, off-peak, etc.)
- School / University start / end and / or class change peak traffic periods
- Seasonal traffic patterns
- Pre-scheduled holiday(s) traffic patterns
- Incident management traffic patterns (i.e. detour routes, hurricane evacuations, etc.)
- Other special event traffic patterns

The Design-Build Team shall select a Private Engineering Firm (PEF) that is currently pre-approved by the NCDOT to work on signal system timing projects. The Technical Proposal shall list projects, including description and similarity to the subject project, for which the PEF has developed Signal System Timing Plans.

The Design-Build Team shall coordinate the number of Signal System Timing Plans with the Division and the Central Office System Timing (COST) Section. 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 COST Section for review and approval prior to field implementation of said timing plans. 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. All Signal System Timing Plans shall be reviewed and accepted by the COST Section prior to implementation.

The Design-Build Team shall field implement Signal System Timing Plans in accordance with the COST Section requirements and the following:

- The Design-Build Team shall ensure all Signal System Timing Plans are operational in both the Master and local controller(s).
- The Design-Build Team shall 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 Signal System Timing Plan in operation at the time.
- The Design-Build Team shall fine-tune Signal System Timing Plans and modify the signal timing, as necessary, for optimal system performance.

At the end of the project, the Design-Build Team shall submit a final report that includes the final implemented Signal System Timing Plans with all supporting documents in *SYNCHRO* 9.0, *Tru-Traffic* Reports and data, *Translink32* database files to the COST Section and Division.

VI. TRAFFIC SIGNALS – CHARLOTTE DOT SIGNALS

There is one existing Charlotte DOT traffic signal that may be impacted by the project; and one proposed Charlotte DOT signal that will be installed on the project. The Charlotte DOT will design, install, modify and maintain their existing and proposed traffic signals. The Design-Build Team shall be solely responsible for coordinating the construction sequences and schedules with the Charlotte DOT. The Department will not honor any requests for additional contract time or compensation for any efforts required for the Charlotte DOT to design, install, modify and / or maintain their existing and / or proposed traffic signals.

The contact person for the Charlotte DOT is:

Gus Jordi, PE
600 East Fourth Street
Charlotte, NC 28202-2858
(704) 336-7085

CHARLOTTE DOT – Existing Signal to be Revised (1)		
Signal Inventory Number	Intersection Description	Work Requirements
10-1850	Johnston Road at I-485 Eastbound Ramps	If the Design-Build Team’s design and / or construction impacts this traffic signal, the Charlotte DOT will design, modify and maintain this traffic signal during construction, as needed.

CHARLOTTE DOT – Proposed Signal (1)		
Signal Inventory Number	Intersection Description	Work Requirements
10-2229	Westinghouse Boulevard at I-485 Direct Connection to Express Lanes / Old Nations Ford Road	The Charlotte DOT will design, install, and interconnect this traffic signal to the Charlotte Signal System via fiber optic cable. The Charlotte DOT will modify and maintain this traffic signal during construction, as needed.

LIGHTING SCOPE OF WORK (12-6-17)

The Design-Build Team shall provide, install and renovate 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 2018 NCDOT *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 incorporated at the Department's discretion and / or 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 and / or construction methods. If the Design-Build Team incorporates design revisions that reduce the lighting construction costs, the Department shall be entitled to a credit.

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 days after receipt of this submittal to update and finalize the lighting design.

The Design-Build Team shall allow ten working days for Department review of each submittal for all materials including poles and foundation designs. An additional ten working 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 Provision found elsewhere in this RFP for additional requirements.

EXISTING LIGHTING

In accordance with the *Lighting* Project Special Provision found elsewhere in this RFP, the Design-Build Team shall relocate all existing lighting in conflict with construction and replace all existing high pressure sodium (HPS) luminaires with light emitting diode (LED) luminaires.

MAINTENANCE

Throughout construction, the Design-Build Team shall assume responsibility for routine maintenance of the newly installed lighting system(s) and 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, at no cost to the Department, any newly installed non-functional lighting system components within the project limits. All luminaires must be fully operational at project acceptance.

UTILITIES COORDINATION SCOPE OF WORK (12-5-16)

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 Design-Build Team 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 utility plans.

During the procurement phase, the Department will allow no direct contact between the Design-Build Team and utility owners. No contact between the Design-Build Team and the utility owners shall be allowed either by phone, e-mail or in person. After the procurement phase, the Design-Build will only be allowed direct contact with the utility owners when the aforementioned PSF is present. (Reference the *Individual Meeting 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 existing or proposed full control of access, 2) in physical conflict with construction, 3) beneath the existing or proposed pavement structure and structurally inadequate, and / or 4) beneath the existing or proposed pavement structure and consist of unacceptable material. 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	Utility Type	Cost Responsibility
Duke Energy	Power (Transmission)	NCDOT (normally)
Duke Energy	Power (Distribution)	NCDOT (normally)
AT&T	Telecommunications	AT&T (normally)
Windstream	Telecommunications	Windstream (normally)
Charlotte Water	Water and Sewer	Design-Build Team (NCDOT will obtain an agreement with Charlotte allowing the Design-Build Team to work on their facilities)
Piedmont Natural Gas	Gas (Distribution)	NCDOT (with easement or PNG)
Time Warner Cable	CATV	Time Warner Cable

Water and Sewer

If the Design-Build Team's design and / or construction require the relocation and / or encasement of existing water and / or sewer facilities, designs shall be coordinated with the NCDOT Utilities Unit. All costs associated with the design and construction for relocation and / or encasement of these existing 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 project. 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.

For all parcels with access to existing water and / or sewer facilities that the project subdivides, the Design-Build Team shall design and construct water / sewer facility extensions to all sub-divided parcels, including but not limited to the sub-divided parcel with the existing water / sewer access, if necessary. 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. All costs associated with the design and construction of water / sewer facility extensions to sub-divided parcels shall be included in the Design-Build Team's lump sum bid for the project.

Designs shall be coordinated with the NCDOT Utilities Unit and the utility owners or their representatives. In .pdf format, the Design-Build Team shall electronically submit one half-size set and one full size set of utility construction drawings to the 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. Once accepted by the State Utilities Manager, the plans, with the appropriate agreement, will be sent to the utility owner for review and concurrence.

The relocation of all water and sewer facilities shall be done in accordance with the NCDOT Policies, as well as the latest Charlotte Water's water and sewer design requirements / specifications. 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 aforementioned appropriate utility owner prior to installation.

Utility Relocation Plans

Excluding water and sewer conflicts, if the Design-Build Team's design and or construction create 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 Utility 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 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.

Cost Responsibility

The Design-Build Team shall be responsible for all costs associated with relocating water and sewer facilities, as described in the Water and Sewer Section of this Scope of Work.

The NCDOT will be responsible for all other non-betterment utility relocation cost when the utility owner has prior rights of way / compensable interest. The utility owner shall be responsible for the relocation costs if they cannot furnish evidence of prior rights of way or a compensable interest in their facilities. The Design-Build Team shall be responsible for verifying / determining the cost responsibility (prior rights and compensable interest) for the utility relocations. The Design-Build Team shall be responsible for all costs associated with utility relocations due to haul roads and / or any other temporary conditions resulting from the Design-Build Team's methods of operation or sequence of work.

Compensable Interest

Typically, affidavits, recorded easements or NCDOT agreements can serve as evidence of prior rights. A compensable interest is identified as follows:

- (A) Existing or prior easement rights within the limits of the project, either by recorded right of way or adverse possession (Utility occupying the same location for twenty (20) plus years outside the existing highway rights of way).
- (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 easements 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 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 Agreement 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, and / or upgrade or incorporate new facilities as part of the highway construction, designs shall be coordinated with the utility owner and the 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; or 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 Lighting, Traffic Signals and ITS Devices

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 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 Resident Engineer.

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 utilities that are in conflict with any proposed communication cables.

Requirements for Attachments to Existing and / or Proposed Structures

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. All utility related attachments must be evaluated and approved by the State Utilities Manager, including any existing attachments to any structure(s) that require modification or replacement. Attachments shall be prohibited under the following criteria:

- (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 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 addressed in accordance with Article 104-7 of the 2018 NCDOT *Standard Specifications for Roads and Structures*.

The Design-Build Team shall be required to use the guidelines as set forth in the following:

- (A) *NCDOT Utility Manual - Policies & Procedures for Accommodating Utilities on Highway Rights of Way* and the *NCDOT Utilities Policy Manual*. If the two aforementioned manuals contradict each other, the *Utilities Policy Manual* shall govern. Reference the website noted below for the current version of the NCDOT utility manuals, and additional information on the transition to the new utility manuals that shall be adhered to:

<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.

The NCDOT State Utilities Manager must execute approved agreements on Design-Build projects. The Utility Relocation Agreements (Cost Agreement) and Encroachment Agreements are available from the NCDOT Utilities Unit. Reference Pages 59 and 60 of the *NCDOT Utility Manual - Policies & Procedures for Accommodating Utilities on Highway Rights of Way* for the different types of Encroachment Agreements available for use.

The Design-Build Team shall submit all Utility Relocation Agreements, (URAs), all Utility Encroachment 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 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 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*.

RIGHT OF WAY SCOPE OF WORK (11-27-2017)

**** 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 permanent 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 also 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. Neal Strickland, in the NCDOT Right of Way Unit, at 919-707-4364. The Design-Build Team shall perform the services as set forth herein and furnish and deliver to the Department reports accompanied by all documents 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 Project I-5507 / R-0211EC / U-4714AB in Mecklenburg County.

Acquisition services required outside of the project construction limits due solely to a 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 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 April 2015 *Right of Way Manual*.
- The Department will prepare all Condemnation Maps. The Design-Build Team shall prepare all Final Condemnation Reports. 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, and the Attorney General, in writing, that revisions have been made that impact a condemned parcel, and provide updated plan sheets 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. 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.
 - 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 April 2015 *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.
- 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 “RW” series 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 in 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.
- In accordance with Chapter 133 of the *General Statutes of North Carolina*, Section 133-40, the Council of State must approve acquisition of property with contaminated soil. Thus, 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

The Department will require 90 days from receipt of the information noted above to coordinate with the Council of State and obtain their approval for the acquisition of contaminated property.

PUBLIC INFORMATION SCOPE OF WORK (2-7-18)

In accordance with the *I-5507 (I-485 Express Lanes) including R-0211EC (Interchange) and U-4714AB (Interchange Modification) Public Involvement Plan*, the 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 Communications Office and Public Involvement Group, 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 start of construction to discuss project impacts to the public. This information will be used by the Department to update the *I-5507 (I-485 Express Lanes) including R-0211EC (Interchange) and U-4714AB (Interchange Modification) Public Involvement and Information Plan*.

The Department will develop, with the assistance of 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.

The Design-Build Team shall discuss in the Technical Proposal their approach to providing the public with communication access to project personnel to inquire as to traffic impacts, including vehicular and pedestrian.

The Design-Build Team shall include in their Lump Sum Bid price for the project, all costs associated with their involvement in the Public 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
- Providing media announcements
- Excluding colored 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
- Website 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 notices to newspapers, the Design-Build Team shall coordinate with the Public Involvement Officer assigned to the project.

The Design-Build Team shall 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 colored 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
- Attending and / or speaking at public meetings
- Hand delivery of time sensitive informational materials

The minimum public information requirements solely associated with the Transportation Management Plans shall include, but not be 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 twenty-one (21) 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
- 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 the project website, the Design-Build Team shall inform the Department at least twenty-one (21) 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 (12-22-16)

The Design-Build Team shall be responsible for coordinating with Norfolk Southern Railway and CSX Transportation (Railroad Owners) to secure the railroad agreements necessary for (1) widening the highway under the rail overpass bridge operated and maintained by Norfolk Southern Railway (NSR), and (2) widening the highway bridge over the track operated and maintained by CSX Transportation (CSXT) and 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 Railroad Owners Right of Way and shall include any necessary agreements required by the NCDOT and / or the Railroad Owners.

The Design-Build Team shall be responsible for all Railroad Owners costs associated with this project to include, but not be limited to, plan reviews, materials furnished by the Railroad Owners, signals and communications work, track and related construction by the Railroad Owners 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. The Railroad Owners will not incur cost, and the Design Build Team shall not enter into or onto the NSR or CSXT rail corridor until an Agreement is executed, insurance requirements are met, and each Railroad Owner receives written authorization to incur cost.

Preparation for Construction within the Existing Railroad Owners Right of Way

- I. The Design-Build Team shall comply with the following applicable documents, unless noted otherwise elsewhere in this RFP and / or a design exception is received from NSR or CSXT 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. *CSX Transportation Public Project Information*, latest edition
 - E. *Federal Aid Policy Guide 23 CFR 140I*
 - F. *Federal Aid Policy Guide 23 CFR 646*
 - G. *NCDOT Construction Manual* Section 105-8
 - H. *NCDOT Standard Specifications for Roads and Structures*, Section 107-9 (Excluding Paragraph 2)

I. North Carolina Administrative Code Section T19A: 02B, 0150 through 015

- II. The Design-Build Team shall verify the number of trains per day and the maximum speed allowed with the Railroad Owners.

Railroad inspection and maintenance requirements, in addition to normal train operations, will occur that may impact construction activities.

- III. This project has one site located on the NSR Corridor at approximately Milepost 9.12. The corridor contains one freight track at this location. Railroad traffic shall be maintained at current levels at all times.

This project has one site located on the CSXT Corridor at approximately Milepost CSXT 318.2. The corridor contains one freight track at this location. Railroad traffic shall be maintained at current levels at all times.

- IV. The Design-Build Team shall design and construct the bridge widenings over the CSXT Corridor to span the existing track. The bridge over the CSXT Corridor shall provide a minimum 23-foot vertical clearance above the highest rail. The bridge over CSXT shall provide a minimum horizontal clearance no less than the existing horizontal clearance. Crashwalls will be required for any foundation element with less than 25 feet of horizontal clearance from the existing track.

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 the Railroad Owners for the installation of temporary grade crossing surfaces, including but not limited to associated temporary drainage, 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 the Railroad Owners 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 the Railroad Owners, or their representative, at the Design-Build Team's expense.

The Design-Build Team shall not commence any work on the Railroad Owners right of way / easement until all agreements have been executed, insurance acquired and approved in accordance with the Railroad Owners policies and procedures, and all construction plans have been approved by NCDOT and NSR or CSXT. The Design-Build Team shall make the necessary arrangements with the Railroad Owners that are required to protect against property damage that may result in loss of service, expense, or loss of life. The Design-Build Team shall be responsible for all damage to the NSR and CSXT resulting from their operations and the Railroad Owners 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 the Railroad Owners and the Railroad Operators, identifying the Railroad Owners 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 the Railroad Owners. 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 the Railroad Owners 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 the Railroad Owners 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 the Railroad Owners' specifications, the private utility owner will be responsible for all associated fees and provide the necessary insurance coverage,.

All work associated with any utility installation across the Railroad Owners' right of way / easement shall adhere to the requirements noted herein and the Railroad Owners' specifications.

- III. After negotiations among the Department, the Design-Build Team and the Railroad Owners have been finalized, and approval obtained from the 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 / CSXT. This section particularly applies if a modification to an agreement is necessary.

Coordination with Norfolk Southern Railway

The Design-Build Team shall coordinate with Kevin Hauschildt, Chief Engineer, Bridges and Structures, Norfolk Southern Railway, 1200 Peachtree Street, NE Atlanta, GA 30309, (contact is Scott Overbey at telephone number 404-582-5588) to obtain plan approval and a partially executed legal agreement with NSR and the Department of Transportation (which includes NCDOT Rail Division plan review) as the parties in the agreement for the Norfolk Southern Railway overpass grade separation. Plan approval shall be based on multiple submittals including at minimum a preliminary plan submittal and 90% plan submittal. The preliminary plan submittal to the NSR shall include the NSR's "Overpass Grade Separation Data Sheet," as applicable, appropriate roadway plan sheets showing impacts to the right of way / easement, erosion control plans, and drainage calculations for any drainage on or across the NSR's right of

way / easement, and bridge plans showing a vertical and horizontal alignment and preliminary general drawings. The 90% plan submittal shall include all necessary details, insets, and notes for construction with no substantial changes to the alignments or layout shown in the preliminary plan submittal and all supporting design calculations. An electronic copy (pdf format) of all review plans and associated data shall be submitted to NSR through the NCDOT Design-Build Unit. If any re-submittals of plans or any additional information is required, an electronic copy (pdf format) shall be submitted to the NCDOT Design-Build Unit for forwarding to the NSR. RFC Plans shall be submitted to NSR before construction begins. For RFC Plans, a minimum of three (3) half-size sets and an electronic copy of the plans (pdf format) shall be submitted to the NCDOT Design-Build Unit for forwarding to the NSR. Working Drawings affecting the NSR's operations and / or right of way / easement shall follow the submittal process as outlined in the 2018 NCDOT *Standard Specifications for Roads and Structures* or Special Provisions. The Department will review all agreement modifications prior to submittal to NSR. The Department will execute and distribute the agreement modifications within 14 calendar days of Board of Transportation approval. The agreements, and any modifications thereto, shall include necessary Force Account items, including but not limited to, preliminary engineering, construction engineering, crossing surfaces, track materials, track construction, signals and flagging. 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 written comments to the NCDOT Design-Build Unit, after which the Department will pay the invoice. The Design-Build Team shall be responsible for maintaining records to verify the invoice items.

Coordination with CSX Transportation

The Design-Build Team shall coordinate with the primary owner of CSXT through the CSXT general Engineering Consultant (GEC), Arcadis. The Design-Build Team shall coordinate with Mr. Joe Schofield at Arcadis, 1650 Prudential Drive, Suite 400, Jacksonville, FL 32207, (904) 861-2898 to obtain coordination procedures for plan approval and, if needed, a partially executed legal agreement with CSXT and the NCDOT as the parties in the agreement for proposed roadway work. The Department will review the agreement prior to submittal to the CSXT. The Department will execute and distribute the Agreement within 14 calendar days of Board of Transportation approval. The agreement, and any modifications thereto, shall include necessary Force Account items, including but not limited to, preliminary engineering, construction engineering, flagging, signal and communication lines, and other work performed by the CSXT, as necessary. CSXT has sole authority to determine the need for flagging required to protect its operations and property. The railroad agreements state that the Department will be responsible for payment of the CSXT's Force Account work and CSTX 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 CSXT 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 CSXT shall include roadway plans, the Railroad's "Overhead Bridge Crossing Data," appropriate roadway plan sheets showing impacts to the CSXT right of way / easement, erosion control plans, and drainage calculations for any drainage on or across the CSXT's right of way / easement and bridge plans showing a vertical and horizontal alignment and preliminary general drawings. Electronic versions of the preliminary plans, final plans and data shall be submitted to Arcadis through the NCDOT 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 Arcadis through the NCDOT Design-Build Unit. Working Drawings affecting CSXT'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.

Coordination with NCDOT Rail Division

All plans submitted to NSR and / or CSXT, as required above, shall be submitted to the NCDOT Rail Division through the NCDOT Design-Build Unit.

***** STANDARD SPECIAL PROVISIONS *******RAILROAD GRADE CROSSING**

(7-1-95) (Rev. 1-15-13)

107-9

DB1 G17R

Provide at least two weeks advance notice to the railroad's local Roadmaster or Track Supervisor when the use of slow-moving or stopped equipment is required over at-grade railroad crossings.

PLANT AND PEST QUARANTINES**(Imported Fire Ant, Gypsy Moth, Witchweed, Emerald Ash Borer and Other Noxious Weeds)**

(8-31-13)(Rev. 12-20-16)

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 <http://www.ncagr.gov/plantindustry/> 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 or other noxious weeds.

COAL COMBUSTION PRODUCTS IN EMBANKMENTS

(Rev. 4-10-15) (Rev. 7-20-17)

235

DB2 R70

Description

This specification allows the Design-Build Team an option, with the approval of the Engineer, 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 Value Management Group. 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-309.215(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 State Value Management Engineer at valuemanagement@ncdot.gov for review. The Engineer and the State Value Management Engineer will coordinate the requirements of NCGS § 130A-309.215(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.

BRIDGE APPROACH FILLS

(10-19-10) (Rev. 10-17-17)

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 2018 Roadway Standard Drawing Nos. 422.01 or 422.02 or Roadway Detail Drawing No. 422D10.

Define bridge approach fill types as follows:

Approach Fills – Bridge approach fills in accordance with 2018 Roadway Standard Drawing No. 422.01 or 422.02 or Roadway Detail Drawing No. 422D10

Standard Approach Fill – Type I Standard Bridge Approach Fill in accordance with 2018

Roadway Standard Drawing No. 422.01

Modified Approach Fill – Type II Modified Bridge Approach Fill in accordance with 2018 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 3" 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 2018 Roadway Standard Drawing Nos. 422.01 or 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 2018 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 8" to 10" 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 8" 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 2018 Roadway Standard Drawing No. 422.01 or 2018 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 2018 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 2018 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 2018 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 2018 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 2018 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 2018 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 2018 Roadway Standard Drawings 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 2018 Roadway Standard Drawing No. 422.03 and cover geotextiles with at least 3" of select material. Place layers of reinforcement geotextiles within 3" of locations shown in 2018 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 2018 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 8" to 10" 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 8" 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 2018 Roadway Standard Drawing No. 422.03.

Temporary walls shall be designed for a surcharge pressure in accordance with 2018 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 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.

CLASS IV SUBGRADE STABILIZATION IN LIEU OF CHEMICAL STABILIZATION

(10-23-15) (Rev. 11-22-17)

501, 542

DB05 R017

Description

In lieu of chemical stabilization, provide Class IV Subgrade Stabilization by replacing 8" of subgrade soils with geotextile and Class IV select material. This substitution shall be allowed in full typical section width, in a given direction, and shall not result in chemically stabilized sections or Class IV stabilized sections less than 1,000 feet in length, unless otherwise approved by the Engineer. This substitution will not be allowed for chemically stabilized sections with

geotextile for pavement stabilization. Notify the Engineer at least 30 days in advance of starting Class IV Subgrade Stabilization in lieu of Chemical Stabilization.

Materials

Refer to the 2018 *Standard Specifications for Roads and Structures* as follows.

Item	Section
Geotextile for Soil Stabilization, Type 4	1056
Select Material, Class IV	1016

Use Class IV Select Material for Class IV Subgrade Stabilization.

Construction Methods

Install geotextile for soil stabilization in accordance with Article 270-3 in the 2018 *Standard Specifications for Roads and Structures*. Place, compact and maintain Class IV subgrade stabilization in accordance with Article 505-3 of the 2018 *Standard Specifications for Roads and Structures*.

FINAL SURFACE TESTING

(4-26-16) (Rev. 9-13-17)

DB6 R45

On all mainline travel lanes, including but not limited to auxiliary lanes, and -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.

ASPHALT CONCRETE PLANT MIX PAVEMENTS

(12-14-17)

610, 1012

DB6 R65

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

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

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

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

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

“S9.5B”.

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

Mix Type	Design ESALs millions ^A	Binder PG Grade ^B	Compaction Levels		Max. Rut Depth (mm)	Volumetric Properties			
			Gmm @			VMA	VTM	VFA	%Gmm @ N _{ini}
			N _{ini}	N _{des}		% Min.	%	Min.-Max.	
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:

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

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

TABLE 610-7 DENSITY REQUIREMENTS	
Mix Type	Minimum % G_{mm} (Maximum Specific Gravity)
S4.75A	85.0 ^A
S9.5B	90.0
S9.5C, S9.5D, I19.0C, B25.0C	92.0

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

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

TABLE 1012-1 AGGREGATE CONSENSUS PROPERTIES^A				
Mix Type	Coarse Aggregate Angularity^B	Fine Aggregate Angularity % Minimum	Sand Equivalent % Minimum	Flat and Elongated 5 : 1 Ratio % Maximum
<i>Test Method</i>	<i>ASTM D5821</i>	<i>AASHTO T 304</i>	<i>AASHTO T 176</i>	<i>ASTM D4791</i>
S4.75A; S9.5B	75 / -	40	40	-
S9.5C; I19.0C; B25.0C	95 / 90	45	45	10
S9.5D	100 / 100	45	50	10
OGFC	100 / 100	45	45	10
UBWC	100 / 85	45	45	10

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

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.

REMOVE AND STOCKPILE EXISTING GUARDRAIL

(7-1-95) (Rev. 7-18-06)

DB8 R55

Carefully dismantle and remove existing guardrail and all components, concrete anchors included, at locations indicated in the plans developed by the Design-Build Team and neatly stockpile it on the right of way, with the small parts stored in sturdy containers, for removal by State Forces. Dispose of the concrete anchors.

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 UNITS, TYPE 350 (TL - 3)

(9-1-11) (Rev. 9-14-17)

DB8 R75

Description

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 list 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 NCHRP Report 350, 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.

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 installation 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 218 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 2018 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

Item	Section
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 3" 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 *LFRD 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. Assume the following soil parameters for shoring backfill:

(a) Unit weight (γ) = 120 pcf;

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 2018 Roadway Standard Drawing No. 1170.01. Use temporary guardrail in accordance with Section 862 of the 2018 *Standard Specifications for Roads and Structures* and 2018 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 3 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 1 and 10 minute readings or less than 0.08 inch between the 6 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.

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 1 to 15 per contractor per calendar year. The Contractor shall sign an agreement to fulfill their annual goal for the year.

Training Classifications

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

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

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

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

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

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

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

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

Records and Reports

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

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

Trainee Interviews

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

Trainee Wages

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

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

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

Achieving or Failing to Meet Training Goals

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

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

Measurement and Payment

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

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 Article 108-13(E), 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)	Bermudagrass
Kobe Lespedeza	Browntop Millet
Korean Lespedeza	German Millet - Strain R
Weeping Lovegrass	Clover – Red / White / Crimson
Carpetgrass	

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

Common or Sweet Sundangrass

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

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

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

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

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

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

***** STANDARD SPECIAL PROVISIONS *******AWARD OF CONTRACT**

(6-28-77)(Rev. 1-8-16)

Z-6

“The North Carolina Department of Transportation, in accordance with the provisions of *Title VI of the Civil Rights Act of 1964* (78 Stat. 252) and the Regulations of the Department of Transportation (*49 C.F.R., Part 21*), issued pursuant to such act, hereby notifies all bidders that it will affirmatively insure that the contract entered into pursuant to this advertisement will be awarded to the lowest responsible bidder without discrimination on the ground of race, color, or national origin”.

TITLE VI AND NONDISCRIMINATION**I. Title VI Assurance**

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:

(1) Compliance with Regulations: The contractor shall comply with the Regulation relative to nondiscrimination in Federally-assisted programs of the Department of Transportation (hereinafter, "DOT") Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time, (hereinafter referred to as the Regulations), which are herein incorporated by reference and made a part of this contract.

(2) 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 either directly or indirectly in the discrimination prohibited by section 21.5 of the Regulations, including employment practices when the contract covers a program set forth in Appendix B of the Regulations.

(3) 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 Regulations relative to nondiscrimination on the grounds of race, color, or national origin.

(4) Information and Reports: The contractor shall provide all information and reports required by the Regulations or 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 North Carolina Department of Transportation (NCDOT) or the Federal Highway Administration (FHWA) to be pertinent to ascertain compliance with such Regulations, orders and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish this information the contractor shall so certify to the NCDOT, or the FHWA as appropriate, and shall set forth what efforts it has made to obtain the information.

(5) Sanctions for Noncompliance: In the event of the contractor's noncompliance with the nondiscrimination provisions of this contract, the NCDOT shall impose such contract sanctions as it or the FHWA may determine to be appropriate, including, but not limited to:

- (a) Withholding of payments to the contractor under the contract until the contractor complies, and / or
- (b) Cancellation, termination or suspension of the contract, in whole or in part.

(6) Incorporation of Provisions: The contractor shall include the provisions of paragraphs (1) through (6) in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Regulations, or directives issued pursuant thereto.

The contractor shall take such action with respect to any subcontractor procurement as the NCDOT or the FHWA may direct as a means of enforcing such provisions including sanctions for noncompliance: provided, however, that, in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier as a result of such direction, the contractor may request the NCDOT to enter into such litigation to protect the interests of the NCDOT, and, in addition, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

II. Title VI Nondiscrimination Program

Title VI of the 1964 Civil Rights Act, 42 U.S.C. 2000d, provides that: "No person in the United States shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance." The broader application of nondiscrimination law is found in other statutes, executive orders, and regulations (see Section III, Pertinent Nondiscrimination Authorities), which provide additional protections based on age, sex, disability and religion. In addition, the 1987 Civil Rights Restoration Act extends nondiscrimination coverage to all programs and activities of federal-aid recipients and contractors, including those that are not federally-funded.

Nondiscrimination Assurance

The North Carolina Department of Transportation (NCDOT) hereby gives assurance that no person shall on the ground of race, color, national origin, sex, age, and disability, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity conducted by the recipient, as provided by Title VI of the Civil Rights Act of 1964, the Civil Rights Restoration Act of 1987, and any other related Civil Rights authorities, whether those programs and activities are federally funded or not.

Obligation

During the performance of this contract, the Contractor and its subcontractors are responsible for complying with NCDOT's Title VI Program. The Contractor must ensure that NCDOT's Notice

of Nondiscrimination is posted in conspicuous locations accessible to all employees and subcontractors on the jobsite, along with the Contractor's own Equal Employment Opportunity (EEO) Policy Statement. The Contractor shall physically incorporate this "**TITLE VI AND NONDISCRIMINATION**" language, in its entirety, into all its subcontracts on federally-assisted and state-funded NCDOT-owned projects, and ensure its inclusion by subcontractors into all subsequent lower tier subcontracts. The Contractor and its subcontractors shall also physically incorporate the **FHWA-1273**, in its entirety, into all subcontracts and subsequent lower tier subcontracts on Federal-aid highway construction contracts only. The Contractor is also responsible for making its subcontractors aware of NCDOT's Discrimination Complaints Process, as follows:

FILING OF COMPLAINTS

1. **Applicability** – These complaint procedures apply to the beneficiaries of the NCDOT's programs, activities, and services, including, but not limited to, members of the public, contractors, subcontractors, consultants, and other sub-recipients of federal and state funds.
2. **Eligibility** – Any person or class of persons who believes he / she has been subjected to discrimination or retaliation prohibited by any of the Civil Rights authorities, based upon race, color, sex, age, national origin, or disability, may file a written complaint with NCDOT's Civil Rights office. The law prohibits intimidation or retaliation of any sort. The complaint may be filed by the affected individual or a representative, and must be in writing.
3. **Time Limits and Filing Options** – A complaint must be filed no later than 180 calendar days after the following:
 - The date of the alleged act of discrimination; or
 - The date when the person(s) became aware of the alleged discrimination; or
 - 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 other discrimination complaints may be submitted to the following entities:

- **North Carolina Department of Transportation**, Office of Equal Opportunity & Workforce Services (EOWS), External Civil Rights Section, 1511 Mail Service Center, Raleigh, NC 27699-1511; 919-508-1808 or toll free 800-522-0453
- **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

Federal Highway Administration, North Carolina Division Office, 310 New Bern Avenue, Suite 410, Raleigh, NC 27601, 919-747-7010

Federal Highway Administration, Office of Civil Rights, 1200 New Jersey Avenue, SE, 8th Floor, E81-314, Washington, DC 20590, 202-366-0693 / 366-0752

Federal Transit Administration, Office of Civil Rights, ATTN: Title VI Program Coordinator, East Bldg. 5th Floor – TCR, 1200 New Jersey Avenue, SE, Washington, DC 20590

Federal Aviation Administration, Office of Civil Rights, 800 Independence Avenue, SW, Washington, DC 20591, 202-267-3258

➤ **US Department of Justice**, Special Litigation Section, Civil Rights Division, 950 Pennsylvania Avenue, NW, Washington, DC 20530, 202-514-6255 or toll free 877-218-5228

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 EOWS at the phone number above 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, sex, age, or disability. The term “basis” refers to the complainant’s membership in a protected group category. Contact this office to receive a Discrimination Complaint Form.

Protected Categories	Definition	Examples	Applicable Statutes and Regulations	
			FHWA	FTA
Race	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	Title VI of the Civil Rights Act of 1964; 49 CFR Part 21; Circular 4702.1B
Color	Color of skin, including shade of skin within a racial group	Black / White / Brown / Yellow / etc.		
National Origin	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	Women and Men	1973 Federal-Aid Highway Act	Title IX of the Education Amendments of 1972
Age	Persons of any age	21 year old person	Age Discrimination Act of 1975	
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	

III. 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);
- 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);
- 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;
- The Federal Aviation Administration’s Non-discrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures discrimination 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;
- 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);
- 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).
- 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);
- 49 CFR Part 26, regulation to ensure nondiscrimination in the award and administration of DOT-assisted contracts in the Department's highway, transit, and airport financial assistance programs, as regards the use of Disadvantaged Business Enterprises (DBEs);
- Form FHWA-1273, “Required Contract Provisions,” a collection of contract provisions and proposal notices that are generally applicable to *all Federal-aid construction projects* and must be made a part of, and physically incorporated into, *all federally-assisted contracts*, as well as appropriate subcontracts and purchase orders, particularly Sections II (Nondiscrimination) and III (Nonsegregated Facilities).

MINIMUM WAGES

(07-21-09)

Z-5

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

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

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

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

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

The determination of the intent of the application of these Acts to the project's contract shall be the Design-Build Team's responsibility.

The Design-Build Team shall have no claim against the Department of Transportation for any changes in the minimum wage laws, State or Federal. It is the responsibility of the Design-Build Team to be fully informed of all Federal and State Laws affecting the project's contract.

***** 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*, the term “Contractor” is replaced with “Design-Build Team”, the term “Bidder” is replaced with “Proposer,” the term “Bid” is replaced by “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 proposal 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 his 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 otherwise noted 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.

PROPOSAL (OR 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.

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.

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 requirements of the Request for Proposals, 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 Proposals will be received for the 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 bid 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 date and time 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 with the proposal 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 Price Proposal. 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 proposal 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 proposal.
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 bid 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 and notarized.
 - 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.
 - f. The Price Proposal execution shall be notarized by a notary public whose commission is in effect on the date of execution. Such notarization shall be applicable both to the Price Proposal and to the Non-Collusion Affidavit, Debarment Certification and Gift Ban Certification that is part of the signature sheets.
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 envelope 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 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 and Price Proposals 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 shortlisted 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 proposal items 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 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 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, Article 104-10, replace the first paragraph 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. All existing and constructed guardrail / guiderail within the project limits shall be included in this maintenance. 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. The Design-Build Team shall perform weekly inspections of guardrail and guiderail and shall report damages to the Engineer on the same day of the weekly inspection. Where damaged guardrail or guiderail is repaired or replaced as a result of maintaining the project in accordance with this Article, such repair or replacement shall be performed within seven consecutive calendar days of such inspection report.

Page 1-39, Article 104-10, add the following after the last paragraph:

The Design-Build Team will not be compensated for performance of weekly inspections and damage reports for the guardrail / guiderail. Other maintenance activities for existing guardrail / guiderail will be handled in accordance with Articles 104-7 and 104-8.

**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 CONSTRUCTION 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 will 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.

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 (2 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 any proposed subcontractors associated with the design of the project.

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 notice

before he 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, he shall be responsible for coordinating with the Engineer in scheduling their attendance and for notifying them. 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 requirement, the Design-Build Team shall submit copies of completed and signed DBE subcontracts, purchase orders, or invoices to the Department.

The Design-Build Team shall submit a traffic control plan in accordance with Article 1101-5 and the Request for Proposals. The Design-Build Team shall designate an employee who is competent and experienced in traffic control to implement and monitor the traffic control plan. 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 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, traffic control and safety plans 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 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 traffic control and safety plans. The Design-Build Team shall not designate its superintendent as the responsible person for either the traffic control plan or the safety plan, unless approved by the Engineer.

If the project requires that 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 it will use 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, 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 Article 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, Article 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, Article 108-13, delete bullet (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 Article 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 : Mecklenburg

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
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ROADWAY ITEMS

0001	0000900000-N	SP	GENERIC MISCELLANEOUS ITEM DESIGN & CONSTRUCTION	Lump Sum	L.S.	
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1538/Jan06/Q1.0/D900000/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	Gal / Ton	0.55	_____ Tons
Sub-Ballast			
Aggregate for Cement Treated Base Course			
Portland Cement for Cement Treated Base Course	Gal / Ton	0.55	_____ Tons
Asphalt Concrete Base Course	Gal / Ton	2.90	_____ Tons
Asphalt Concrete Intermediate Course			
Asphalt Concrete Surface Course			
Open-Graded Asphalt Friction Course			
Permeable Asphalt Drainage Course			
Sand Asphalt Surface Course, Type SA-1			
Portland Cement Concrete Pavement:			
Thru Lanes and Shoulders (> 11")	Gal / SY	0.327	_____ SY
Thru Lanes and Shoulders (9" to 11")		0.272	_____ SY
Thru Lanes and Shoulders (< 9")		0.245	_____ SY
* Structural Concrete (Cast-in-Place Only)	Gal / CY	0.98	_____ CY

* 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 and Price Proposal.)

LISTING OF MBE & WBE SUBCONTRACTORS

Sheet _____ of _____

FIRM NAME AND ADDRESS	MBE or WBE	ITEM NO.	ITEM DESCRIPTION	* AGREED UPON UNIT PRICE	** DOLLAR VOLUME OF ITEM

Contract No. _____ **County** _____ **Firm** _____

**This form must be completed in order for the Bid to be considered responsive and be publicly read.
Bidders with no MBE and/or WBE participation must so indicate this on the form by entering the word or number zero.**

LISTING OF MBE & WBE SUBCONTRACTORS

Sheet _____ of _____

FIRM NAME AND ADDRESS	MBE or WBE	ITEM NO.	ITEM DESCRIPTION	* AGREED UPON UNIT PRICE	** DOLLAR VOLUME OF ITEM

Contract No. _____ **County** _____ **Firm** _____

**This form must be completed in order for the Bid to be considered responsive and be publicly read.
Bidders with no MBE and/or WBE participation must so indicate this on the form by entering the word or number *zero*.**

LISTING OF MBE & WBE SUBCONTRACTORS

Sheet _____ of _____

FIRM NAME AND ADDRESS	MBE or WBE	ITEM NO.	ITEM DESCRIPTION	* AGREED UPON UNIT PRICE	** DOLLAR VOLUME OF ITEM

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 MBE and / or WBE subcontractor, and these prices will be used to determine the percentage of the MBE and / or WBE participation in the contract.

** Dollar Volume of MBE Subcontractor \$ _____
 MBE Percentage of Total Construction Cost _____ %
 (Including Right of Way Acquisition Cost)
 ** Dollar Volume of WBE Subcontractor \$ _____
 WBE Percentage of Total Construction Cost _____ %
 (Including Right of Way Acquisition Cost)

** Must have entry even if figure to be entered is zero.

**This form must be completed in order for the Bid to be considered responsive and be publicly read.
 Bidders with no MBE and/or WBE 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 _____
Secretary / Assistant Secretary
Select appropriate title

By _____
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

Signature of Witness

By

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.

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 _____

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.: **C203970**

County: **Mecklenburg County**

ACCEPTED BY THE
DEPARTMENT OF TRANSPORTATION

Contract Officer

Date

Execution of Contract and Bonds
Approved as to Form:

Attorney General