# MONROE CONNECTOR/BYPASS (TIP R-3329, R-2559)

## THIRD INDUSTRY REVIEW DRAFT

## REQUEST FOR PROPOSALS: VOLUME II

## August 11, 2010

*VOID FOR BIDDING*

DATE AND TIME OF TECHNICAL AND PRICE PROPOSAL SUBMISSION: **October 1, 2010 at 4:00 PM**

DATE AND TIME OF PRICE PROPOSAL OPENING: **October 22, 2010 at 2:00 PM**

| | |
|---|---|
| CONTRACT ID: | C202587 |
| WBS ELEMENT NO. | 34533.5.TA1 |
| COUNTY: | Mecklenburg and Union |
| ROUTE: | Monroe Connector/Bypass |
| MILES: | 19.7 |
| LOCATION: | From US 74 near I-485 in Mecklenburg County to US 74 between the towns of Wingate and Marshville in Union County. |
| TYPE OF WORK: | DESIGN-BUILD SERVICE AS SPECIFIED IN THE SCOPE OF WORK CONTAINED IN THE REQUEST FOR PROPOSAL |

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. C202587**

**IN MECKLENBURG AND UNION COUNTIES, NORTH CAROLINA**

**Date_____ 20_____**

**NORTH CAROLINA TURNPIKE AUTHORITY,**

**A DIVISION OF THE 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. C202587, 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 Board 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 solicitation of said bonds 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. C202587 in Mecklenburg and Union Counties by no later than the dates(s) specified in the Final RFP or Technical Proposal, whichever is earlier, and in accordance with the requirements of the Contract Documents, including the Technical Proposal prepared by the Design-Build Team. The Design-Build Team further agrees that the work required in these Contract Documents will be performed 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 and the Authority are preliminary and provided solely to assist the Design-Build Team in the development of the project design. Unless otherwise noted herein, the Department and the Authority do not warrant or guarantee the sufficiency or accuracy of any information furnished by the Department or the Authority.

The Department and the Authority do not warrant or guarantee the sufficiency or accuracy of any investigations made, nor the interpretations made or opinions of the Department or the Authority 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 and the Authority except as may be allowed under the provisions of the Standard Specifications.

Although the Authority 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 Authority's 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 and the Authority harmless for any additional costs and all claims against the Department, Authority, or the State which may arise due to errors or omissions of the Department and Authority 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, JULY 2006,* 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, and as to the extent provided in the Contract Documents.

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. 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 solicitation of said bonds is received by them, as provided in the Contract Documents; otherwise said deposit will be returned to the Design-Build Team.

| | |
|---|---|
| TO BE SEALED IN FINAL RFP | TO BE SEALED IN FINAL RFP |
| *NCTA Director of Construction* | *NCTA Chief Engineer* |

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# PROJECT SPECIAL PROVISIONS

## DEFINITIONS

Definitions that apply to the entire RFP are contained in Article 101-3 of the Standard Special Provision entitled "Division One". Definitions that apply to a specific provision, or reference thereto, are contained in the Project Special Provisions for (1) "Disadvantaged Business Enterprise" by reference to the Instructions to Proposers (Volume I); (2) "Dispute Review Board;" (3) "Three-Year Guarantee;" and (4) "Rock Blasting," as well as Article 108-2 of the Standard Special Provision entitled "Division One."

## CONTRACT TIME AND LIQUIDATED DAMAGES

(3-17-08) SP1 G07

The Authority will issue a written Unlimited Notice to Proceed to the Design-Build Team immediately upon execution of the Contract in accordance with the Project Special Provision, "Proposal Validity Period". The Design-Build Team shall begin performance of the Work as directed in the Unlimited Notice to Proceed, and shall thereafter perform the Work in accordance with the cost-loaded Critical Path Method Project Schedule (CPM), so as to achieve timely completion of the Project by the applicable completion dates specified herein. Any design or construction activities started or performed before receipt of the written Unlimited Notice to Proceed, including without limitation design efforts beyond those required for the generation of the Technical Proposal, the order or purchase of materials and/or equipment, mobilization of equipment, or other associated activities, shall be at the risk and expense of the Design-Build Team. The first day of Contract performance will be specified in the Unlimited Notice to Proceed.

Regardless of the issuance of an Unlimited Notice to Proceed, no physical work in jurisdictional waters and/or wetlands shall begin until a meeting between the NCTA, applicable Regulatory Agencies, and the Design-Build Team is held and appropriate permits are obtained in accordance with the Contract Documents.

When observation periods are required by the Contract Documents, the observation periods are not a part of the Work to be completed by the completion dates and/or intermediate contract times. Should an observation period extend beyond the Final Completion Date either (1), the performance and payment bonds shall remain in full force and effect until the observations have been completed and the Work has been accepted or (2) the Warranty Bond required in the Project Special Provision, "Three-Year Guarantee" shall clearly cover the observation periods.

The Substantial Completion Date for the Project is defined as the Substantial Completion Date proposed in the Technical Proposal by the Proposer who is awarded the contract. The Substantial Completion date thus proposed shall be no later than December 31, 2014. Subject to any time extensions approved in writing by the Authority, the Proposer shall be liable for liquidated damages in the amount of Twenty Five Thousand Dollars ($25,000.00) per calendar day for each day of delay in achieving Substantial Completion.

The Final Completion Date for the Project is defined as the Final Completion Date proposed in the Technical Proposal by the Proposer who is awarded the contract. The Final Completion date thus proposed shall be no later than July 1, 2015. Subject to any time extensions approved in writing by the Authority, the Proposer will be liable for liquidated damages in the amount of Ten Thousand Dollars ($10,000.00) per calendar day for each day of delay in achieving Final Completion.

By execution and submission of a Price Proposal, the Design-Build Team agrees and acknowledges that such liquidated damages are reasonable in order to compensate the Authority for damages it will incur as a result of delays in achieving Substantial Completion and Final Completion. Such damages include, without limitation, (1) loss of revenue for the Authority due to late service commencement, (2) loss of use, enjoyment and benefit of the Project and connecting transportation facilities by the general public, (3) additional oversight and administrative costs, (4) debt service costs, and (5) injury to the credibility and reputation of the Authority's transportation improvement program with policy makers and with the general public who depend on and expect availability of service by the planned Completion Dates, which injury to credibility and reputation may directly result in loss of ridership on the Project and connecting transportation facilities, and further loss of revenue and/or toll revenues. The Design-Build Team further agrees and acknowledges that these liquidated damages are incapable of accurate measurement at the time of Contract execution because of, among other things, the unique nature of the Project and the unavailability of a substitute.

## PROPOSAL VALIDITY PERIOD

"Gap" funding may become available on, or around, July 1, 2010, prior to bond proceeds and other financial commitments. The Financial Closing Date for full funding is anticipated to be on, or before, December 2010.

Provided the Authority does not elect to pursue a Best and Final Offer, the Department intends to issue a Notice of Award to the Design-Build Team with the lowest Adjusted Price in October 2010. This Notice of Award will not solicit the submission of contract payment and contract performance bonds. Instead, immediately following the Financial Closing Date, the Department will solicit, in writing, the contract payment and contract performance bonds required by the Contract Documents. Written Unlimited Notice to Proceed will be issued to the Design-Build Team immediately following execution of the Contract.

After Notice of Award but prior to Contract execution, and at the Design-Build Team's own risk, the Design-Build Team may elect to further the design of the project. If requested in writing by the Design-Build Team, the Department will review these design submittals. Any such request must acknowledge that the Design-Build Team is not expecting compensation for said design submittals, related meetings, or re-submittals until the first partial payment following the Financial Closing Date.

The Design-Build Team agrees, as evidenced by submission of the Technical Proposal and Price Proposal, to remain bound to all terms, conditions, requirements, and technical components of

the RFP, the Technical Proposal, and Price Proposal until 120 days after the latest submission of the Technical Proposal and Price Proposal.

If necessary, this 120 day period may be extended if mutually agreeable by the NCTA and the Design-Build Team. Otherwise, the Design-Build Team may withdraw their Price Proposal in accordance with Article 103-4(A) of the Standard Special Provision entitled "Division One" (as amended by the details herein) contained elsewhere in this RFP.

If a delay in the Unlimited Notice to Proceed occurs solely due to the failure to provide full funding on or before December 31, 2010, contract time extension(s) will be administered in accordance with the Standard Special Provision entitled "Division One" contained elsewhere in the RFP. The time extension will apply to the Substantial Completion Date and the Final Completion Date. Contract time extensions applicable as a result of the Department's inability to execute the contract due to funding will be applicable to the Bonus for early completion.

In the event that the Authority elects to proceed with a Best and Final Offer (BAFO), written notification of this election will be provided within 60 days of the Opening of Price Proposals. Upon such written notification, the Department will release the surety from the obligations of the bid bond submitted with the original Price Proposal. However, a new bid bond conforming to the requirements of the Contract Documents will be required with the Design-Build Team's Price Proposal, and if applicable their revised Technical Proposal, that is submitted to the Department in response to the Best and Final Offer Request for Proposals.

## SUBSTANTIAL COMPLETION BONUS (3-15-08)

Coordination and cooperation among the Design-Build Team and the Toll Integrator is critical. Please refer to Project Special Provision titled "Cooperation Between Contractors".

The NCTA desires that each of these entities work with such labor, equipment and materials as necessary to ensure that the Substantial Completion Date will be met without regard to the time extensions and time reliefs provided for in this contract or any associated Specifications. Therefore, as full compensation for all extra cost involved and subject to the conditions outlined herein, the NCTA agrees to pay as a bonus, one of the applicable amounts noted below:

1. In the event that Substantial Completion, as defined by the Project Special Provision entitled "Substantial Completion," is achieved by the Substantial Completion Date proposed in the Technical Proposal, and toll collection and enforcement technology is fully implemented with appropriate accuracy levels achieved and uninterrupted revenue collection could begin immediately upon opening to traffic, the aggregate sum of $3,000,000.00 will be paid to the Design-Build Team for this project.

   In the event that Substantial Completion of this project, as defined by the Project Special Provision entitled "Substantial Completion," is achieved by the Substantial Completion Date proposed in the Technical Proposal and the Design-Build Team has met all contractual obligations to facilitate in a timely manner the work of the Toll Integration contractors, then the Design-Build Team will be paid a bonus of $2,000,000.00.

2. In the event the Design-Build Team fails to achieve Substantial Completion in accordance with either case noted above, then no bonus of any kind will be paid under this provision.

If the Unlimited Notice to Proceed is delayed due to a delayed Financial Closing Date as noted in the Project Special Provision, "Proposal Validity Period," the Substantial Completion Date for the purposes of the bonus noted herein will be adjusted in accordance with the Standard Special Provision entitled "Division One" contained elsewhere in this RFP**. An adjustment to the Substantial Completion Date will not apply for the purpose of the bonus unless the adjustment is granted solely due to a delay in the Financial Closing Date.**

## OTHER LIQUIDATED DAMAGES AND INCENTIVES

(3-17-08) DB1 G11

**Refer to the Traffic Control Scope of Work 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 US 74, US 74 Bypass, and I-485, including ramps and loops, are $5,000.00 per 30 minutes or any portion thereof..

Liquidated Damages for **Intermediate Contract Time #2** for lane narrowing, lane closure, holiday and special event time restrictions for –Y- lines, are $1,000.00 per hour or any portion thereof.

Liquidated Damages for **Intermediate Contract Time #3** for road closure time restrictions for US 74, US 74 Bypass, and I-485, including ramps and loops, are $2,500.00 per 15 minute period or any portion thereof.

Liquidated Damages for **Intermediate Contract Time #4** for road closure time restrictions for –Y- lines are $500.00 per 15 minute period or any portion thereof.

**Erosion and Sedimentation Control Incentives and Liquidated Damages:**

Liquidated damages and incentives related to erosion and sediment control apply to this project. Reference Erosion and Sedimentation Control Scope of Work for additional information.

**Open Road Tolling Infrastructure and Conduit:**

Liquidated damages apply to the completion dates of the open-road tolling infrastructure and all ITS devices to ensure that adequate time is reserved for the Toll Integration contractor to complete their work by the Substantial Completion Date.

Liquidated damages for Intermediate Contract Date #1 for completion of the open-road tolling infrastructure and all ITS devices for the entire project are Fifteen Thousand Dollars ($15,000.00) per calendar day. The portion of work required for this Intermediate Contract Date is all work necessary to design, fabricate, install, and erect on the entire project the toll gantries, conduit, ITS devices, and other items as depicted in the ORT Infrastructure Scope of Work and

ITS Scope of Work and any other scopes of work sufficient to allow installation and testing of toll technology by the Toll Integrator. The Completion Date for this Intermediate Contract Date #1 is 120 calendar days prior to the Substantial Completion Date.

## COST-LOADED CRITICAL PATH METHOD PROJECT SCHEDULE

A cost-loaded Critical Path Method Project Schedule (CPM) is required for this project. Reference Article 108-2 of the Standard Special Provision entitled "Division One" found elsewhere in this RFP.

## MOBILIZATION

(10-31-05) (Rev 3-13-08) DB1 G15

Revise the *2006 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 (5) 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 following the issuance of the Unlimited Notice to Proceed. Payment will be made at the rate of 50 percent of the lump sum amount calculated for Mobilization. The remaining 50 percent of the calculated Mobilization will be paid with the first partial pay estimate following the issuance the environmental permits as described in the Environmental Permits Scope of Work.

## FUEL PRICE ADJUSTMENTS

(1-10-08)

The Design-Build Team shall prepare and submit an Estimate of Quantities in accordance with the Instructions to Proposers, Section 3.C.

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.

## PARTNERING

07/29/09 DB1 G49

As a part of its quality management program, the North Carolina Turnpike Authority intends to encourage the formation of a cohesive relationship with the Design-Build Team and its principal

subcontractors and suppliers. This relationship will be structured to draw on the strengths of each organization to identify and achieve reciprocal goals. The objectives are safe, effective, and efficient contract performance; and completion within budget, on schedule, and in accordance with the plans and specifications.

This relationship will be bilateral in makeup. The Design-Build Team shall hire a professional facilitator to conduct partnering meetings every 4 months thereafter for the life of the project. All cost associated with this item shall be included in the Design-Build Team's lump sum bid.

To implement this initiative prior to starting work in accordance with the requirements of Section 108 of the Standard Special Provision for Division One (found elsewhere in this RFP), and prior to the preconstruction conference, the Design-Build Team's management personnel and Division Construction Engineer will initiate a partnering development seminar/team building workshop. Project personnel working with the assistance of the Construction Unit will make arrangements to determine attendees at the workshop, agenda of the workshop, duration, and location. Persons required to be in attendance will be the NCDOT Resident Engineer, the NCDOT Division Construction Engineer, and key project personnel; the Design-Build Team's senior management personnel, the Design-Build Team's on-site project manager, and key project supervisory personnel for both the Design-Build Team and principal subcontractors and suppliers. The project design engineers, FHWA, and key local government personnel will also be invited to attend as necessary.

The establishment of the partnering charter on a project will not change the legal relationship to the contract nor relieve either party from any of the terms of the contract.

## SCHEDULE OF ESTIMATED COMPLETION PROGRESS

(07-15-08) DB1 G58

The Design-Build Team's attention is directed to the Standard Special Provision entitled "Availability of Funds - Termination of Contracts" included 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:

| Fiscal Year | Progress (Dollar Value) |
|---|---|
| 2011 (07/01/10 – 06/30/11) | 20 % of Total Amount Bid |
| 2012 (07/01/11 – 06/30/12) | 29 % of Total Amount Bid |
| 2013 (07/01/12 – 06/30/13) | 23 % of Total Amount Bid |
| 2014 (07/01/13 – 06/30/14) | 17 % of Total Amount Bid |
| 2015 (07/01/14 – 06/30/15) | 11 % of Total Amount Bid |

The Authority will invest gap funds, TIFIA loan funds and/or bond proceeds in a variety of investment instruments directly upon receipt. In order to ensure funds are readily available, to facilitate the Design-Build Team's construction schedule and respective payments, and allow for reasonable investment of these funds, if the Design-Build Team anticipates that their schedule will require payments to be accelerated from that indicated above, the Design-Build Team shall submit with their Price Proposal a similar chart to that above. This chart shall indicate the

Design-Build Team's anticipated payout schedule, in terms of percentages of the entire lump sum price bid for the project, on a fiscal year basis. The NCTA does not intend to limit progress based on the above schedule of estimated progress unless required to do so by the North Carolina General Assembly or the trustee of the project funds.

The Design-Build Team shall also furnish his own cost-loaded CPM in accordance with Article 108-2 of the Standard Special Provision entitled "Division One" contained elsewhere in the RFP. 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 NCTA.

**SUBSTANTIAL COMPLETION** (3-18-08)

The Project will have reached Substantial Completion when all of the following requirements are satisfied:

1. Through traffic has been placed along the Project or along the work so that all lanes and shoulders are open such that traffic can move unimpeded at the posted speed and intersecting roads and service roads are completed 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 mainline alignment of the project (-L-) are complete;
3. All signs for the purposes of safe travel, enforcement of any applicable laws, and guidance of the public are complete and accepted, including any required for toll collection purposes;
4. All guardrails, drainage devices, ditches, and embankments are completed;
5. Remaining Project Work on the mainline alignment of the project (-L-) consists of permanent pavement markings, permanent pavement markers or incidental construction that is away from the paved portion of the roadway; and
6. A satisfactory warranty bond is executed and provided to the NCTA. Reference the Project Special Provision "Three-Year Guarantee."

Upon apparent substantial completion of the Project, the Design-Build Team will perform an in-depth self-inspection to ensure that the Project meets the conditions of Substantial Completion as defined herein. Upon recommendation from the Design-Build Team, the Engineer will perform a subsequent inspection. The results of the Engineer's inspection will be shared with the Design-Build Team in writing, and the Design-Build Team will be advised as to whether or not the Engineer has determined Substantial Completion to have been met. Substantial Completion will not have occurred until all of the recommendations made, if any, at the time of the Engineer's inspection have been satisfactorily met.

Once toll collection begins, the NCTA will loan transponders to the Design-Build Team to allow completion of the project free of tolls.

**VALUE ANALYSIS**
(1-5-07) DB2 R12

Value Engineering Construction Proposals (VECP), as identified in Article 104-12 of the Standard Special Provision, Division One contained elsewhere in this RFP will be accepted. Only proposals, which alter the requirements of the Contract Documents issued by NCTA, will be considered as Value Engineering Construction Proposals.

**REVISION TO FHWA-1273 CONCERNING PERSONAL INFORMATION ON PAYROLL SUBMISSIONS:**
(1-20-09) DB1G59

Revise the *Standard Special Provision FHWA-1273 Required Contract Provisions Federal-Aid Construction Contracts* as follows:

Section V, Paragraph 2b is replaced with the following:

The payroll records shall contain the name, and the last four digits of the social security number of each such employee, his or her correct classification; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalent thereof the types described in Section 1(b)(2)(B) of the Davis Bacon Act); daily and weekly number of hours worked; deductions made; and actual wages paid.

**DISADVANTAGED BUSINESS ENTERPRISE**
(10-29-09) DB1 G61

**The Design-Build Team's attention is directed to Section 10 of the Instructions to Proposers (Volume I) which contains pertinent definitions and DBE requirements to be met during the procurement period and prior to contract award and which, by reference, are fully incorporated into these Contract Documents.**

**Policy**

It is the policy of the North Carolina Department of Transportation that Disadvantaged Business Enterprises (DBEs) as defined in *49 CFR Part 26* shall have the equal opportunity to compete fairly for and to participate in the performance of contracts financed in whole or in part by Federal Funds.

**Obligation**

The Design-Build Team, subcontractor, and sub-recipient shall not discriminate on the basis of race, religion, color, national origin, age, disability or sex in the performance of this Contract. The Design-Build Team shall comply with applicable requirements of *49 CFR Part 26* in the award and administration of federally assisted contracts. Failure by the Design-Build Team to comply with these requirements is a material breach of this Contract, which may result in the termination of this contract or such other remedy, as the Authority deems necessary.

**Contract Goal**

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

Disadvantaged Business Enterprises **15 %**

The Design-Build Team shall exercise all necessary and reasonable steps to ensure that Disadvantaged Business Enterprises participate in at least the percent of the contract as set forth above as the goal.

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

**Contract Requirement**

The approved DBE participation submitted by the Design-Build Team shall be the **Contract Requirement**.

**DBE Replacement**

The Design-Build Team shall not terminate a committed DBE subcontractor for convenience or perform the work with its own forces or those of an affiliate. If the Design-Build Team fails to demonstrate reasonable efforts to replace a committed DBE firm that does not perform as intended with another committed DBE firm or completes the work with its own forces without the Engineer's approval, the Design-Build Team and any of its affiliated companies may be disqualified from further bidding for a period of up to 6 months.

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

**(A)** Performance Related Replacement

When a DBE is terminated or fails to complete its work on the contract for any reason, the Design-Build Team shall take all necessary, reasonable steps to replace the DBE subcontractor with another DBE subcontractor to perform at least the same amount of work as the DBE that was terminated. The Design-Build Team is encouraged to first attempt to find another DBE firm to do the same work as the DBE that was being terminated.

To demonstrate necessary, reasonable good faith efforts, the Design-Build Team shall document the steps they have taken to replace any DBE subcontractor who is unable to perform successfully with another DBE subcontractor. Such documentation shall include but not be limited to the following:

(1) Copies of written notification to DBEs that their interest is solicited in subcontracting the work defaulted by the previous DBE subcontractor or in subcontracting other items of work in the contract.

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

(a) The names, addresses, and telephone numbers of DBEs who were contacted.

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

(3) For each DBE contacted but rejected as unqualified, the reasons for the Design-Build Team's conclusion.

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

**(B)** Decertification Replacement

(1) When a committed DBE is decertified by the Department after a Request for Subcontract has been received by the NCTA, the NCTA will not require the Design-Build Team to solicit replacement DBE participation equal to the remaining work to be performed by the decertified firm. The participation equal to the remaining work performed by the decertified firm will count toward the contract requirement.

(2) When a committed DBE is decertified prior to the NCTA receiving a Request for Subcontract for the named DBE firm, the Design-Build Team shall take all necessary and reasonable steps to replace the DBE subcontractor with another DBE subcontractor to perform at least the same amount of work to meet the contract goal or demonstrate that it has made a good faith effort to do so.

**Changes in the Work**

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

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

When the Engineer makes changes that result in an alteration of plans or details of construction and a portion or all of work had been expected to be performed by a committed DBE, the Design-Build Team shall seek participation by DBEs unless otherwise approved by the Engineer.

When the Design-Build Team requests changes in the work that result in the reduction or elimination of work that the Design-Build Team committed to be performed by a DBE, the Design-Build Team shall seek additional participation by DBEs equal to the reduced DBE participation caused by the changes.

**Reports**

All requests for subcontracts involving DBE subcontractors shall be accompanied by a certification executed by both the Design-Build Team and the DBE subcontractor attesting to the agreed upon unit prices and extensions for the affected contract items. This information shall be submitted on the Department Form RS-1-D, located at:

http://www.ncdot.org/doh/forms/files/FORMRS-1-D.doc

unless otherwise approved by the Engineer. The NCTA reserves the right to require copies of actual subcontract agreements involving DBE subcontractors.

Within 30 calendar days of entering into an agreement with a DBE for materials, supplies or services, not otherwise documented by a Request for Subcontract as specified above, the Design-Build Team shall furnish the Engineer a copy of the agreement. The documentation should also indicate the percentage (60% or 100%) of expenditures claimed for DBE credit.

All certifications will be considered a part of the project records, and consequently will be subject to penalties under Federal Law associated with falsifications of records related to projects.

**Reporting Disadvantaged Business Enterprise Participation**

**(A)** The Design-Build Team shall provide the Engineer with an accounting of payments made to Disadvantaged Business Enterprise firms, including material suppliers, 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:

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

(2) Removal of any affiliated company of the Design-Build Team from the Department's appropriate prequalified list or the removal of other entities from the approved subcontractors list.

(3) Removal of any affiliated company of the Design-Build Team from consideration on future NCTA projects.

**(B)** The Design-Build Team shall report the accounting of payments through the Department's DBE Payment Tracking System, which is located at:

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

The Design-Build Team shall also provide the Engineer an affidavit attesting the accuracy of the information submitted in the Payment Tracking System. This too shall be submitted for any given month by the end of the following month.

**(C)** Design-Build Teams reporting transportation services provided by non-DBE lessees shall evaluate the value of services provided during the month of the reporting period only.

Prior to payment of the final estimate, the Design-Build Team shall furnish an accounting of total payment to each DBE. A responsible fiscal officer of the payee contractor, subcontractor, or second tier subcontractor who can attest to the date and amounts of the payments shall certify that the accounting is correct.

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

Failure on the part of the Design-Build Team to submit the required information in the time frame specified may result in the disqualification of that Design-Build Team and any of its affiliated companies from further bidding until the required information is submitted.

Failure on the part of any subcontractor to submit the required information in the time frame specified may result in the disqualification of that contractor and any affiliate companies from working on any DOT project until the required information is submitted.

**Failure to Meet Contract Requirements**

Failure to meet contract requirements in accordance with Article 102-16(J) of the Standard Special Provision, Division One contained elsewhere in this RFP may be cause to disqualify the Design-Build Team.

## CERTIFICATION FOR FEDERAL-AID CONTRACTS

(3-21-90) DB1 G85

The prospective participant certifies, by signing and submitting this Price Proposal, to the best of his or her knowledge and belief, that:

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

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

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

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

## CONTRACTOR'S LICENSE REQUIREMENTS (7-1-95)

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).

## U.S. DEPARTMENT OF TRANSPORTATION HOTLINE

(11-22-94) DB1 G100

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

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

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

## SUBSURFACE INFORMATION

(3-22-07) DB1 G119

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 submitting its Price Proposal, the Proposer acknowledges that the subsurface information furnished by NCDOT or NCTA is preliminary and provided solely to assist the Proposer in the development of the project design. No information with respect to subsurface conditions

furnished by the NCTA or NCDOT shall be considered a Contract Document or part of the Contract. If the Proposer or Design-Build Team relies upon any subsurface information furnished by NCTA or NCDOT, they do so at their own risk.

## COOPERATION BETWEEN CONTRACTORS

(07/1/95) (Rev 01-11-08) DB1 G133

The Design-Build Team's attention is directed to Article 105-7 of the Standard Special Provision, Division One contained elsewhere in this RFP. The following projects are in the immediate vicinity of R-3329/R-2559:

- **U-4024** Monroe, Union County. Widen US 601, from US 74 to the proposed Monroe Bypass (R-2559) to multi-lanes.

The Design-Build Team on this project shall cooperate with the Design-Build Team/ Contractor 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.

The NCTA will advertise and select a contractor for Landscaping after the award of this contract and therefore no landscaping shall be included in the Design-Build Team's Price Proposal. This contract will encompass the entire Monroe Connector/Bypass Corridor and construction will be preformed concurrent with this Design-Build contract. The Design-Build Team shall coordinate with the Toll System Integrator in the planning, scheduling, design and construction of the elements that are collective to both entities. The Design-Build Team shall integrate the toll system integration schedules into the CPM schedule and make work areas available, as needed, to successfully meet the contract substantial completion date and contract completion dates. Close coordination with the Toll System Integrator is essential.

The Design-Build Team for this project shall be required to meet and coordinate with the ITS, Toll Integration, Landscaping, and any other Contractors necessary to successfully plan, design, and construct the Monroe Connector/Bypass Corridor.

Meetings shall be scheduled and attended by authorized representatives of this Design-Build Team and include personnel from the Toll Integration Contractor, Landscaping Contractor, any other pertinent Contractors, and representatives from the NCTA and NCDOT. At a minimum, there shall be a pre-construction meeting, meetings during the construction process, and a post-construction meeting. One final meeting shall be held to reach concurrence that all the construction and toll facility components have been installed properly and function to provide the ability to collect revenue from this freeway.

## PRICE PROPOSAL DOCUMENTATION

(1/10/08)

### General

The successful Design-Build Team shall submit the original, unaltered Price Proposal documentation or a certified copy of the original, unaltered Price Proposal documentation used to prepare the Price Proposal for this contract to the Department in accordance with Section 13 of

the Instructions to Proposers (Volume I). By reference, the requirements of Section 13 of the Instructions to Proposers is hereby fully incorporated into these Contract Documents.

**Duration and Use**

The Price Proposal documentation and affidavit shall remain in escrow until sixty (60) calendar days from the time the Design-Build Team receives full payment on the final estimate; or until such time as 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 NCTA or Department related to the contract; or until authorized in writing by the Design-Build Team. 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 NCTA or the Department, or receipt of a letter from the Design-Build Team authorizing release, the Department may obtain the release and custody of the Price Proposal documentation. If the Price Proposal documentation remains in escrow sixty (60) calendar days after the time the Design-Build Team receives the final payment and the Design-Build Team has not filed a written claim, filed a written and verified claim, or has not initiated litigation against the NCTA or the Department related to the contract, the Department shall instruct the banking institution or other bonded document storage facility to release the sealed container to the Design-Build Team.

The Proposer certifies and agrees that the sealed container placed in escrow contains all of the Price Proposal 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.

**Confidentiality of Bid Documentation**

The Price Proposal documentation and affidavit in escrow are, and will remain, the property of the Proposer. The Department has no interest in, or right to, the Price Proposal documentation and affidavit other than to verify the contents and legibility of the Price Proposal 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 NCTA or 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 NCTA or the Department, or receipt of a letter from the Design-Build Team authorizing release, the Price Proposal 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 Price Proposal documentation designated by the Proposer as a "trade secret" at the time the bid documentation is delivered to the State Contract Officer shall be protected from disclosure as provided by *G.S. 132-1.2*.

**Cost and Escrow Instructions**

The cost of the escrow will be borne by the NCTA. The Department will provide escrow instructions to the banking institution or other bonded document storage facility consistent with this provision.

**Payment**

There will be no separate payment for all costs of compilation of the data, container, or verification of the Price Proposal documentation. Payment at the lump sum price for the Design-Build project will be full compensation for all such costs.

## DISPUTE REVIEW BOARD (DRB)

### GENERAL

### A. Definitions

**Dispute** – A contractual issue that involves cost and/or time (either credits or additions) that remains unresolved following good faith negotiations between authorized representatives of the Design-Build Team and the North Carolina Turnpike Authority (NCTA).

**Dispute Review Board (DRB)** – three neutral individuals, selected as provided herein, that reviews Disputes and renders findings and recommendations based on the Contract.

### B. Formal DRB Review

This provision provides for a formal DRB review process.

Any of the procedures for the formal DRB Review established by this provision may be altered or modified by mutual written agreement of the Design-Build Team and the NCTA to better suit the needs of a particular Dispute.

### C. Summary

A DRB will be established to assist in the analysis of Disputes that arise between the Design-Build Team and the NCTA, to include, but not limited to, Articles 104-4, 104-8(B) or 108-10 of the Standard Special Provisions, Division One, contained elsewhere in this RFP.

It is not intended for the NCTA or the Design-Build Team to default on their normal responsibilities to cooperatively and fairly settle their differences by indiscriminately assigning them to the DRB. It is intended that the DRB encourage the NCTA and Design-Build Team to resolve potential disputes without resorting to this alternative resolution procedure.

Utilization of the DRB does not relieve the Design-Build Team or NCTA from complying with all Contract terms and conditions, and does not waive any notice or timeliness requirements of the Standard Specifications for Roads and Structures. However, if a Dispute is referred to the DRB, the claim submittal and review time frames may be superseded by time frames established by the DRB, and agreed to in writing by both the Design-Build Team and the NCTA.

Either the Design-Build Team or the NCTA may refer a Dispute to the DRB. Such referral should be initiated as soon as it appears that the normal NCTA-Design-Build Team dispute resolution effort is not succeeding. However, prior to referring a Dispute to the DRB, the NCTA and Design-Build Team must agree on the central or core issue to bring before the DRB.

Promptly thereafter, the DRB will impartially consider the Dispute(s) referred to it. The DRB will provide **non-binding** written findings and recommendations to the Design-Build Team and the NCTA.

Although the findings and recommendations of the DRB should carry great weight for both the Design-Build Team and the NCTA, they are **not binding** on either the Design-Build Team or the NCTA.

The Dispute Review Board is a condition of this Contract. The NCTA and the Design-Build Team agree that the submission of any unresolved dispute or claim to the DRB is a condition precedent to the Design-Build Team submitting a final claim.

**D. Scope**

This provision describes the purpose, procedure, function, and features of the DRB. A Three-Party Agreement among the NCTA, Design-Build Team, and the selected DRB members will formalize creation of the DRB and establish the scope of its services and the rights and responsibilities of the Design-Build Team and the NCTA.

**E. Purpose**

The purpose of the DRB is to provide an independent and impartial review of the Dispute and provide **non-binding** written findings and recommendations, in accordance with the Contract, applicable contract law, industry practices, and the facts presented.

It is not the purpose, or responsibility, of the DRB to resolve the Dispute. That responsibility remains with the Design-Build Team and the NCTA. However, it is anticipated that the DRB review will assist the Design-Build Team and the NCTA in resolving the Dispute.

Creation of the DRB is not intended as a substitute for NCTA or Design-Build Team responsibility to make a good-faith effort to settle the Dispute. Indiscriminate referral of disputes to the DRB without prior attempts by the Design-Build Team and the NCTA to resolve them shall be avoided. The Design-Build Team or NCTA shall exhaust resolution through the escalation process defined in the formal partnering process prior to escalating an issue to the DRB.

**F. Continuance of Work**

Both the Design-Build Team and the NCTA shall proceed diligently with the work and comply with all applicable Contract provisions while the DRB considers a Dispute.

**G. Tenure of DRB**

The DRB will be deemed established after the NCTA, the Design-Build Team and the DRB execute the Three-Party Agreement.

The DRB will be dissolved as of the end of the contract unless earlier terminated or dissolved by mutual agreement of the Design-Build Team and the NCTA. If mutually agreed upon by the

Design-Build Team and the NCTA, the DRB may be dissolved on the date of final payment to the Design-Build Team.

**MEMBERSHIP**

**General**

The DRB will consist of three members selected as provided below.

**B. Criteria**

Experience

1. It is desirable that all DRB members be experienced with the construction process including design, construction, contract administration, contract law, and resolution of construction disputes.

2. It is not necessary that the DRB members be intimately familiar with the specific type of construction involved in the Dispute. The DRB may consult technical experts if the need arises under provisions provided for elsewhere in this Special Provision

Neutrality

1. It is imperative that the DRB members be neutral, act impartially, and be free of any conflict of interest.

2. For purposes of this subparagraph, the term "member" also includes the member's current primary or full-time employer, and "involved" means having a contractual relationship with either the Design-Build Team or the NCTA, such as a subcontractor, architect, engineer, or construction manager.

3. Prohibitions; disqualifying relationships for prospective members:

   (a) An ownership interest in any entity involved in the Project or Contract, or a financial interest in the Contract, except for payment for services on this Dispute Review Board;

   (b) Previous employment by, or financial ties to, any party involved in the Contract within a period of eighteen (18) months prior to award of the Contract, except for fee-based consulting services on other projects;

   (c) A close professional or personal relationship with any key member of any entity involved in the Contract which, in the judgment of either the Design-Build Team or the NCTA, could suggest partiality; or

   (d) Prior involvement in the project of a nature that could compromise the prospective member's ability to participate impartially in the DRB's activities.

4. Prohibitions; disqualifying relationships for members:

   (a) Employment, including fee-based consulting services, by any entity involved in the construction contract except with the express approval of both the Design-Build Team and the NCTA;

   (b) Discussion concerning, or the making of, an agreement with any entity involved in the Contract regarding employment after the Contract is completed.

5. Any of the provisions of 1 through 4 above may be waived by mutual written agreement of the Design-Build Team and the NCTA.

**C. Disclosure Statement**

As a part of the selection process, all prospective DRB members will be required to submit complete disclosure statements for the approval of both the Design-Build Team and the NCTA. Each statement shall include a resume of experience, together with a declaration describing all past, present, and anticipated or planned future relationships, including indirect relationships through the prospective member's primary or full-time employer, to this project and with the Design-Build Team or the NCTA, or others involved in the Contract, including subcontractors, suppliers, design professionals, and consultants. Disclosure of close professional or personal relationships with all key members of the Design-Build Team or the NCTA or other parties involved in the construction Contract shall be included.

**D. Selection Process**

Within 30 calendar days of Notice to Proceed, or as otherwise mutually agreed upon by the Design-Build Team and NCTA, the Design-Build Team and the NCTA will jointly select the DRB using the following procedure:

1. To form a DRB, the NCTA will provide to the Design-Build Team a copy of the resume and references of the person proposed for the DRB. Likewise, the Design-Build Team will provide NCTA the resume and references for their proposed DRB Member. The Design-Build Team and the NCTA will confirm the availability, neutrality, experience, and expertise of the nominees. Both the NCTA and Design-Build Team will have the ability to reject the others nominee. The parties shall continue to exchange nominee information until each party has selected a nominee that is acceptable to the other party. The NCTA shall be responsible for notifying the nominees of their selection.

2. Once the two mutually agreeable nominees have confirmed their participation within the DRB, they shall be responsible for selecting a third DRB member, who shall become the DRB Chairperson.

3. Should the need arise to select a replacement DRB member; the replacement member shall be selected in the same manner that the member to be replaced was selected..

**E. Three-Party Agreement**

The DRB members and the authorized representatives of the Design-Build Team and the NCTA shall execute the Dispute Review Board Three-Party Agreement within 2 weeks after the selections are made.

**OPERATION**

**A. General**

The DRB will operate in accordance with this provision. The DRB may initiate, with the concurrence of the NCTA and Design-Build Team, new procedures or modifications to existing procedures as it deems appropriate.

**B. Contract Documents, Reports and Information**

The NCTA will provide a set of the Contract Documents to each DRB member.

The DRB members will be kept informed of construction activity and other developments by means of timely transmittal of relevant information requested by the DRB and prepared by the Design-Build Team and the NCTA in the normal course of construction, including, but not limited to, periodic reports and minutes of progress meetings. At any time, the DRB may request copies of documents that are normally generated by the Design-Build Team or the NCTA during the course of business throughout the Project. Only during the resolution of a specific dispute may the DRB request reports, documents or other information that is not normally generated during the course of business, and this information shall be limited to that which is specific to this dispute.

**C. Periodic Meetings and Visits**

If requested, the DRB may participate in the formal partnering process as outlined in the contract. Additional meetings or site visits may be needed as mutually agreed among the NCTA, the Design-Build Team, and the DRB.

Site visits should cover all active segments of the work. Representatives of both the Design-Build Team and the NCTA shall accompany the DRB during project meetings or site visits.

The DRB shall be provided “issue logs” and “Supplemental Agreement/Change Order Logs” throughout the life of the contract.

**REVIEW OF DISPUTES**

**A. General**

The Design-Build Team and the NCTA will cooperate to ensure that the DRB considers Disputes promptly, taking into consideration the particular circumstances and the time required to prepare appropriate documentation.

Procedures and time periods may be modified by mutual agreement.

**B. Prerequisites to Review**

A Dispute is subject to referral to the DRB when either the Design-Build Team or the NCTA believes that bilateral negotiations have reached an impasse. However, the NCTA and Design-Build Team must agree on the central or core issue to bring before the DRB prior to referring a dispute to the DRB.

**C. Requesting Review**

Either the Design-Build Team or the NCTA may refer a dispute to the DRB. Requests for DRB review shall be submitted in writing to the Chairperson of the DRB. The Request for Review shall state clearly and in full detail the specific core issue of the Dispute to be considered by the DRB. A copy of the request shall be simultaneously provided to the other party.

After conferring with both the Design-Build Team and the NCTA, the DRB Chairperson will establish a submittal/presentation schedule. Unless the Design-Build Team and the NCTA both agree otherwise, the presentation shall be scheduled no sooner than 30 days after receipt of the Request for Review and no sooner than 14 days after receipt of the rebuttal information.

Concise written position statements shall be prepared by both the Design-Build Team and the NCTA, with page number references to any supporting documentation, and submitted to each DRB member and simultaneously to the other party.

Any rebuttal information to the position statements shall be submitted to each DRB member and simultaneously to the other party

**D. Presentation**

Unless otherwise agreed by the DRB, the Design-Build Team and the NCTA, the presentation will be conducted at the NCTA office. However, any location that would be more convenient and still provide all required facilities and access to necessary documentation is satisfactory. Private deliberations of the DRB may be held at any convenient location.

The Design-Build Team and the NCTA shall have representatives in attendance at all presentations. The party that brought the dispute before the DRB will make its presentation first. A full presentation of the dispute shall be allowed without interruption, except from the DRB. Once all information is presented the other party may provide a rebuttal, at which time each party will be allowed successive rebuttals until all aspects of the dispute are fully covered. The DRB members, the Design-Build Team and the NCTA may ask questions, request clarification, or ask for additional data. In difficult or complex cases, additional presentations may be necessary in order to facilitate full consideration and understanding of all the evidence presented by both the Design-Build Team and the NCTA. Both the Design-Build Team and the NCTA shall be provided adequate opportunity to present their evidence, documentation, and statement regarding all issues before the DRB. No documents, materials, reports, analysis or other information of any type shall be referenced in the presentations or considered by the DRB in its

review unless the same was previously provided to the other party as supporting documentation for the position statement.

Unless otherwise agreed by the Design-Build Team and the NCTA, presentations will relate to issues of entitlement only. Contract time extensions and compensation will be resolved between NCTA and the Design-Build Team, in accordance with the provisions of the Standard Special Provision entitled "Division One" contained elsewhere in this RFP.

Normally, a formal transcript of the presentations will not be prepared. When requested by either the Design-Build Team or the NCTA, the DRB may allow recordation and transcription with the cost to be allocated to the party requesting such documentation. Such transcript, when prepared, **shall not** constitute the official record of the DRB Review. The record prepared by the DRB shall be the official record of the DRB Review. The DRB may provide for audio or video recordings of the presentations for the use of the DRB only.

The Design-Build Team and the NCTA shall not have their attorneys in attendance at the presentations to counsel and/or advise them.

If either the Design-Build Team or the NCTA fails to appear before the DRB on the date scheduled for the presentations, without justifiable cause, the dispute will continue under the applicable provisions of the 2006 NCDOT Standard Specifications for Roads and Structures and this RFP to include, but not limited to, Articles 104-8, 108-10 107-25 and 109-10 of the Standard Special Provision, Division One found elsewhere in this RFP.

**E. Deliberations**

After the presentation is concluded, the DRB will confer to formulate its findings and recommendations. All DRB deliberations shall be conducted in private, with all individual views kept confidential.

If the DRB desires technical assistance, the DRB will make a request in writing to both parties (Design-Build Team and NCTA) briefly defining the scope and estimated budget for the services. **Direct attorney advisement or assistance is prohibited.** If mutually agreeable, the Design-Build Team and NCTA will execute an agreement with a service provider. The Design-Build Team and NCTA will equally share the costs for the service provider. In the typical situation the special services provider will respond to questions from the DRB in private consultation between the provider and the DRB and no permanent record of the questions or responses will be required by the Design-Build Team or the NCTA. However, if mutually agreeable, these typical operating procedures may be modified. In arriving at its findings and recommendations, the DRB will not be bound by any information provided by the special service provider.

**F. Findings and Recommendations**

It is **not** the responsibility of the DRB to resolve the Dispute, only to make a recommendation based upon the contract documents and information supplied and presented before them. It shall remain the responsibility of the Design-Build Team and the NCTA to resolve all Disputes.

The findings and recommendations of the DRB will be provided in writing, by certified mail, return receipt requested, to both the Design-Build Team and the NCTA within 14 calendar days of the completion of the presentations or, when technical assistance is required, withing 14 calendar days of receipt of technical assistance. The DRB should set forth, as clearly as possible, the logic and reasoning behind its findings and recommendations. The findings and recommendations will address entitlement only. In difficult or complex cases, and in consideration of the DRB member's schedule, this time may be extended by mutual agreement of the DRB, the Design-Build Team and the NCTA.

If the DRB is unable to reach unanimity in its findings and recommendations, the DRB will so advise the Design-Build Team and the NCTA in the report of the DRB. The DRB report shall consist of a majority opinion and, when the decision is not unanimous, a minority opinion.

**G. Acceptance or Rejection**

Within 30 calendar days of the date of the DRB's findings and recommendations, or such other time specified by the DRB, both the Design-Build Team and the NCTA shall provide, by certified mail return receipt requested, written notice to the other and to the DRB of acceptance or rejection of the DRB findings and recommendations.

If, with the aid of the DRB findings and recommendations, the Design-Build Team and the NCTA are able to resolve their Dispute, the NCTA will promptly process any required Contract changes.

If either the Design-Build Team or the NCTA rejects the findings and recommendations of the DRB, the Dispute will continue under the applicable provisions of the Contract.

**H. Clarification and Reconsideration**

Should the dispute remain unresolved because of a request for clarifications of the recommendation or new information or material becomes available which was not available at the time of the presentation, either the Design-Build Team or the NCTA may within the 7 calendar day period following the date of the DRB findings and recommendations, request in writing, by certified mail return receipt requested, that the DRB clarify or reconsider its findings and recommendations. This information shall be supplied simultaneously to the other party.

Should new information be made available, the other party shall have 7 days to review such information and respond appropriately. After that period, the DRB shall promptly notify the Design-Build Team and the NCTA of any changes to DRB findings and recommendations.

**I. Admissibility**

If the DRB's findings and recommendations do not resolve the Dispute, the Contract, the written findings and recommendations, including any minority report, and the qualifications of the DRB members will be admissible as evidence to the extent permitted by law in any subsequent dispute resolution proceeding or forum to establish (a) that a DRB considered the Dispute, (b) the qualifications of the DRB members, and (c) the DRB's findings and recommendations that resulted from the process.

**J. Legal Relations**

Each DRB member, in the performance of his or her duties on the DRB, is acting in the capacity of an independent agent and not as an employee of either the Design-Build Team or the NCTA.

Each DRB member is acting in a capacity intended to facilitate resolution of Disputes. Accordingly, the Design-Build Team and the NCTA agree that to the fullest extent permitted by law, each DRB member shall be accorded quasi-judicial immunity for any actions or decisions associated with the review and findings and recommendations of Disputes referred to the DRB. No DRB member may be called as a witness by either the Design-Build Team or the NCTA in subsequent proceedings on the dispute. The DRB shall, upon completion of their findings, turn all records of the DRB over to the NCTA for storage and preservation.

By execution of the Three-Party Agreement, the Design-Build Team and the NCTA agree not to pursue legal proceedings against a DRB member for activities related to or consequences resulting from their participation in the DRB.

**PAYMENT**

**A. Method of Measurement**

The Design-Build Team and the NCTA shall equally bear the costs and expenses of the DRB.

The DRB members should not engage in activities related to the project, for which compensation is expected, unless requested by either the NCTA or Design-Build Team.

Time spent at formalized meetings or reviewing the Dispute – Each DRB member will be compensated for actual time spent at the rate of $250 per hour with a maximum of $2,000 per day. This rate shall include all normal incidental expenses such as telephone, fax, postage, courier, printing, and computer services. The DRB activity must be preauthorized by both the Design-Build Team and the NCTA.

Travel Time to and from Preauthorized Meetings – Each DRB member will be compensated for actual travel time to and from DRB meetings at the rate of $50 per hour with a maximum of $200 each way.

Travel Expenses – Travel expenses will be reimbursed at standard NC state rates for transportation, lodging, and meals for each day, or portion thereof, that the DRB member is traveling to or from, or attending, an authorized DRB activity. Expense receipts are required.

The NCTA will provide, at no cost to the Design-Build Team, administrative services such as conference facilities, meeting rooms and copying services during DRB presentations.

The Three Party Agreement and the Special Provisions contain all of the provisions for compensation and expenses of the DRB. All DRB members shall be compensated at the same daily and hourly rate.

Each DRB member may submit invoices for payment for work completed and qualified expenses no more often than once per month during the progress of work. Such invoices shall be in a format approved by the NCTA, and accompanied by a general description of activities performed during that period. The value of work accomplished for payment shall be established from the billing rate and hours expended by the DRB member together with qualified expenses incurred.

The cost records and accounts pertaining to this Agreement shall be kept available for inspection by representatives of the NCTA or Design-Build Team for 5 years after final payment.

No additional compensation for services associated with the DRB, beyond that detailed above, will be provided to the DRB members.

**B. Basis of Payment**

Payment for accepted work will be made as follows:

The Design-Build Team shall pay the invoices of all DRB members after approval by both the Design-Build Team and the NCTA. The Design-Build Team shall then bill the NCTA for one-half of such invoices, which shall be processed in accordance with Article 104-7 of the Standard Special Provision, Division One.

There shall be no markups applied to expenses connected with the DRB, either by the DRB members or by the Design-Build Team. Regardless of the DRB recommendation, neither the NCTA nor the Design-Build Team shall be entitled to reimbursement of DRB costs from the other party.

If the DRB desires special technical services, both the Design-Build Team and the NCTA must agree to provide the special services following the procedures included in the Dispute Review Board, Review of Disputes, Deliberations section, contained elsewhere in this provision. If such services are approved and rendered, payment will be made under these provisions in accordance with the Dispute Review Board, Review of Disputes, Deliberations section, contained elsewhere in this provision.

These special provisions and the Three Party Agreement contain all of the provisions for compensation and expenses of the DRB. All DRB members shall be compensated at the same daily and hourly rate.

## 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 NCTA.

**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 NCTA 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 NCTA determines that Immediate Corrective Work is necessary for public safety, the NCTA or its agent may perform emergency repairs. Prior to such emergency repairs, the NCTA will document the basis for the emergency action and will preserve evidence of the defective condition.

**Project Warranty Term:**

The Warranty Term for each element of the Project shall commence upon Substantial Completion as determined by NCTA . The Warranty Term for municipality utility work shall commence once all water and sewer work for that owner is accepted. 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 Warranties regarding all elements of the Project shall remain in effect until **three years after Substantial Completion as determined by NCTA.** These warranties are binding on the Design-Build Team's successors, transferees, heirs, and assigns. If NCTA 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.

The Design-Build Team shall be responsible for any and all remediation activities at the on-site stream mitigation site for a period of twelve months following NCTA's final acceptance of the stream mitigation site at no additional cost to the NCTA.

**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 cost of the contract construction, 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 NCTA will supply the Warranty Bond form upon request.

**Initial Project Acceptance**

The NCTA and the Design-Build Team shall jointly review all completed Work, or a portion thereof, as determined by the NCTA. 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 NCTA 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 NCTA, routine maintenance of such becomes the responsibility of the NCTA, 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 NCTA and the Design-Build Team with a copy of such being sent to the Design-Build Team's warranty bond surety agent.

The NCTA 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 NCTA diminishes the Design-Build Team's responsibility under this warranty. Acceptance of material, in penalty, under the NCTA'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 NCTA 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 photographical 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 NCTA with copies submitted to the Design-Build Team.

**Final Warranty Acceptance**

The NCTA 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 NCTA 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 NCTA'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 NCTA 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 NCTA in its notice, the Design-Build Team and NCTA shall agree on a remedy immediately upon notice by NCTA of such need for immediate work**. No Corrective Work shall occur without NCTA knowledge of such activities or operations.**

The NCTA 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 NCTA fail to reach such an agreement within such seven calendar day period (or immediately, in the case of Immediate Corrective Work), then NCTA, 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 NCTA, 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 NCTA 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 NCTA, 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 NCTA and Design-Build Team inspections, tests and approvals, and shall run directly to and be enforceable by the Design-Build Team and/or NCTA, including their respective successors and assigns. The Design-Build Team hereby assigns to NCTA 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 NCTA 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. NCTA'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 NCTA hereunder for latent construction defects.

**Warranty Beneficiaries**

In addition to benefiting NCTA 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 NCTA 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 NCTA'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 NCTA 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 NCTA pending resolution of the dispute.

Should disputed Corrective Work pose a safety issue to the motorist, the NCTA 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 NCTA 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 NCTA**

The NCTA:

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 NCTA. The NCTA 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 NCTA’s satisfaction and within the time frame required by the NCTA, the NCTA 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 NCTA that the warranted work will be free of defects in materials and workmanship. The warranty bond shall be submitted to the NCTA as a prerequisite of the NCTA 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 NCTA approved materials and methods.

D. Shall be responsible for performing Corrective Work upon NCTA specifying a failure of any Work to satisfy Design-Build Team's Warranties, unless otherwise directed.

E. Shall notify the NCTA 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 NCTA 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 NCTA.

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 NCTA pursuant to the NCDOT 2006 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 NCTA 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 NCTA 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 NCTA 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 is 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 NCTA is 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 NCTA and the Design-Build Team; the Design-Build Team is responsible for the percentage of fault attributable to the materials and/ or workmanship and the NCTA is 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 NCTA and the Design-Build Team will be conducted. The NCTA 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 NCTA 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 NCTA 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 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.

**F. 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.

**G. 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.

**H. 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 NCTA 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 NCTA approval. The limits of the Corrective Work shall be approved by NCTA 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) | ≥ 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) | ≥ 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 | ≥ 2% of segment area | Mill and Resurface affected |

| | | |
|---|---|---|
| (Major) | | courses |
| Raveling | ≥ 8% of segment area | Mill and Resurface affected courses |
| Flushing | ≥ 4% of segment area | Mill and Resurface affected courses |
| Rutting (3) | 25% of segment length having an avg. rut depth ≥ 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. |

(1) Warranty Corrective Work is required upon documentation of the threshold limit being met or exceeded
(2) The rut depth threshold applies to each wheel path independently.
(3) The pavement surface will be evaluated for the presence of rutting on each driving lane 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 NEW JOINTED PORTLAND CEMENT CONCRETE PAVEMENT

### Application

This section applies to all components within and the combination thereof to construct new jointed portland cement concrete pavement placed on hot mix asphalt or aggregate base course.

### Limits of Warranted Work

The warranted work includes all jointed Portland cement concrete pavement placed for travel lanes within the project limits.

**Condition Parameters and Threshold Limit**

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

**A.** **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. Crack types are:

1. **Transverse** - 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..

2. **Longitudinal** - A crack, 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.

3. **Corner** – A crack with orientation generally diagonal and located near a slab corner. It typically intersects both the transverse and longitudinal pavement joints.

4. **Map** - Interconnecting, variable spaced cracks in a random orientation and pattern.

5. **Shrinkage** - A small crack or cracks produced by the loss of contained water during the dehydration process.

**B.** **Spalling** - Broken or missing piece of concrete contiguous with the perimeter edge of a slab with a surface area exceeding two square inches.

**C.** **Joint Sealant Failure** - The loss of material integrity consisting of either adhesive failure (debonding), cohesive failure (material separation), or the complete loss of sealant material.

**D.** **Shattered Slab** - A pavement slab broken into four or more sections by full-depth cracks.

**E.** **Scaling** - The concrete surface has a visible, exposed, rough texture from a loss of either aggregate or mortar.

**F.** **Non-function Joint** – Joints or areas within 4 feet of the joint showing distresses include faulting, pumping, spalling, cracking, blowups, and mid-panel cracking or inadequate load transfer.

**G.** **Ride Quality / Pavement Smoothness** - Measurement of pavement roughness to establish appropriate ride comfort levels for the motorist on the facility.

**H. 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 NCTA 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 NCTA approval. The limits of the Corrective Work shall be approved by NCTA 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. NCTA will determine if such full width removal is necessary; however a patch greater that 4 feet in length is typically the maximum allowed prior to patching full width.

| **PORTLAND CEMENT CONCRETE PAVEMENT WARRANTY REQUIREMENTS** | | |
|---|---|---|
| **CONDITION PARAMETER** | **THRESHOLD LIMITS PER SEGMENT (1) (Length = 528 feet)** | **RECOMMENDED CORRECTIVE WORK (7) (13)** |
| Transverse Cracking | Any transverse crack measuring ≥ 6 feet | Remove and replace slab(8) (9) |
| Longitudinal Cracking | Any longitudinal crack measuring ≥ 8 feet | Remove and replace slab(8) (9) |
| Corner Cracking | ≥ 3 corner cracks within segment | Repair with elastomeric conc.(10) |
| Map Cracking | ≥ 5% of segment area | Remove and replace slab(9) |
| Shrinkage Cracking | ≥ 5% of segment area | Remove and replace |
| Spalling | ≥ 10% of a single 15 slab (2) and ≤ 5 slabs requiring repair (14) | Repair with elastomeric concrete (10) |
| Joint Sealant Failure | ≥ 10% joint length (3) and ≤ 4 slabs requiring repair | Remove and replace seal material(12) |
| Shattered Slab(4) | Any shattered slab shall be replaced | Full depth removal of slab and replacement |
| Scaling | ≥ 25% of the slab area ≤ 3 slabs within segment | Diamond grind surface(11) |
| Nonfunctioning Joint(s) | ≥ 3 Non-consecutive joints(15) | Remove pavement full depth a minimum 6 feet either side of joint and replace slab and joint |

| | | |
|---|---|---|
| Ride Quality (IRI) | ≥ 85(5) | Diamond grind(11) , or replace to bring back to within threshold limit |
| Skid Resistance | ≥ 37(6) | Diamond Grind affected area(11) |

(1) Warranty Corrective Work is required upon documentation of the threshold limit being met or exceeded.
(2) Can be non-contiguous. 10% value applies to total perimeter (four sides) of the slab.
(3) Applies to all transverse and longitudinal joints on the perimeter of the slab. Noncontiguous lengths will be summed on a per slab basis.
(4) Shattered slabs will not be an acceptable condition, and shall be removed and replaced as approved by the Engineer.
(5) 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.
(6) Skid Number as measured with a locked wheel tester
(7) If multiple condition parameters are present, the recommended action may be revised. Removal and replacement is required if multiple crack types are present.
(8) The appropriate corrective treatment is dependent on the crack's location and depth.
(9) Dependent on cause.
(10) Repair dependent on area and depth of crack.
(11) Diamond grinding applies to entire slab surface area where corrective action is needed.
(12) Replace with existing material type. Neoprene seals shall be removed and replaced full-width.
(13) All Corrective Work shall be conducted in accordance with the most current procedures and material mixtures recommended by NCDOT Portland Cement Concrete Pavement Repair Manual, unless otherwise approved.
(14) Excessive spall repair throughout the segment may necessitate more substantial repairs to include full depth slab replacement.
(15) Evaluate all joints within defective segment with the MIT Scan. Repairs will be based upon dowel placement and functioning joints within segment.

## 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 NCTA 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 NCTA approval. The limits of the Corrective Work shall be approved by NCTA 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. NCTA will determine if such full width removal is necessary; however a patch greater that 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** (Map cracking) | Greater than 20% of deck | Mill or Hydro demolition a minimum 1" deep or to sound concrete; repair with latex modified concrete |
| (1) Warranty Corrective Work is required upon documentation of the threshold limit being met or exceeded<br>(2) Repairs are dependant upon size, depth and cause; therefore, all corrective work shall be approved by NCTA<br>(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. | | |

**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 NCTA.

**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 NCTA.

**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 NCTA, to bring the bridge approach transition back to within the ½ inch tolerance.

* only allowed for Hot Mix Asphalt Pavements

**OUTSOURCING OUTSIDE THE USA:**

(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.

**PROCEDURE FOR MONITORING BORROW PIT DISCHARGE:**

(2-20-07) 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 DWQ within 24 hours of any stream turbidity standard exceedances that are not brought into compliance.

During the Environmental Assessment required by Article 230-4 of the *2006 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 shall be suspended until turbidity levels in the stilling basin can be reduced to a level where sediment deposition does not occur. Staining of wetland surfaces from suspended clay particles, occurring after evaporation or infiltration, does not constitute sedimentation. No activities shall occur in wetlands that adversely affect the functioning of a wetland. Visible sedimentation shall be considered an indication of possible adverse impacts on wetland use.

The Engineer shall perform independent turbidity tests on a random basis. These results shall be maintained in a log within the project records. Records shall include, at a minimum, turbidity test results, time, date and name of sampler. Should the Engineer's test results exceed those of the Design-Build Team's test results, an immediate test shall be performed jointly with the results superceding the previous test results of both NCTA and/or NCDOT and the Design-Build Team.

The Design-Build Team shall use the *NCDOT Turbidity Reduction Options for Borrow Pits Matrix*, available at http://www.ncdot.org/doh/preconstruct/ps/contracts/letting.html to plan, design, construct, and maintain BMPs to address water quality standards. Tier I Methods include

stilling basins which are standard compensatory BMPs. Other Tier I methods are noncompensatory and shall be used when needed to meet the stream turbidity standards. Tier II Methods are also noncompensatory and are options that may be needed for protection of rare or unique resources or where special environmental conditions exist at the site which have led to additional requirements being placed in the DWQ's 401 Certifications and approval letters, Isolated Wetland Permits, Riparian Buffer Authorization or a DOT Reclamation Plan's Environmental Assessment for the specific site. Should the 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 bid for the project. CEC values exceeding 15 milliequivalents per 100 grams of soil may indicate a high potential for turbidity and should be avoided when dewatering into surface water is proposed.

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

## EROSION & SEDIMENT CONTROL/STORMWATER CERTIFICATION

1-16-07 (DB Rev. 3-13-08) DB1 G18

### General

The NCTA recognizes the imperative need to have qualified individuals designing, constructing, maintaining, and performing oversight of erosion and sediment control/stormwater components within all transportation facility projects. This accountability and competence is required to assure that the environmental commitments into which the NCTA has entered are in conformity with the requirements of the approved plans, specifications, and permit conditions. To ensure that candidates are qualified to construct, maintain, and oversee environmental related operations, certification programs have established written and/or proficiency standards. The certification issued jointly by the North Carolina Department of Transportation and North Carolina State University is a privileged certification that should be held in high regard.

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 to 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 and sediment control / stormwater 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.

In the case of difference of opinion or interpretation of plan or contract requirements between the Design-Build Team and the Engineer, the Engineer's determination and decision will be final.

**Roles and Responsibilities**

(A) *Certified Supervisor* - The Certified Supervisor shall be Level II and responsible for ensuring erosion and sediment control / stormwater is adequately implemented and maintained on the project and conducting the quality control program. The Certified Supervisor shall be on the project within 24 hours from initial exposure of an erodible surface to the project's final acceptance when questions or concerns arise with erosion and sedimentation control / stormwater issues. The Certified Supervisor shall perform the following duties:

(1) (a) 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.

(b) Oversee the work of subcontractors so that appropriate erosion and sediment control / stormwater preventive measures are conformed to at each stage of the work.

(c) Prepare the required weekly erosion control punchlist and submit to the Engineer.

(d) Attend all weekly or monthly construction meetings to discuss the findings of the NPDES inspection and other related issues.

(e) Implement the erosion and sediment control / stormwater site plans requested.

(f) Provide for erosion and sediment control / stormwater methods for the Design-Build Team's temporary work not shown on the plans, such as, but not limited to work platforms, temporary construction, pumping operations, plant and storage yards, and cofferdams.

(g) Acquire applicable permits and comply with requirements for borrow pits, dewatering, and any temporary work conducted by the Design-Build Team in jurisdictional areas.

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

(i) Fully install erosion and sediment control / stormwater work prior to suspension of the work.
(j) Coordinate with NCTA, NCDOT, Federal, State and Local Regulatory agencies on resolution of erosion and sediment control / stormwater issues due to the Design-Build Team's operations.
(k) Ensure that proper cleanup occurs from vehicle tracking on paved surfaces and / or any location where sediment leaves the Right-of-Way.
(l) Have available a set of erosion control plans that has been properly updated to reflect necessary plan and field changes for use and review by NCTA and NCDOT personnel as well as regulatory agencies.

(2) Requirements set forth under the NPDES Permit – The NCTA's NPDES permit 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 NCTA and/or NCDOT shall incorporate the applicable requirements into its delegated Erosion and Sediment Control Program. Some of the requirements are, but are not limited to:

(a) Control project site waste to prevent contamination of surface or ground waters of the state (i.e. 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 at least once every 7 calendar days, twice weekly for 303(d) impaired streams, and within 24 hours after a significant rainfall event of 0.5 inches within 24 hours.
(c) Maintain an onsite rain gauge and a record of rainfall amounts and dates.
(d) Maintain erosion and sediment control / stormwater inspection records for review by NCTA, NCDOT and Regulatory personnel upon request.
(e) Implement approved reclamation plans on all borrow pits and waste sites.
(f) Maintain a log of turbidity test results as outlined in the NCDOT'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 NPDES Permit requirements, and the requirements of the *General Permit, NCG010000*.
(i) Report violations of the NPDES permit to the Engineer who will notify the DWQ Regional Office within 24 hours.

(3) In accordance with NCTA's NPDES Permit, Contractors involved in construction and maintenance activities shall receive training in stormwater pollution prevention awareness. Appropriate training will be provided to the Design-Build Team's appropriate staff based upon their role in the project. The NCTA approved training shall encompass the following on an annual basis:

- General stormwater awareness
- NPDES Stormwater permit NCG01000 implementation

- Indentification of stromwater pollution potential
- Appropriate spill response actions
- Reporting/ documenting procedures for spills
- Identification of illicit discharge and illegal dumping activities
- Reporting/documenting procedures for illicit discharge and illegal dumping activities
- Contacts for reporting spills and illicit connections/illegal dumping
- General erosion and sediment control
- Proper utilization of the *NCDOT Turbidiity Reduction Options for Borrow Pits Matrix*, including inspection and maintenance of borrow pits.

(4) Quality Control Program - Maintain a quality control program to control erosion, prevent sedimentation and follow provisions 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) Maintain temporary erosion and sediment control devices.
(h) Remove temporary erosion or sediment control devices when they are no longer necessary as agreed upon by the Engineer.
(i) 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 *Certified Installer* is not onsite, the Design-Build Team may substitute a Level I Installer with a Level II Foreman, 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 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 2 days of change.

**Ethical Responsibility**

Any company performing work for the NCTA or NCDOT 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 NCTA's Chief Engineer to the NCDOT and/or the certification entity, certification for Supervisor, Certified Foreman, Certified Installer and Certified Designer may be revoked or suspended with the issuance of a Continuing Immediate Corrective Action (Continuing ICA), Notice of Violation (NOV), or Cease and Desist Order for erosion and sediment control / stormwater related issues. In such case, the NCTA Chief Engineer reserves the right to require the Design-Build Team to replace the personnel responsible for the citation.

Should any of the following circumstances occur, NCTA's Chief Engineer may recommend to NCDOT suspension or permanent revocation of such certification. In addition, the NCTA reserves the right to require the Design-Build Team to replace the personnel responsible.

(A) Failure to adequately perform the duties as defined within the certification program
(B) Issuance of a Continuing 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 within another state

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

A registrant has the right to appeal any adverse action which results in suspension or permanent revocation of certification by responding, in writing, to NCTA's Chief Engineer within 10 calendar days after receiving notice of the proposed adverse action.

NCTA Chief Engineer
5400 Glenwood Avenue
Suite 400
Raleigh, NC 27612

Failure to appeal within 10 calendar days will result in the proposed adverse action becoming effective on the date specified on the certified notice. Failure to appeal within the time specified will result in a waiver of all future appeal rights regarding the adverse action taken. The registrant will not be allowed to perform duties associated with the certification during the appeal process.

NCTA's Chief Engineer will hear the appeal and make a decision within 7 days of hearing the appeal. Decision of NCTA's Chief Engineer will be final and will be made in writing to the registrant.

If a certification is temporarily suspended, the registrant 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 Supervisor*, *Certified Foremen*, *Certified Installers* and *Certified Designer* will be incidental to the project for which no direct compensation will be made.

## WASTE REDUCTION INITIATIVES

In concert with the recycling provisions contained elsewhere within the RFP, the Design-Build Team is encouraged to take steps to reduce the overall waste materials of all kinds from the project with the ultimate goal of creating a "zero waste" project. This provision does not specifically dictate that the Design-Build Team create a zero waste project. The intent of this provision is to encourage the Design-Build Team to find reuse opportunities where economically reasonable.

Once the alignment and grade plans are approved, the Design-Build Team shall review the project impact area, to include all easements and right of way, and identify all structures and buildings that are to be removed as part of this project (including those partially contained within right of way and easements). Once identified, the Design-Build Team is encouraged to work with local charitable organizations such as Habitat for Humanity and Builders of Hope to find reuse opportunities for the structures or components of the structures.

Develop a preliminary estimate of the waste materials expected to be generated from the project, including the probable origin, type, and quantities of waste materials projected from any demolition for any project component including vegetative removal. Evaluate the projected materials expected to be used in the new construction and develop a preliminary listing of new construction/renovation project materials quantities for comparison to the properties and quantities of potentially available recycle/reuse materials that might be incorporated into and/or around the new construction.

Evaluate the opportunity to develop a potential on-site program for processing recycle/reuse materials for implementation during the project construction phase. Evaluate the potential for on-site composting of materials for later use in seeding and erosion control applications. Initiate on-site opportunities to incorporate as much of the environmentally permissible recycle/reuse materials into the project as reasonable and feasible. Identify the best method for on-site handling storage of the waste stream materials.

For waste materials not incorporated into the project, evaluate available alternate recycling/reuse locations for "waste materials". Research local and regional recycling/reuse markets for the key

materials identified, realizing that the uses of the materials in off-site reuse/recycling opportunities will be regionally dependent. It is the desire of the NCTA that all roadway materials (aggregate, concrete, asphalt) removed under this project be recycled for reuse on this project if economically feasible.

Prior to commencing any demolition operations, provide the NCTA a comprehensive waste management plan that addresses the items detailed above and outlines in detail the Design-Build Team's plan for recycling/ reuse of waste materials.

## CLEARING AND GRUBBING

(3-14-08) DB2 R01

The North Carolina Turnpike Authority is committed to limiting environmental impacts of the project to the extent practicable. Upland forests, which provide habitat for terrestrial wildlife, are instrumental in protecting water and air quality and are one of the natural resources that the NCTA includes in this commitment. For these reasons NCTA is requiring the Design-Build Team to identify and subsequently protect existing upland forests from disturbance within the project right-of-way where feasible. Project safety, constructability and long term project maintenance are not to be compromised in order to implement this commitment. To this end the Design-Build Team shall:

- Identify in the designs the locations where upland trees will be preserved to include quadrants, the median (outside clear recovery zone) and any other locations within the right of way;
- Schedule, coordinate with NCTA, and attend one meeting that may include representatives from the NCTA, FHWA, USEPA, NCDOT, and other agencies to review the recommended areas for upland tree preservation and discuss the methodology for determining these locations. The meeting shall occur prior to beginning land clearing of any section of the project.
- Provide the approach and management plans for implementing the upland forest protection plan in the field with the various contractors and subcontractors;
- Implement the plan such that all project personnel are aware of these upland tree protective zones until the entire project is accepted; and
- Schedule, coordinate with NCTA, and attend additional meetings regarding upland forest preservation areas, if it is determined during construction that conditions have changed such that the upland forest preservation areas identified in the design must be modified.

With the exception of areas with Permanent Utility Easements, perform clearing on this project to the limits established by Method "III" shown on Standard No. 200.02 or 200.03 of the *2006 NCDOT Roadway Standard Drawings*. In areas with Permanent Utility Easements, clearing shall extend to the Right of Way limits.

Revise the 2006 *Standard Specifications for Roads and Structures* as follows:

**Page 2-2, Article 200-3, Clearing, add the following as the 6th paragraph:**

At bridge sites, clear the entire width of the right of way beginning at a station 3 feet back of the beginning extremity of the structure and ending at a station 3 feet beyond the ending extremity of the structure.

**SHPO DOCUMENTATION FOR BORROW / WASTE SITES**
(12-18-07) DB8 R02

Revise the 2006 *Standard Specifications for Roads and Structures* as follows:

**Division 2 Earthwork**

**Page 2-16, Subarticle 230-1(D),** add the words: *The Contractor specifically waives* as the first words of the sentence.

**Page 2-17, Subarticle 230-4(B) Contractor Furnished Sources, first paragraph, first sentence replace with the following:**

Prior to the approval of any borrow sources developed for use on any project, obtain certification from the State Historic Preservation Officer of the State Department of Cultural Resources certifying that the removal of the borrow material from the borrow sources(s) will have no effect on any known district, site building, structure, or object, architectural and / or archaeological that is included or eligible for inclusion in the National Register of Historic Places.

**Division 8 Incidentals**

**Page 8-9, Article 802-2 General Requirements, add the following as the 1st paragraph:**

Prior to the removal of any waste from any project, obtain certification from the State Historic Preservation Officer of the State Department of Cultural Resources certifying that the deposition of the waste material to the proposed waste area will have no effect on any known district, site building, structure, or object, architectural and / or archaeological that is included or eligible for inclusion in the National Register of Historic Places. Furnish a copy of this certification to the Engineer prior to performing any work in the proposed waste site.

**Page 8-10, Article 802-2, General Requirements, 4th paragraph, add the following as the 2nd sentence:**

The Department's borrow and waste site reclamation procedures for contracted projects is available on the NCDOT website and shall be used for all borrow and waste sites on this project.

**BURNING RESTRICTIONS**
(7-1-95) DB2 R05

Open burning is not permitted on any portion of the right-of-way limits established for this project. Do not burn the clearing, grubbing or demolition debris designated for disposal and generated from the project at locations within the project limits, off the project limits or at any

waste or borrow sites in these counties. Dispose of the clearing, grubbing and demolition debris by means other than burning, according to state or local rules and regulations.

## BUILDING AND APPURTENANCE REMOVAL / DEMOLITION

(12-5-06) DB2 R12

The Design-Build Team shall 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 210 and 215 of the *2006 Standard Specifications*.

The NCTA, through their Right-of-Way "Agent" will conduct all asbestos assessment and abatement. The Design-Build Team shall consult with the Right-of-Way "Agent" early and often to ensure that the Agent has ample time to perform asbestos assessment and abatement prior to releasing the site to the Design-Build Team for removal of the structures. The Design-Build Team shall notify the Agent of their intent to remove any and all buildings and allow 90 days from the date of notifying the Agent for the Agent to perform the necessary assessment and abatement.

## REINFORCED CONCRETE PIPE DESIGN

(10-20-09) DB3 R006

### DESCRIPTION

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

### Materials

### (A) Design

When the design of a reinforced concrete pipe is required on the plans developed by the Design-Build Team, design the reinforced concrete pipe in accordance with the current edition of the AASHTO LRFD Bridge Design Specifications. Provide the diameter of pipe as indicated on the plans developed by the Design-Build Team and manufacture the pipe in accordance with ASTM C 1417. Provide a reinforced concrete pipe that meets the requirements of Section 1032-9, Section 1077 and any other applicable parts of the 2006 *Standard Specifications for Roads and Structures*.

The design of the reinforced concrete pipe shall be the Design-Build Team's responsibility and is subject to review, comments and approval. Submit two sets of detailed plans for review and acceptance. Include all details in the plans, including the size and spacing of the required reinforcement necessary to fabricate the reinforced concrete pipe. Include checked design calculations for the reinforced concrete pipe. Have a North Carolina Registered Professional Engineer seal the plans and design calculations. After the plans are reviewed and , if necessary, all corrections made, submit

one set of reproducible tracings on 22” * 34” sheets to become part of the plans developed by the Design-Build Team.

**(B) Reinforced Concrete Pipe Sections**

(1) Class

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

(2) Design Criteria

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

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

**(C) Joints**

Produce the reinforced concrete pipe sections with spigot and bell ends. Design and form the ends of the pipe section so, when the sections are laid together, they make a continuous line of pipe with a smooth interior free of appreciable irregularities in the flow line, and compatible with the permissible variations given in the 2006 *Standard Specifications for Roads and Structures* and ASTM C 1417.

**(D) Manufacture**

In addition to the requirements of the 2006 *Standard Specifications for Roads and Structures* and ASTM C 1417, devices or holes are permitted in each pipe section for the purpose of handling and placement. Submit details of handling devices or holes for approval and do not cast any concrete until approval is granted. Remove all handling devices flush with concrete surfaces as directed. Fill holes in a neat and workmanlike manner with an approved non-metallic non-shrink grout, concrete or plug.

**CULVERT PIPE**
(1-19-10) DB10R32

Revise the 2006 *Standard Specifications for Roads and Structures* as follows:

**Page 10-67, Article 1032-1, replace (A), (B), (C), (E) and (F) with the following**:

(A) Coated corrugated metal culvert pipe and pipe arches.
(B) Coated corrugated metal end sections, coupling band and other accessories
(C) Corrugated aluminum alloy structural plate pipe and pipe arches
(D) Corrugated aluminum alloy end sections, coupling band and other accessories
(E) Welded steel pipe

**Page 10-69, Subarticle 1032-3(A)(5) Coating Repair, replace with the following**:

Repair shall be in accordance with Section 1076-6 of the 2006 *Standard Specifications for Roads and Structures*.

**Subarticle 1032-3(A)(7) Aluminized Pipe, replace with the following:**

Aluminized pipe shall meet all requirements herein, except that the pipe and coupling bands shall be fabricated from aluminum coated steel sheet meeting the requirements of AASHTO M274.

**Page 10-71, Article 1032-4 Coated Culvert Pipe, replace (A), (1), (2), (3), (4), (B), (C), (D), (E), (F) and (G) with the following:**

(A) Coatings for Steel Culvert Pipe or Pipe Arch

The below coating requirements apply for steel culvert pipe, pipe arch, end sections, tees, elbows and eccentric reducers.

(1) Steel Culvert Pipe shall have an aluminized coating, meeting the requirement of AASHTO M274.

(2) When shown on the plans developed by the Design-Build Team, and as approved by the Engineer, a polymeric coating meeting the requirements of AASHTO M246 for Type B coating may be substituted for aluminized coating.

(B) Acceptance

Acceptance of coated steel culvert pipe, and its accessories, shall be based on, but not limited to, visual inspections, classification requirements, check samples taken from material delivered to the project, and conformance to the annual Brand Registration.

**Page 10-73, Article 1032-5, sixth paragraph, third sentence, remove the word "spelter"**

**Page 10-74, 1032-7 Vitrified Clay Culvert Pipe, delete section in its entirety.**

**Page 10-75, Article 1032-8 Welded Steel Pipe, change title to WELDED STEEL PIPE FOR DRAINAGE**

**Subarticle 1032-9(B) Plain Concrete Culvert Pipe, delete section in its entirety.**

**Page 10-77, Article 1032-10 Corrugated Polyethylene Culvert Pipe, change title to CORRUGATED POLYETHYLENE (HDPE) CULVERT PIPE**

**Add the following: Article 1032-11 Polyvinyl Chloride (PVC) Pipe**

Polyvinyl Chloride pipe shall conform to AASHT M 304 or ASTM 949. When rubber gaskets are to be installed in the pipe joint, the gasket shall be the sole element relied on to maintain a tight joint. Test pipe joints at the plant hydrostatically using test methods in ASTM D 3212. Soil tight joints shall be watertight to 13.8 kPA. Watertight joints shall be watertight to 34.5 kPA unless a higher pressure rating is specified in the plans developed by the Design-Build Team.

**DRAINAGE PIPE**

(3-16-10) DB3 R36

**Description**

Where shown in the plans developed by the Design-Build Team, the Contractor 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:

**Material**

| Item | Section |
|---|---|
| Corrugated Aluminum Alloy Pipe | 1032-2(A) |
| Aluminized Corrugated Steel Pipe | 1032-3(A)(7) |
| Corrugated Polyethylene Pipe (HDPE) | 1032-10 |
| Reinforced Concrete Pipe – Class II or III | 1032-9(C) |
| Polyvinyl-Chloride (PVC) | 1032-11 |
| Elbows | 1032 |

Corrugated Steel Pipe shall not be permitted in counties listed in the Pipe Installation and Pipe Culverts Special Provision. In other counties, Corrugated Steel Pipe requires an acceptable coating in accordance with Section 1032-4 of the 2006 *Standard Specifications for Roads and Structures*.

Only pipe with smooth inside walls shall be allowed for storm drain systems. Storm drain systems are defined as pipe under curb and gutter, expressway gutter, and shoulder berm gutter that connects drainage structures and is not open ended.

All pipe types are subject to the maximum and minimum fill height requirements as found on Roadway Standard Detail 300D01 - 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 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.

Allowable side drain pipe material is outlined in Article 310-4 of the Pipe Installation and Pipe Culverts Special Provision.

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.

**Construction Methods**

Pipe Culverts shall be installed in accordance with the plans developed by the Design-Build Team, this RFP and the 2006 *Standard Specifications for Roads and Structures*.

Where allowed by the plans developed by the Design-Build Team, use any of the several alternate pipes shown herein, but only one type of pipe shall be permitted between drainage structures or for the entire length of a cross line pipe.

## PIPE INSTALLATION AND PIPE CULVERTS

(1-19-10) DB3R40

Revise the 2006 *Standard Specifications for Roads and Structures* as follows:

Replace Section 300 and Section 310 with the following:

**SECTION 300**

**PIPE INSTALLATION**

**300-1 DESCRIPTION**

Excavate, undercut, provide material, condition foundation, lay pipe, joint and couple pipe sections, and furnish and place all backfill material as necessary to install the various types of pipe culverts and fittings required to complete the project.

Do not waste excavation unless permitted. Use suitable excavated material as backfill; or in the formation of embankments, subgrades, and shoulders; or as otherwise directed. Furnish disposal areas for the unsuitable material. The Engineer will identify excavated materials that are unsuitable.

Where traffic is to be maintained, install pipe in sections so that half the width of the roadway is available to traffic.

## 300-2 MATERIALS

Refer to Division 10:

| Item | Section |
|---|---|
| Flowable Fill | 1000 |
| Select Materials | 1016 |
| Joint Materials | 1032-9(G) |
| Engineering Fabric | 1056-1 |

Provide foundation conditioning material meeting the requirements of Article 1016-3 for Class V or VI as shown on the plans developed by the Design-Build Team.

Provide bedding material meeting the requirements of Article 1016-3 for Class II (Type 1 only) or Class III as shown on the plans developed by the Design-Build Team.

Provide backfill material meeting the requirements of Article 1016-3 for Class II (Type 1 only) or Class III material as shown on the plans developed by the Design-Build Team.

Do not use corrugated steel pipe in the following counties:

> Beaufort, Bertie, Bladen, Brunswick, Camden, Carteret, Chowan, Columbus, Craven, Currituck, Dare, Gates, Hertford, Hyde, Jones, Martin, New Hanover, Onslow, Pamlico, Pasquotank, Pender, Perquimans, Tyrrell and Washington.

## 300-3 UNLOADING AND HANDLING

Unload and handle pipe with reasonable care. Do not roll or drag metal pipe or plates over gravel or rock during handling. Take necessary precautions to ensure the method used in lifting or placing the pipe does not induce stress fatigue in the pipe. Use a lifting device that uniformly distributes the weight of the pipe along its axis or circumference. Repair minor damage to pipe when permitted. Remove pipe from the project that is severely damaged or is rejected as being unfit for use. Undamaged portions of a joint or section may be used where partial lengths are required.

## 300-4 PREPARATION OF PIPE FOUNDATION

Prepare the pipe foundation in accordance with the applicable method as shown on the plans developed by the Design-Build Team, true to line and grade, and uniformly firm.

Camber invert grade an amount sufficient to prevent the development of sag or back slope in the flow line. The Design-Build Team shall determine the amount of camber required and submit to the Engineer for approval.

Where material is found to be of poor supporting value or of rock and when the Engineer cannot make adjustment in the location of the pipe, undercut existing foundation material within the limits established on the plans developed by the Design-Build Team. Backfill the undercut with foundation conditioning material, Class V or VI select material. Encapsulate the foundation conditioning material with Type 4 engineering fabric prior to placing bedding material. Overlap all transverse and longitudinal joints in the fabric at least 18 inches.

Maintain the pipe foundation in a dry condition.

**300-5 INVERT ELEVATIONS**

No adjustment in contract time or compensation shall be granted for pipe field adjustments.

**300 -6 LAYING PIPE**

The Department reserves the right to perform forensic testing on any installed pipe.

**(A) Rigid Pipe**

Concrete and welded steel pipe shall be considered rigid pipe. Lay pipe on prepared foundation, bell or groove end upgrade with the spigot or tongue fully inserted. Check each joint for alignment and grade as the work proceeds.

Use flexible plastic joint material except when material of another type is specified on the plans developed by the Design-Build Team. Joint material of another type may be used when permitted.

Repair lift holes in concrete pipe, if present. Thoroughly clean and soak the lift hole and completely fill the void with an approved non-shrink gout. Submit alternate details for repairing lift holes to the engineer for review and approval.

For all pipes 42 inches in diameter and larger, wrap filter fabric around all pipe joints. Use Type 2 Class B fabric. Extend fabric at least 12 inches beyond each side of the joint. Secure the filter fabric against the outside of the pipe by methods approved by the Engineer.

**(B) Flexible Pipe (Except Structural Plate Pipe)**

Corrugated steel, corrugated aluminum, corrugated polyethylene (HDPE), and polyvinylchloride (PVC) pipe shall be considered flexible pipe. Place flexible pipe carefully on the prepared foundation starting at the downstream end with the inside circumferential laps pointing downstream and with the longitudinal laps at the side or quarter points.

Handle coated corrugated steel pipe with special care to avoid damage to coatings.

Join pipe sections with coupling band, fully bolted and properly sealed. Provide coupling bands for annular and helical corrugated metal pipe with circumferential and longitudinal strength sufficient to preserve the alignment, prevent separation of the sections, and prevent backfill infiltration. Match-mark all pipe 60 inches or larger in diameter at the plant for proper installation on the project.

At locations indicated on the plans developed by the Design-Build Team, corrugated steel pipe sections shall be jointed together with rod and lug coupling bands, fully bolted. Sleeve gaskets shall be used in conjunction with rod and lug couplings and the joints properly sealed. Coupling bands shall provide circumferential and longitudinal strength sufficient to preserve the alignment, prevent separation of the sections and prevent infiltration of backfill material.

## 300-7 BEDDING AND BACKFILLING

Loosely place bedding material, in a uniform layer, a depth equal to the inside diameter of the pipe divided by six or six inches, whichever is greater. Leave bedding material directly beneath the pipe uncompacted and allow pipe seating and backfill to accomplish compaction. Excavate recesses to receive the bells where bells and spigot type pipe is used.

Place fill around the pipe in accordance with the applicable method shown on the plans developed by the Design-Build Team in layers not to exceed 6 inches loose unless otherwise permitted. Compact to the density required by Subarticle 235-4(C). Approval of the backfill material is required prior to its use. Use select material as shown on the plans developed by the Design-Build Team.

Take care during backfill and compaction operations to maintain alignment and prevent damage to the joints. Keep backfill free from stones, frozen lumps, chunks of highly plastic clay, or other objectionable material.

Grade and maintain all pipe backfill areas in such a condition that erosion or saturation will not damage the pipe foundation or backfill.

Excavatable flowable fill may be used for backfill when approved by the Engineer. When using excavatable flowable fill, ensure that the pipe is not displaced and does not float during backfill. Submit methods for supporting the pipe and material placement to the Engineer for review and approval.

Do not operate heavy equipment over any pipe until it has been properly backfilled with a minimum three feet of cover. Place, maintain, and finally remove the required cover that is above the proposed finished grade at no cost to the Department. Remove and replace, at no cost to the Department, pipe that becomes misaligned, shows excessive settlement, or has been otherwise damaged by the Design Build Team's operations.

## 300-8 INSPECTION AND MAINTENANCE

Prior to final acceptance, the Engineer will perform random video camera and or mandrel inspections to ensure proper jointing and that deformations do not exceed allowable limits. Replace pipes having cracks greater than 0.1 inches or deflections greater than 7.5 percent. Repair or replace pipes with cracks greater than 0.01 inches, exhibiting displacement across a crack, exhibiting bulges, creases, tears, spalls, or delamination. Maintain all pipe installations in a condition such that they shall function continuously from the time the pipe is installed until the project is accepted.

## 300-9 MEASUREMENT AND PAYMENT

No separate payment will be made for any costs incurred for compliance with this Special Provision. All material and labor, including but not limited to foundation conditioning material, foundation conditioning fabric, select bedding and backfill material, pavement repair, and removal and disposal of existing pavement shall be included in the lump sum price bid for the entire project.

# SECTION 310

# PIPE CULVERTS

## 310-1 DESCRIPTION

Furnish and install drainage pipe at locations and size called for in the plans developed by the Design-Build Team. The work includes construction of joints and connections to other pipes, endwalls and drainage structures.

## 310-2 MATERIALS

Refer to Division 10:

| Item | Section |
|---|---|
| Plain Concrete Pipe Culvert | 1032-9(B) |
| Reinforced Concrete Pipe Culvert | 1032-9(C) |
| Precast Concrete Pipe End Sections | 1032-9(D) |
| Concrete Pipe Tees and Elbows | 1032-9(E) |
| Corrugated Aluminum Alloy Pipe Culvert | 1032-2(A) |
| Corrugated Aluminum Alloy Pipe Tees and Elbows | 1032-2(B) |
| Corrugated Steel Culvert Pipe and Pipe Arch | 1032-3(A) |
| Prefabricated Corrugated Steel Pipe End Sections | 1032-3(B) |
| Corrugated Steel Pipe Tees and Elbows | 1032-3(C) |
| Corrugated Steel Eccentric Reducers | 1032-3(D) |
| HDPE Smooth Lined Corrugated Plastic Pipe | 1032-10B |
| Polyvinylchloride (PVC) Pipe | 1032-11(B) |

Suppliers that provide metal pipe culverts, fittings and all other accessories covered by this section shall meet the requirements of the Department's Brand Certification program for metal

pipe culverts, and be listed on the Department's pre-approved list for suppliers of metal pipe culvert.

Do not use corrugated steel pipe in the following counties:

Beaufort, Bertie, Bladen, Brunswick, Camden, Carteret, Chowan, Columbus, Craven, Currituck, Dare, Gates, Hertford, Hyde, Jones, Martin, New Hanover, Onslow, Pamlico, Pasquotank, Pender, Perquimans, Tyrell and Washington.

**310-3 PIPE INSTALLATION**

Install pipe, pipe tees and elbows in accordance with Section 300 above.

**310-4 SIDE DRAIN PIPE**

Side drain pipe shall be defined as storm drain pipe running parallel to the roadway, to include pipe in medians, outside ditches, driveways, and under shoulder berm gutter along outside shoulders greater than four feet wide.

Where shown in the plans developed by the Design-Build Team, side drain pipe may be class II reinforced concrete pipe, aluminized corrugated steel pipe, corrugated aluminum alloy pipe, HDPE pipe or PVC pipe. Corrugated steel pipe shall be restricted in the counties listed in Article 310-2 above. Install side drain pipe in accordance with Section 300 above. Cover for side drain pipe shall be at least one foot.

**310-5 PIPE END SECTIONS**

Choose which material to use for the required end sections. Both corrugated steel and concrete pipe end sections will be allowed on concrete pipe, corrugated steel pipe and HDPE smooth lined corrugated plastic pipe.

**310-6 MEASUREMENT AND PAYMENT**

No separate payment will be made for items covered by this Special Provision. All material and labor, including but not limited to linear feet of pipe, select bedding, backfill material, pipe end sections, tees, elbows and eccentric reducers, shall be included in the lump sum price bid for the entire project.

## CEMENT AND LIME STABILIZATION OF SUB-GRADE SOILS

(07-12-07) 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

The Design-Build Team shall take soil samples, after the project has been graded to within 2 inches of final sub-grade elevation. The Design-Build Team shall sample the top 8 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. 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 NCDOT Materials and Test Unit's Soils Laboratory.

**TABLE 1**

| TEST | AASHTO DESIGNATION |
|---|---|
| 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. For the initial laboratory tests 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**

| CRITERIA FOR SELECTING LIME OR CEMENT | | |
|---|---|---|
| **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 2 specimens for each selected cement rate.
- Cure the specimens for 7 days in a moist room maintained at a temperature of 73°F ±2.7° and a humidity of 100%. At the end of the curing period, immerse the specimens in water for 4 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 *2006 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 2 days and a maximum of 4 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.

**Subsection 501-15 Method of Measurement**
The entire sub-sections are not applicable.

**Subsection 501-16 Basis of Payment**
The entire sub-section is 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 North Carolina Department of Transportation *2006 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.

**Subsection 542-16 Method of Measurement**
This entire sub-section is not applicable.

**Subsection 542-17 Basis of Payment**
This entire sub-section is not applicable.

**Unconfined Compressive Strength**

The Design-Build Team shall allow a minimum of seven days curing before testing for strength.

The lime-stabilized subgrades shall be tested using Dynamic Cone Penetrometer (DCP) 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.

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.

## PRICE ADJUSTMENTS FOR ASPHALT BINDER

(3-22-07) DB6 R25

Price adjustments for asphalt binder for plant mix will be made in accordance with Section 620 of the *2006 Standard Specifications.*

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 _____ per ton.

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

## MATERIAL TRANSFER VEHICLE

Revise the *2006 Standard Specifications for Roads and Structures* as follows:

**Page 6-45, Article 610-8, delete the third paragraph and replace with the following:**

Use a Material Transfer Vehicle (MTV) when placing all asphalt concrete plant mix pavements for all full width travel lanes, shoulders, collector lanes, ramps, and loops, unless otherwise approved.

## PRICE ADJUSTMENTS – ASPHALT CONCRETE PLANT MIX

(2-6-06) DB6 R26

Revise the *2006 Standard Specifications for Roads and Structures* as follows:

**Page 6-27, Article 609-8 and Page 6-49, Article 610-13**

Add the following paragraph before the first paragraph:

The "Asphalt Price" used to calculate any price adjustments set forth in this section shall be $50 per theoretical ton. This price shall apply for all mix types.

## ROCK BLASTING

(3-13-08)

### Description

This project special provision governs fracturing rock for excavation and constructing stable rock cut slopes using controlled, production and trench blasting. Controlled blasting is used to form a certain slope by limiting the effects of blasting with cushion or trim blasting. Another type of controlled blasting known as presplitting is not addressed by this provision. Production blasting is used to fracture rock in manageable sizes for excavation. Trench blasting is used to create trenches in rock for utilities and pipes and construct open ditches. This provision also addresses secondary blasting and blasting adjacent to highway structures in lieu of Article 410-11 of the *2006 NCDOT Standard Specifications for Roads and Structures*.

Exercise care when using bulk ammonium nitrate and fuel oil (ANFO) near open water to prevent ANFO from leaching into lakes, streams, creeks and rivers. Control blasting to avoid damaging public and private property. Design and perform rock blasting such that no flyrock occurs. If flyrock occurs, the Engineer may suspend blasting operations in accordance with Article 108-7 of the Standard Special Provision entitled Divison One contained elsewhere in this RFP and require test blasts and a revised general blast plan. When blasting in the vicinity of an open travelway, have equipment standing by to remove material that interferes with traffic flow.

Perform rock blasting, develop blast plans, provide explosive materials, drill, load and stem holes, record drilling, conduct blast surveys, monitor blasts and submit drilling records, surveys and reports in accordance with the plans, 2006 NCDOT Standard Specifications for Roads and Structures and this provision.

### Project Requirements

Blasting along the existing US 74 corridor, as well as in the vicinity of the Forest Park, Acorn Woods, Bonterra Village, Avondale Park, College Park, and Glencroft subdivisions, will be very critical due to the close proximity of businesses and populated residential areas. The Design-Build Team shall exercise caution and the utmost care when designing and performing blasts adjacent to these areas.

Blasting adjacent to CSX Railroad Right-of-way is very critical and the Design-Build Team shall obtain CSXT Representative's written approval for use of explosives adjacent to CSXT property.

All blasting adjacent to CSXT property shall be performed in accordance with CSXT Special Provisions and shall in no way interfere with CSXT operations or cause damage to CSXT property.

Pre-blast Surveys

Hire an independent Blast Consultant which is prequalified with NCDOT's Construction Unit to perform the pre-blast surveys, blast monitoring and post-blast surveys (work code 3120). Prequalified firms are included in the Department's Vendor Directory at the following web address:

https://apps.dot.state.nc.us/Vendor/Directory/wktyps.aspx

At a minimum, conduct pre-blast surveys for any building, residence or utility within 250 feet or less of the blast zone. In areas where no buildings, residences, structures or utilities are within 250 feet, conduct pre-blast surveys for any building, residence, structure or utility when the maximum charge per delay ($W_{max}$) and the distance to the subject structure (D) may result in a peak particle velocity (PPV) equal to or greater than 0.4 in/sec using the formulas in the "Peak Particle Velocity and Scaled Distance" section of this provision.

Blast Monitoring

Hire an independent Blast Consultant which is prequalified with NCDOT's Construction Unit to perform the pre-blast surveys, blast monitoring, and post-blast surveys (work code 3120).

If buildings, residences, structures or utilities are within 250 feet or less of the blast, monitor, at minimum, the four nearest buildings, residences, structures or utilities to the blast for vibration and air-overpressure (noise).

If no buildings, residences, structures or utilities are within 250 of the blast, at minimum, monitor the nearest building, residence, structure or utility to the blast for vibration and air overpressure (noise).

**Definitions**

**Air-Overpressure or Air Blast (Noise)** – The pulsating pressure changes above and below ambient air pressure generated by an explosion. Air-overpressure "linear scale" measurements include low frequency noise with a 2 hertz (Hz) response and are expressed in units of decibels-L (dBL).

**Blast Pattern** – A plan of blast hole locations or an expression of the burden and spacing distance and their relationship to each other.

**Burden –** The amount of rock broken by an explosive charge measured as the distance between the blast hole and the nearest free face.

**Charge per Delay (W)** – The sum of all charge weights firing within any 8 milliseconds (ms) time period. For example, if two 10 lb charges fire at 100 ms and one 15 lb charge fires at 105 ms, the charge per delay would be 35 lbs.

**Cushion or Trim Blasting** – A controlled blasting technique in which a line of blast holes along a rock face are detonated during the last delay period of the blast. The main burden is moved from the face by production blast holes leaving only a small burden to be removed by the line of blast holes at the face. Charges in these holes are lighter than charges in the production blast holes.

**Deck Loading (Decking) –** A method of loading blast holes in which two or more explosive charges, called decks or deck charges, are loaded in the same hole separated by stemming or an air cushion.

**Delay Blasting –** The practice of initiating individual explosive decks, blast holes or rows of holes at predetermined time intervals using delays or delay detonators as compared to firing all blast holes simultaneously.

**Flyrock** – Rocks propelled through the air by the force of an explosion.

**Free Face –** A rock surface exposed to air or water that provides room for expansion upon fragmentation.

**Magazine –** Any building, structure or container, approved for storage of explosive materials other than an explosive manufacturing building.

**Misfire –** An event where all or some charges in a blast fail (do not detonate) when initiated or a term for any portion of explosive materials that fail to detonate as planned.

**Peak Particle Velocity (PPV)** – The maximum ground vibration velocity measured in the vertical, longitudinal or transverse direction. PPV measurement units are expressed in inches per second (in/sec).

**Scaled Distance (Ds)** – A calculated value in units of $ft/lb^{0.5}$ describing relative vibration energy based on distance to a structure (D) and charge per delay (W). Ds is equal to D divided by the square root of W, $Ds = D / W^{0.5}$ or $W = (D / Ds)^2$.

**Spacing –** The distance between blast holes in a row. In production blasting, the distance is measured parallel to the free face and perpendicular to the burden.

**Stemming** – Crushed stone placed in the unloaded collar area of blast holes for the purpose of confining explosive charges and limiting rock movement and air-overpressure.

**Subdrilling** – The portion of a blast hole that is drilled below or beyond the desired excavation depth or limit. Subdrilling is generally required to prevent the occurrence of high or tight areas of unfractured rock between blast holes.

**Regulations**

Comply with all the latest applicable Federal, State and local codes, laws, rules and regulations as well as professional society standards for the storage, transportation and use of explosives. These include but are not limited to the following:

- The Occupational Safety and Health (OSH) Act of 1970 and the Construction Safety Act (CSA) of 1969, as amended
- Safe Explosives Act, Title XI, Subtitle C of Public Law 107-296; Interim Final Rule

- Title 29, U. S. Code, Section 651 et seq., including safety and health regulations for construction
- Title 27, Code of Federal Regulations (27 CFR), Part 555, U. S. Department of Justice, Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF)
- Organized Crime Control Act of 1970, Title XI, Public Law 91-452, as amended
- Title 49, Code of Federal Regulations (49 CFR), Parts 105-177 (DOT RSPA) & Parts 301-399 (DOT FHA)
- Title 29, Code of Federal Regulations (29 CFR), Parts 1910 & 1926, N. C. Department of Labor, Division of Occupational Safety and Health
- *The Mining Act of 1971, North Carolina General Statute, Chapter 74, Article 7*, as amended
- *Fire Code of North Carolina, Section 105.6.15 Explosives*
- Administrative Rules, 13 NCAC 06.0521 – 13 NCAC 06.0526, N. C. Department of Labor
- "A Guide to the Safe Storage of Explosive Materials" and "North Carolina Occupational Safety and Health Standards in Construction for Blasting & Use of Explosives", N. C. Department of Labor

Keep a copy of all regulations listed above at the project site.

Non-regulatory Industry Support Organizations:

- Blast Monitoring Equipment Operation Standards (1999), Vibration Subcommittee of the International Society of Explosive Engineers (ISEE)
- Institute of Makers of Explosives (IME) Safety Library Publications (SLPs)

In case of conflict, the more stringent regulation applies.

**Submittals**

In lieu of a blasting plan in accordance with Article 107-11 of the Standard Special Provisions, Division One, located elsewhere in this RFP, the following submittals are required for rock blasting.

- Blasting Contractor Personnel and Experience
- General Blast Plan including Blast Monitoring Consultant
- Site Specific Blast Plans including Pre-blast Surveys
- Post-blast Reports including Drilling Records, Blast Monitoring Report and Blast Damage Report

Allow 14 calendar days upon receipt by the NCTA for the review and acceptance of the Blasting Contractor personnel and general blast plan. Provide these submittals in both electronic (pdf format on CD or DVD) and hard copy form to the NCTA.

Submit a hard copy of the site specific blast plans and post-blast reports to the NCTA. After completing all blasting for a cut, structure or an excavation, submit electronic copies (pdf format on CD or DVD) of all site specific blast plans and post-blast reports.

The Engineer may suspend blasting operations in accordance with Article 108-7 of the Standard Special Provisions, Division One, located elsewhere in this RFP, if submittals are incomplete or not provided.

**(A) Blasting Contractor Personnel and Experience**

The Engineer may waive this submittal if a Blasting Consultant is not required and the Blasting Contractor and Blaster-in-Charge for this project were previously accepted within the last year for another NCDOT or NCTA project with subsurface conditions and blasting of a similar scope and complexity.

Obtain acceptance of the Blasting Contractor personnel and experience before submitting a general blast plan.

**(1) Blasting Contractor**

Use a Blasting Contractor prequalified by the NCDOT Construction Unit for rock blasting work (work code 070). Submit documentation that the Blasting Contractor has successfully completed at least 5 blasting projects within the last 3 years with subsurface conditions and blasting of a similar scope and complexity. Documentation should include the General Contractor, Owner's name and current contact information with descriptions of past project experience.

**(2) Blaster-in-Charge**

The Blaster-in-Charge shall have total authority over the handling, use and security of explosives and shall be responsible for coordinating, planning and supervising explosives use. The Blaster-in-Charge shall also be responsible for designing blasts and preparing blast plans. An approved Blaster-in-Charge is required to be on-site during blasting.

Submit documentation that the Blaster-in-Charge and any alternate Blasters-in-Charge has a minimum of 5 years experience in blasting with past projects of similar scope and complexity. Documentation should include resumes, references, certifications, project lists, experience descriptions and details, etc. If there is a change in the Blaster-in-Charge, discontinue explosives use until a new Blaster-in-Charge is submitted and accepted.

**(3) Blast Monitoring Consultant**

When a Blast Monitoring Consultant is required in the "Project Requirements" section of this provision, submit the consultant's name with the general blast plan. The Blast Monitoring Consultant shall not be an employee of the Blasting Contractor or any affiliated companies or product suppliers.

**(B) Blast Plans**

Blast plans are for quality control and record keeping purposes and shall be signed by the Blaster-in-Charge. Review and acceptance of blast plans does not relieve the Design-Build Team of responsibility for the blast results or liability in accordance with Articles 107-11 and 107-12 of the Standard Special Provisions, Division One, located elsewhere in this RFP.

**(1) General Blast Plan**

Submit a general blast plan before beginning drilling or when revised drilling or blasting methods are proposed.

At a minimum, include the following in the plan:

- Work procedures and safety precautions for the storage, transportation, handling and detonation of explosives
- Explosive products and devices for dry and wet blast holes including explosives, primers and detonators with material safety data sheets
- Drilling equipment and methods for maintaining blast hole alignment
- Typical plan, profile and sectional views for both production and controlled blasting showing hole diameter, depth, inclination and spacing, maximum blast limits, burden, subdrill depth and maximum charge per delay
- Initiation and delay methods and delay times
- Site specific blast plan format
- Blast hole drill log format
- Pre-blast survey criteria and method
- Blast monitoring report format and equipment including calibration information
- Post-blast report format
- Test blast locations when required

Do not deliver explosives to the project site until the general blast plan is reviewed and accepted by the NCTA.

**(2) Site Specific Blast Plan**

After the general blast plan is accepted, submit a site specific blast plan at least 24 hours in advance of each blast. Site specific blast plans may be waived for non-critical blasts as determined by the Engineer. The following is required for the site specific blast plan:

- Scaled drawings of the blast area with cross-sections showing the beginning and ending stations, hole diameter, depth, inclination, spacing, burden, subdrill depth and free face location and any joints, bedding planes, weathered zones, voids or other significant rock structure that may influence the blast
- A loading pattern diagram showing the location and amount of each type of explosive including primers and detonators
- The locations and depths of stemming, column heights and maximum charge per delay for each type of loading
- A delay and initiation diagram showing delay pattern, sequence and times

- Pre-blast surveys (once per structure; not required when submitted for a prior blast)
- Identify average depth of overburden material and how this material will be managed during production blasting

For site specific blast plans do not exceed the maximum charge per delay accepted in the general blast plan or submit a revised general blast plan to increase the maximum charge per delay allowed.

**(C) Pre-blast Surveys and Post-blast Reports**

**(1) Peak Particle Velocity and Scaled Distance**

Use the following formulas to determine peak particle velocity (PPV) and scaled distance (Ds).

$PPV = K(Ds)^m$ and $Ds = D / (W_{max})^{0.5}$

where: PPV = Peak Particle Velocity (in/sec)
K and m = Site specific constants defining initial energy and decay
Ds = Scaled Distance ($ft/lb^{0.5}$)
D = Distance to subject structure (ft)
$W_{max}$ = Maximum charge per delay (lbs)

Typically, a K of 240 and an m of -1.6 may be used for the equations above. However, K and m are site specific and may be determined by performing a regression analysis of multiple PPV and Ds data pairs. Select K and m based on actual site conditions, rock type and structure, subsurface information and blast monitoring measurements.

**(2) Pre-blast Survey**

Conduct pre-blast surveys in accordance with the "Project Requirements" section of this provision and the accepted general blast plan. At a minimum, include the following in the survey:

- Summary naming the person who performed the survey and comments about each structure and existing condition
- Sketches of interior and exterior walls and foundations with existing cracks and a written description of the cracks including the length, width, type and angle
- 4 x 6 inch color 35-mm or minimum 5-megapixel digital photographs or miniDV or DVD digital video documenting the existing cracks and condition of each structure

Light Detection and Ranging (LIDAR) may also be utilized for documentation in Pre-blast Surveys with the approval of NCTA.

Submit pre-blast surveys with site specific blast plans.

**(3) Post-blast Report**

Within 3 days after each blast or before the next blast, whichever is sooner, submit a post-blast report signed by the Blaster-in-Charge that includes the following:

- Results and effectiveness of the blast and any proposed changes to subsequent site specific blast plans
- Blast monitoring report
- Blast damage report when necessary
- Drilling records including blast pattern and blast hole drill logs

Light Detection and Ranging (LIDAR) may also be utilized for documentation in Post-blast Reports with the approval of NCTA.

**(a) Blast Monitoring**

Furnish seismographs capable of measuring particle velocities in the longitudinal, vertical and horizontal directions. Use monitoring equipment calibrated within one year of the date the data is collected. Interpret the recorded data and submit a blast monitoring report signed by the Blast Monitoring Consultant with the post-blast report that includes the following for each monitoring location:

- Type, identification and specific location of monitoring equipment
- Distance and direction to blast
- PPV in each direction and peak vector sum
- Maximum air-overpressure

If damage occurs from blasting, notify the Engineer immediately. Submit a blast damage report signed by the Blaster-in-Charge and Blast Monitoring Consultant with the post-blast report that includes the following:

- Property owner's (and injured person's, if any) names, addresses and telephone numbers
- Details and description of property damage (and injury, if any) with photos or video
- Any associated tort claims, complaint letters and other applicable information

**(b) Drilling Records**

Identify each blast hole with a number on a blast pattern. Log the hole number, total depth, date drilled and the depth and description of significant conditions encountered such as water, voids and weak or jointed seams. Submit the blast pattern and blast hole drill logs signed by the Driller with the post-blast report.

**Blast Design Requirements**

**(A) Vibration and Air-overpressure**

Design blasts for the vibration and air-overpressure (noise) detailed below.

| Variable | Warning Level | Not-to-Exceed Limit |
|---|---|---|
| Vibration (PPV) > 40 Hz | 0.75 in/sec | 1.0 in/sec |
| Vibration (PPV) < 40 Hz | 0.40 in/sec | 0.50 in/sec |
| Air-overpressure (noise) | 120 dBL | 133 dBL |

If warning levels are exceeded, the Engineer may require additional monitoring. If not-to-exceed limits are exceeded, the Engineer may suspend blasting operations in accordance with Article 108-7 of the Standard Special Provisions, Division One, located elsewhere in this RFP, require test blasts and a revised general blast plan, or require the use of a blasting consultant during future blasting operations.

**(B) Production Blasts**

Design production blasts in accordance with the following unless otherwise approved:

- Maintain a minimum 6 feet clearance between the production blast holes and final cut slope face
- Diameter of production blast holes may not exceed 6 inches
- Do not drill production blast holes below the bottom of adjacent controlled blast holes
- Use delay blasting to detonate production blast holes towards a free face

**(C) Controlled Blasts**

Controlled blasts are required for final cut slopes steeper than 2:1 (H:V) when the height of the rock face from the toe of the slope measured vertically, exceeds 15 feet.

**(D) Cushion Blasts**

Cushion blasts refer to either trim or cushion blasting. Design cushion blasts in accordance with the following unless otherwise approved:

- Diameter of cushion blast holes may not exceed 6 inches
- Minimize subdrilling to only that required for excavation of the final cut slopes
- Do not subdrill below final grade
- Bench height or lift thickness may not exceed 25 feet
- Use a maximum of half the charge density and burden of the production blast holes for the cushion blast holes
- Do not use bulk ANFO or any other bulk loaded products
- Fire cushion blast holes after production blast holes with a minimum 25 ms delay

**(E) Trench Blasts**

Design trench blasts in accordance with the following unless otherwise approved:

- Diameter of trench blast holes may not exceed 3 inches
- Do not use bulk ANFO or any other bulk loaded products
- Use cartridge explosives or other types of explosives specifically designed for trench blasting
- Use a charge diameter ½ to ¾ inch less than the diameter of the trench blast holes

**(F) Test Blasts**

A test blast is defined as drilling, blasting and excavation of a test section before beginning or restarting full scale blasting.

Test blasts are required for any blasting occurring within 250 feet or less of any building, residence, structure or utility.

When a test blast is required, perform one or more test blasts for both production and controlled blasting (cushion or trim blasting) or trench blasting before beginning full scale blasting. Submit proposed test blast locations with the general blast plan. Also, if the Engineer suspends blasting operations after full scale blasting has begun, one or more test blasts may be required before resuming blasting. Inform the Engineer of the test blast locations before submitting any site specific blast plans.

Perform test blasts in accordance with the submittal, blast design and construction requirements except submit site specific blast plans for test blasts 72 hours before beginning drilling. Full scale blasting may not begin or resume until the test blasts are acceptable to the Engineer. The Engineer will not consider whether a test blast is acceptable until the rock face is exposed and the post-blast report is submitted. Examples of results that may be unacceptable include excessive vibration, air-overpressure or flyrock, overbreakage, damage to the final cut slope face and overhangs.

**Construction Methods**

Conduct a pre-blast meeting with the Blaster-in-Charge, Blast Monitoring Consultant and NCTA to discuss the blasting and associated activities. This meeting should occur after the general blast plan is accepted and before submitting the site specific blast plan for the first blast on the project.

Drill and blast in accordance with site specific blast plans, the general blast plan, and this provision. Use explosives in accordance with all applicable government regulations, professional society standards and manufacturer guidelines and recommendations.

Remove appropriate amount of overburden material to prevent caving and/or contamination of the blast holes and to prevent uncontrolled distribution of the overburden during blasting.

Drill blast holes within 3 inches of plan location and control drilling to maintain the final cut slope angle. Accurately determine the angle at which the drill steel enters the rock. Cover all blast holes after drilling to prevent unwanted backfill. Identify and mark each hole with hole number and depth. Blast holes shall be free of obstructions for the entire depth. Load holes without dislodging material or caving in the blast hole wall. Use standard size 67 and 78M course aggregate in accordance with Section 1005 of the *2006 NCDOT Standard Specifications for Roads and Structures* for stemming. Stem blast holes with diameters of 5" (250 mm) or greater with no. 67 coarse aggregate and blast holes with diameters less than 5" (250 mm) with no. 78M coarse aggregate. Do not stem blast holes with drill cuttings. Matting is required when blasting in close proximity to buildings, residences, structures, utilities, traffic and populated areas.

Blasting mats shall be used to control blast debris unless the Design-Build Team can demonstrate alternative methods to confining the material during blasting operations.

At least 7 days prior to the initial blast, notify all occupants/owners of residences, businesses, structures and utilities in the surrounding area of the anticipated blast schedule. Subsequent scheduled blasts shall require a 24 hour notice.

Check for misfires immediately after each blast before signaling all clear. Remove any loose, hanging or potentially dangerous conditions by hand or machine scaling methods. Resume drilling only after scaling is complete.

When the height of a cut requires multiple lifts or benches, offset the controlled blast holes for each subsequent lift the minimum distance necessary to allow for drill equipment clearances. Adjust the alignment of controlled blast holes to account for this offset as well as any drift that occurred in the preceding lift.

The Engineer may suspend blasting operations in accordance with Article 108-7 of the Standard Special Provisions, Division One, located elsewhere in this RFP, when vibration or air-overpressure limits are exceeded, flyrock is evident or unsatisfactory rock cut slopes are produced.

Remove all loose material from final rock faces by scaling. The Design-Build Team is responsible for the final rock face. If blasting damages the final rock face, stabilize the slope with a method acceptable to the NCTA.

**Secondary Blasting**

Secondary blasting is used to reduce the size of naturally occurring boulders or those resulting from initial blasting. Secondary blasting methods include block holing or boulder busting. Block holing or boulder busting is the breaking of boulders by loading and firing small explosive charges in small diameter blast holes. Submit a combined general and site specific blast plan for secondary blasting. The Engineer may waive the pre-blast surveys, blast monitoring and post-blast reports at their discretion.

Mud capping, which is defined as placing an unconfined explosive charge in contact with a rock surface without the use of a blast hole and covering it with mud, is not allowed.

**Blasting Adjacent to Highway Structures**

Do not blast adjacent to highway structures until the concrete strength reaches 3000 psi. When blasting adjacent to highway structures, limit PPV to 0.4 in/sec measured at a location on the structure nearest the blast. Reference monitoring requirements.

When blasting for foundation excavation, submit a combined general and site specific blast plan. The Engineer may waive the pre-blast surveys, blast monitoring and post-blast reports at their discretion.

## USE OF ELECTRONIC DESIGN FILES

The Design-Build Team shall develop coordinately correct MicroStation electronic design plans (three dimensional models optional) adhering to Roadway Design Guidelines for Design-Build Projects located at:

http://www.ncdot.org/doh/preconstruct/altern/design_build/RoadwayGuidelines080107.pdf

The Design-Build Team shall adhere to the surveying/ construction layout requirements detailed in Section 801 of the NCDOT *2006 Standard Specifications for Roads and Structures*. Should the Design-Build Team elect to design a three dimensional project model and integrate such model with GPS machine guidance during project construction, Section 801 may be modified provided the Design-Build Team can demonstrate an acceptable alternative approach. The Design-Build Team shall submit, for approval, a plan detailing procedures for surveying/construction layout that will ensure construction tolerances detailed within the Contract Documents are accomplished. Additionally, this plan shall detail the procedures that the Design-Build Team CEI firm will employ to verify such construction tolerances are met. The Design-Build Team shall also demonstrate that the model, in conjunction with the proposed GPS machine guidance procedures, is capable of achieving the construction tolerances detailed within the Contract Documents. If the surveying/construction layout/ oversight plan or machine accuracy control is deemed unacceptable by the NCTA, during any part of planning, design, or construction, the Design-Build Team may be required to revert back to requirements of Section 801 of the Standard Specifications.

**Project Oversight**

Once accepted by NCTA, the Design-Build Team shall electronically provide the MicroStation Released For Construction (RFC) plans and associated three dimensional model, if created, to the Design-Build CEI firm and NCTA prior to construction of that work element. Any revisions to such files shall also be provided by the Design-Build Team prior to construction of that work element.

All accepted MicroStation project design files and digital terrain models (existing or proposed) shall be made available electronically to the Design-Build CEI firm and the NCTA for use in the

project oversight process. The Design-Build CEI Firm and the NCTA shall utilize such MicroStation electronic design files and any proposed three dimensional models in the project oversight process. The Design-Build Team CEI firm shall utilize a computer application which integrates coordinately correct electronic plans (three dimensional models optional) with physical GPS location, construction oversight processes, and asset inventory/quantity management. Such computer application shall be *Bentley OnSite Electronic Field Book for Stakeout and Inspection* or an approved equal. Such computer application can be used for the quantity management, project documentation, and as-built plan development contained in the CEI Scope of Work.

**As-Built Plans**

Regardless of the surveying/construction layout used, the Design-Build Team shall be responsible for providing coordinately correct as-built plans, which are calibrated to the state and project coordinate grid, detailing all assets, items and features included within the design. The final inspection shall be performed with the final as-built plans in hand.

## DESIGN REFERENCES

Design references developed and published by NCDOT and/ or other agencies and adopted for use by NCTA which are to be used in the design of this project may be obtained by contacting the Contracts and Standards Development Unit. Standard prices for materials, which the NCDOT normally sells for a fee, will be in effect. The Design-Build Team is responsible for designing in accordance with the applicable documents and current revisions and supplements thereto. Unique design guides created by the NCTA are available at no charge from the NCTA website.

## REVIEW OF DESIGN SUBMITTALS

Major design milestones and required design submittals shall be identified as activities on the CPM. Unless otherwise noted in the RFP or the Design Build Submittal Guidelines, submittals will be reviewed within 10 working days (15 days for temporary structures, overhead sign assemblies, MSE walls, FEMA compliance documents and temporary shoring) from the date of receipt by NCDOT and NCTA unless otherwise stipulated in the scope of work. During the review process, the NCTA may require that a submittal be revised and re-submitted. However, if all issues are not resolved upon review of the second submittal of a particular plan submittal, the Design-Build Team may request a meeting with the NCTA Project Manager, or the NCTA will engage the Design-Build Team Project Manager to assist in the expeditious resolution of the remaining issues surrounding that submittal.

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 concurrently to the NCTA Project Manager, the NCTA Chief Engineer and the NCDOT Director of Transportation Program Management. The NCTA or NCDOT will not accept subsequent submittals until prior submittal reviews have been completed for that item. The Design-Build Team shall inform the NCTA Chief Engineer and the NCDOT Director of

Transportation Program Management in writing of any proposed changes to the NCTA and/or 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 concurrently. All submittals shall include pertinent Special Provisions. No work shall be performed prior to North Carolina Turnpike Authority, FHWA and NCDOT review of the design submittals.

No review, approval, suggestion, or comment of NCDOT, FHWA or NCTA with respect to any design submittal shall diminish, reduce, mitigate, or waive the Design-Build Team's responsibility and liability for the design or design submittal.

All designs shall be in Microstation format using Geopak software (current version used by the NCDOT). Geopak drainage shall be required.

The Design-Build Team shall certify all plans, specifications, estimates and engineering data furnished by the Team.

The review of design plans by the NCTA 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 NCTA accepts the details of the Technical Proposal submitted by the Design-Build Team.

## DESIGN QUALITY CONTROL PLAN

The Design-Build Team shall submit for NCTA approval a quality control plan for design which is to ensure quality of all design elements. The following shall be addressed in the quality control plan:

### General

The Design-Build Team shall provide specific detail on the following:

- Design Quality Control process to include policy, procedures and specific roles
- How this quality control program promotes improved quality in the future design and submittals
- Qualifications for all key design personnel.
- Program administration; Level, frequency, and methods of review
- Methods by which all final design documents will be independently reviewed; verified for constructability, completeness, clarity, and accuracy; and back-checked
- Individual(s) accountable for each section of the program
- Responsibility for preparing and checking the plans, drawings, specifications, estimated, calculations, computer application input data, notes, and other submittal items.
- Review requirements, design standards, and design criteria
- How markups will be handled and resolved

- Internal design conflict resolution
- Who has authority to stop design work or elevate an issue
- Who will be certifying all plans, specifications, estimates, and engineering data that is furnished
- Quality Control process for specialty items
    - Reviewed in house and with what expertise
    - Responsible party for this review
    - Process for incorporation into other elements of the design
    - Documentation in the submittal process
- Handling of multiple reviewers / calculations for different aspects
- Third-party (sub-consultant, supplier, etc.) review requirements and prime consultant's role in the review of sub-consultant's work.
- Quality Control requirements of sub-consultant and/or prime prior to the prime certifying the deliverables to NCTA/NCDOT. Documentation and submission procedures to ensure that the established design Quality Assurance/Quality Control procedures have been followed.
- Quality Control of sub-consultant with no in house quality review (e.g. one noise analysis person in the firm)
- Internal process utilized for the certification of the deliverable prior to submittal
- Incorporation of Quality Control design process as a metric responsibility of all personnel involved and a measure of performance
- Environmental/ permit compliance review of each submittal to include sign off and handing of conflicts
- Railroad and utility permitting
- Connection between design, construction and warranty

<u>Plans</u>

- Establishment and maintenance process for plan/ shop drawings/ submittals management and process for handling:
    - Issued drawings and design computations
    - Comments received by the NCTA/NCDOT
    - Disposition of comments
    - Revisions
    - Superseded drawings
    - RFC Plans
    - Sub-consultant documents
    - File structure and security
    - Drafting standards
    - Specific NCTA and discipline specific checklist that will be used
- Establishment and maintenance process for design calculation management and process for handling:
    - Calculation information linked to project: project title, calculation subject, consecutive page numbers, calculation date, check date

- Calculations show full last name of originator and check
- Summary of calculation and assumption(s) used
- References
- Backup materials appropriately labeled and referenced
- Documentation of assumptions used for computer applications with hardcopies signed
- Revisions
- Superseded calculations
- File structure and security

Audit

The Design-Build Team shall provide specific detail on the following:

- Who conducts the project audits, a team is preferred
- Audit team qualifications
- The scope of project audits, to include:
  - percentage of the design, calculations, computer input assumptions, and design details reviewed
  - Incorporation of past audit findings
- The level and frequency of the design audits
- Who will be invited to participate in the audits
- How findings will be disseminated
- Process utilized if corrective action is necessary,
- Time frames required for corrective action to occur,
- When follow-up audits should occur
- How audit information will be shared with team members and NCTA
- How the information discovered during audits will be incorporated into the design process for continuous quality improvement

The Design-Build Team shall certify each submittal stating that the processes and procedures identified in the Design Quality Control Plan have been performed.

## PROJECT MANAGEMENT INTERNET COMMUNICATION REQUIREMENTS

The Internet/Web-based project collaboration software package Constructware®, provided by NCTA and developed by Autodesk, shall be used to manage and track this project. As a requirement of this project, the Design-Build Team shall use Constructware® on this project to facilitate design reviews, transmittals, and RFIs; to store and retain project files, design, plans, test results and all other plan documents; and to communicate collaboratively among project members. The Design-Build Team shall enter and maintain all project related documents in Constructware®. The Engineer, on a case-by-case basis, may approve distribution of document and files in the traditional manner, outside Constructware®.

The North Carolina Turnpike Authority will provide the Constructware® software and temporary licenses to use the project database for the duration of the project.

All other costs associated with using this system, including computer hardware, and Internet service, are the responsibility of Design-Build Team.

Use of Constructware® will not replace or alter any contractual responsibilities of the Design-Build Team set forth in the Contract Documents or within the NCDOT Standard Specifications for Roads and Structures.

Design-Build Team members must have access during normal business operations to the Internet and an Internet e-mail address in order to utilize Constructware®.

The NCTA will provide key personnel training on the use of the Constructware® project collaboration system. The Design-Build Team will then disseminate this training information such that necessary personnel are proficient in the use of Constructware®.

The Design-Build Team shall provide an adequate number of users to manage the project utilizing the modules contained within Constructware®, the NCTA project collaboration system.

The Design-Build Team shall prepare minutes within seven calendar days for all project meetings that they attend utilizing the Constructware® Meeting Module. The uploading of minutes prepared outside of Constructware® is not acceptable.

More information on Constructware® is available via the World Wide Web, at www.autodesk.com/Constructware®.

**DESIGN, CONSTRUCTION & CEI WORK PERFORMED BY DESIGN-BUILD TEAM**

The Design-Build Team shall acknowledge that Provided Materials furnished by the NCTA and/or NCDOT 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 NCTA and NCDOT harmless and shall be fully liable for any additional costs and all claims against the NCTA and NCDOT 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 NCTA, except that the Design-Build Team may, with prior notification of such action to the NCTA, sublet property searches and related services without further approval of the NCTA.

All work by the Design-Build Team shall be performed in a manner satisfactory to the NCTA and in accordance with the established customs, practices, and procedures of the NCDOT and NCTA, 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 North Carolina Turnpike

Authority shall control in all questions regarding location, type of design, dimension of design, and similar questions.

Alternate designs, details, or construction practices (such as those employed by other states, but not standard practice in NC) are subject to North Carolina Turnpike Authority review and will be evaluated on a case by case basis.

**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 North Carolina Turnpike Authority's and NCDOT's ethics policies. 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 consideration on future NCTA projects and/or in the recommendation to the NCDOT that the Company be removed from the NCDOT's appropriate prequalified list.

**APPROVAL OF PERSONNEL**

The Department will have the right to approve or reject for cause any personnel assigned to a project by the Design-Build Team.

The Design-Build Team or any subcontractor for the Design-Build Team which are employed to provide services for this project shall not discuss employment opportunities or engage the services of any person or persons, now in the employment of the NCTA or NCDOT during the time of this contract, without written consent of the NCTA or NCDOT, as applicable.

In the event of engagement, 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 NCTA or NCDOT. 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 scope of the contract
Selection of the Design-Build Team
Negotiation of the cost of the contract (including calculating manhours or fees); and
Administration of the contract

An exception to these terms may be granted when recommended by the NCTA Executive Director or Secretary of Transportation, as applicable, and approved by the NCTA Board of Directors or NCDOT Board of Transportation, as applicable.

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.

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. 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 NCTA Design-Build Projects.

## PROJECT SAFETY PLAN

The Design-Build Team shall establish and submit to NCTA a project specific safety plan, which provides a safe and healthful environment for all construction personnel, proper maintenance of traffic and safety of the traveling public through the work zone. Identify, within the safety plan, the requirements for all subcontractors.

At minimum, the safety plan should detail the following:

- Safety Officer with contact information
- List of employees with OSHA or safety related certifications
- Individual/s responsible for monitoring and enforcing safe conditions on daily basis
- Employee safety orientation program
- Annual, monthly, weekly or daily safety meetings
- Safety training initiatives
- Safety standards and measurements
- Safety procedures to address the NCTA's four emphasis areas: fall protection, crane safety, back-up alarms and trenching/shoring.
- Required personal protective gear
- Procedures in place for communication of unsafe acts and/or safety improvements
- Accountability process to include incident investigation procedures
- Safety assessment procedures for subcontractors performing work

In addition to the above company policies, provide safety procedures specific to the project work zone and daily project operations such as:

- Identification of ingress and egress from work areas
- Lane closure installation and maintenance
- Night time work plan to include lighting requirements
- Critical lift procedures
- Confined space entry

The Design-Build Team shall also include a plan with established procedures to react to potential security or emergency situations within the project limits.

**OVERHEAD SIGN SUPPORTS**
(5-05-10) DB11 R012

## Description

Design, fabricate, furnish and erect various types of overhead sign assemblies. The types of overhead sign assemblies included in this specification are span structures, cantilever structures and sign structures attached to bridges.

## Materials

Structural Steel……...…….…….Section 1072
Overhead Structures…….Section 1096
Signing Materials…….……Section 1092
Organic Zinc Repair Paint ……Article 1080-9
Reinforcing Steel …….Section 1070

## Construction Methods

### A. General

Fabricate overhead sign assemblies in accordance with the details shown in the approved working drawings and the requirements of these specifications.

No welding, cutting or drilling in any manner shall be permitted in the field, unless prior approval by the Engineer is obtained.

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 shall not be permitted.

Erect sign panels in accordance with the requirements for Type A or B signs as indicated in the plans or Roadway Standard Drawings. Field drill two holes per connection in the Z bars for attaching signs to overhead structures. Use two bolts at each connection.

Use two coats of a zinc-rich paint to touch up minor scars on all galvanized materials.

### B. Shop Drawings

Design the overhead sign supports, including foundations, prior to fabrication. Submit computations and working drawings of the designs to the Engineer for review and acceptance.

Have a professional engineer registered in the State of North Carolina perform the computations and render a set of sealed, signed and dated drawings detailing the construction of each structure.

Submit to the Engineer for review and acceptance complete design and fabrication details for each overhead sign assembly, including foundations and brackets for supporting the signs and maintenance walkways. Base design upon the revised structure line drawings, wind load area and the wind speed shown in the plans, and in accordance with the *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*.

Submit thirteen (13) copies of completely detailed working drawings and one (1) copy of the design computations including all design assumptions for each overhead sign assembly to the Engineer for approval prior to fabrication. Working drawings shall include complete design and fabrication details (including foundations); provisions for attaching signs, maintenance walkways (when applicable), applicable material specifications, and any other information necessary for procuring and replacing any part of the complete overhead sign assembly.

Allow 15 days for initial working drawing review after the Engineer receives them. If revisions to working drawings are required, an additional 15 days shall be required for review and approval of the final working drawings.

Approval of working drawings by the Engineer shall not relieve the Design-Build Team of responsibility for the correctness of the drawings, or for the fit of all shop and field connections and anchors.

## C. Design and Fabrication

The following criteria governs the design of overhead sign assemblies:

Design shall be in accordance with the *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 4th Edition, 2001*, and the latest Interim Specifications.

Within this Specification, there are several design criteria that are owner specified. They include:

- The wind pressure map that is developed from the 3-second gust speeds, as provided in Article 3.8, shall be used.

- Overhead cantilever sign structures shall include galloping loads (exclude four-chord horizontal trusses), truck-induced gust loading and natural wind gust loading in the fatigue design, as provided for in Article 11.7.1, 11.7.4 and 11.7.3 respectively.

- The natural wind gust speed in North Carolina shall be assumed to be 11.6 mph for inland areas, and 15.7 mph for coastal areas. The coastal area shall be defined as any area within 2 miles from the waterfront facing the ocean or sound and all area where the design basic wind speed is above 120 mph, as shown in Figure 3-2.

- The fatigue importance category used in the design, for each type of structure, as provided for in Article 11.6, Fatigue Importance Factors, shall be Category II unless otherwise shown on the contract plans.

The following Specification interpretations or criteria shall be used in the design of overhead sign assemblies:

- For design of supporting upright posts or columns, the effective length factor for columns "K", as provided for in Appendix B, Section B.5, shall be taken as the following, unless otherwise approved by the Engineer:

  Case 1 For a single upright post of cantilever or span type overhead sign structure, the effective column length factor, "K", shall be taken as 2.0.

  Case 2 For twin post truss-type upright post with the post connected to one chord of a horizontal truss, the effective column length factor for that column shall be taken as 2.0.

  Case 3 For twin post truss-type upright post with the post connected to two truss chords of a horizontal tri-chord or box truss, the effective column length factor for that column shall be taken as 1.65

- For twin post truss-type upright post, the unbraced length shall be from the chord to post connection to the top of base plate.

- For twin post truss-type upright post, that is subject to axial compression, bending moment, shear, and torsion the post shall satisfy <u>*Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals*</u> Equations 5-17, 5-18 and 5-19. To reduce the effects of secondary bending, in lieu of Equation 5-18, the following equation may be used:

$$\frac{f_a}{F_a} + \frac{f_b}{\left(1 - \frac{0.6f_a}{F_é}\right)F_b} + \left(\frac{f_v}{F_v}\right)^2 \leq 1.0$$

Where fa = Computed axial compression stress at base of post

- The base plate thickness for all uprights and poles shall be a minimum of 2" but not less than that determined by the following criteria and design.

  Case 1 Circular or rectangular solid base plates with the upright pole welded to the top surface of base plate with full penetration butt weld, and where no stiffeners are provided. A base plate with a small center hole, which is less than 1/5 of the upright diameter, and located

concentrically with the upright pole, may be considered as a solid base plate.

The magnitude of bending moment in the base plate, induced by the anchoring force of each anchor bolt shall be, $M = (P \times D_1) / 2$.

Case 2 Circular or rectangular base plate with the upright pole socketed into and attached to the base plate with two lines of fillet weld, and where no stiffeners are provided, or any base plate with a center hole that is larger in diameter than 1/5 of the upright diameter
The magnitude of bending moment induced by the anchoring force of each anchor bolt shall be $M = P \times D_2$.

- *M* - *bending moment at the critical section of the base plate induced by one anchor bolt*

- *P* - *anchoring force of each anchor bolt*

- $D_1$ - *horizontal distance between the center of the anchor bolt and the outer face of the upright, or the difference between the radius of the bolt circle and the outside radius of the upright*

- $D_2$ - *horizontal distance between the face of the upright and the face of the anchor bolt nut*

- The critical section shall be located at the face of the anchor bolt and perpendicular to the radius of the bolt circle. The overlapped part of two adjacent critical sections shall be considered ineffective.

- The thickness of base plate of Case 1 shall not be less than that calculated based on formula for Case 2.

- Uprights, foundations, and trusses that support overhead signs shall be designed in accordance with the Overhead Sign Foundation Project Special Provision found elsewhere in this RFP for the effects of torsion. Torsion shall be considered from dead load eccentricity of these attachments, as well as for attachments such as walkways, supporting brackets, lights, etc., that add to the torsion in the assembly. Truss vertical and horizontal truss diagonals in particular and any other assembly members shall be appropriately sized for these loads.

- Uprights, foundations, and trusses that support overhead mounted signs shall be designed for the proposed sign wind area and future wind areas. The design shall consider the effect of torsion induced by the eccentric force location of the center of wind force above (or below) the center of the supporting truss. Truss vertical and horizontal truss diagonals in particular and any other assembly members shall be appropriately sized for these loads.

Fabricate all overhead sign assemblies, including but not limited to foundations, in accordance with the details shown on the approved shop drawings and with the requirements of these Specifications.

Fabricate the span and cantilever supporting structures using tubular members of either aluminum or steel, using only one type of material throughout the project. Sign support structures that are to be attached to bridges shall be fabricated using other structural shapes.

Horizontal components of the supporting structures for overhead signs may be of a truss design or a design using singular (monotube) horizontal members to support the sign panels. Provide permanent camber in addition to dead load camber in accordance with the *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*. Indicate on the shop drawings the amount of camber provided and the method employed in the fabrication of the support to obtain the camber.

Use cantilever sign structures that meet the following design criteria:

a. Do not exceed an L / 150 vertical dead load deflection at the end of the arm due to distortions in the arm and vertical support, where L is the length of the arm from the center of the vertical support to the outer edge of the sign.

b. Do not exceed an L / 40 horizontal deflection at the end of the arm due to distortions in the arm and vertical support, as a result of design wind load.

Attach the overhead sign assemblies to concrete foundations by the use of galvanized anchor bolts with galvanized nuts, flat washers, and lock washers. For cantilever structure use a minimum of eight anchor bolts. Provide anchor bolts that have an anchor plate with nut at the end to be embedded in concrete.

Fabricate attachment assemblies for mounting signs in a manner that allows easy removal of sign panels for repair.

**Anchor Rod Assembly**

Attach the overhead sign structure to concrete foundations by the use of straight galvanized anchor bolts with galvanized heavy hex nuts and flat washers. The rods and nuts shall be galvanized in accordance with AASHTO M232. The washers shall be galvanized in accordance with AASHTO M298 Class C. For cantilever structures, use a minimum of eight anchor rods. Provide anchor rods that have an anchor plate with nut at the end to be embedded in concrete.

Ensure material used in steel anchor rods conforms to AASHTO M 314 or ASTM F1554, and the specified yield strength does not exceed 55,000 psi. Compute the required projection of the anchor rod above the foundation top. Compute the total projection based on the following:

- Provide between 3 and 5 threads of anchor rod projection above the top nut after tightening is complete. Avoid any additional projection, or a normal depth socket torque wrench shall not be used on top nuts.

- Include the sum of the thickness of top nut, top nut flat washer or top nut beveled washers, base plate, leveling nut flat washer or leveling nut beveled washers, leveling nut.

- Set the maximum distance between the bottom of the leveling nut and the foundation top to one nut height to avoid excessive bending stresses in the anchor rod under service conditions.

- Do not use lock washers.

**Anchor Rod Nut Tightening Requirements**

**Prior to installation:**

1. Protect the anchor rod threads from damage prior to and during installation.

2. Prior to installation of the rods in the foundation, turn nuts onto and off the rods, well past the elevation of the bottom of the leveling nuts. Turn by the effort of one worker using an ordinary wrench without a cheater bar. Report to the Engineer thread damage requiring unusually large effort.

**During installation:**

1. Place leveling nuts (bottom nuts) on the anchor rod.

2. Place leveling nut washers on top of the anchor rod leveling nuts.

3. Place a rigid template on top of the leveling nuts to check the level of the nuts. If the anchor nut and washer cannot be brought into firm contact with the template, then beveled washers shall be used.

4. Verify that the distance between the bottom of the leveling nut and the top of the concrete foundation is no more than one anchor rod diameter. If an upright is required to be back-raked, then the distance between the bottom of the leveling nut and the top of the concrete foundation shall be no more than one anchor rod diameter, averaged over the anchor rod group.

5. Place the base plate and structural element to which it is attached. However, do not attach to the upright element, during tightening of the anchor nuts, cantilever beams or arms with span in excess of 10 feet. Luminaire arms and fixtures may be attached prior to standing the pole on the foundation.
6. Place top nut washers.

7. Do <u>not</u> use lock washers.

8. Lubricate threads and bearing surfaces of top nuts. Lubricant shall be beeswax, stick paraffin, or other lubricant approved by the Engineer.

9. Place top nuts. If the anchor nut and washer cannot be brought into firm contact with the base plate, then beveled washers shall be used.

10. Tighten top nuts to snug-tight. A snug-tight condition is defined as the washer and nut being in full contact with the base plate, and the application of the full effort of a workman on a 12-inch wrench. Turn top nuts in increments following a star pattern (using at least two full tightening cycles).

11. To ensure proper pretensioning, after all top nuts have been brought to snug-tight condition, repeat the procedure on the leveling nuts. Turn leveling nuts in increments following a star pattern (using at least two full tightening cycles).

12. At this point, verify if beveled washers are required. Beveled washers shall be required under the leveling nut or top nut if any face of the base plate has a slope greater than 1:20 and / or any nut can not be brought into firm contact with the base plate.

13. Before further nut turning, mark the reference position of the nut in the snug-tight condition with a suitable marking (ink or paint that is not water-soluble). Mark on the corner at the intersection of two flats with a corresponding reference mark on the base plate at each nut. After tightening, verify the nut rotation.

14. Achieve pretensioning by turn-of-nut method. Turn the top nuts to 1/6 of a turn. Do so in a star pattern using at least two full-tightening cycles.

15. After installation, ensure that firm contact exists between the anchor rod nuts, washers, and base plate on any anchor rod installed.

16. For overhead sign assemblies: The span type truss or the cantilever truss may be placed on the uprights or attached to the upright at this time. For signal support structures: The span wires or mast arms may be attached to the upright at this time.

17. After a period of no less than 4 days, and no more than 2 weeks, and in the presence of the Engineer, use a torque wrench to verify that a torque at least equal to 600 foot-pounds is provided on each top nut. For cantilever structures, verify the torque after erection of the remainder of the structure and any heavy attachments to the structure.

18. If any top nut torque reveals less than 600 foot-pounds of effort is required to move the nut, then tighten the nut to no less than 600 foot-pounds.

19. The Design-Build Team shall calibrate the torque indicator, and obtain corresponding certification, for all torque wrenches used for anchor nut tightening. The calibration and certification shall have occurred no more than 12 months prior to use of the

torque wrench. Torque wrenches that were calibrated and certified more than twelve months prior to anchor nut tightening shall be re-calibrated and re-certified prior to use. Provide the Engineer a certification of such calibration.

20. Because inspection or re-tightening of the leveling nuts would be prevented, and to reduce moisture retention and associated corrosion, grout shall not be allowed under the base plate.

## OVERHEAD SIGN FOUNDATIONS

(5-14-09) DB11 R013

### Description

The work covered by this project special provision consists of the design and construction of overhead sign foundations in accordance with the submitted approved plans and this provision. Design and construct either spread footing type foundations and/or drilled pier type foundations for each overhead sign unless otherwise directed by the Engineer.

### Materials

Portland Cement Concrete Production and Delivery...…….....……....Section 1000
Reinforcing Steel ...…….Section 1070
Anchor Bolts ...…….Article 1072-6
Structural Steel and Overhead Sign Structures ……..Section 1072 and 1096

### Construction Methods

### A) General

A North Carolina Licensed Professional Engineer shall seal all design calculations, drawings and recommendations. Design foundations for the effects of dead, wind and ice loads in accordance with the wind zone load shown on the plans and Section 3 of the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signal*s (including interims). Use either spread footing or drilled pier foundations. In some instances, conflicts with drainage structures may dictate a certain type of foundation. Spread footings or dual drilled pier foundations shall be required for full span overhead signs (no single drilled pier foundations). When designing dual drilled pier foundations, a rectangular grade beam with a moment of inertia approximately equal to either of the drilled piers shall be required to connect the pier tops.

Provide reinforced concrete design in accordance with either Section 13.7.2 or 13.6.2 (whichever is applicable), allowable stress design method, of the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals* (including interims).

Consider sloping ground in the design, if applicable. Do not exceed an allowable bearing pressure of 3 ksf for spread footings. For drilled pier foundations, do not exceed an

allowable lateral soil pressure of 4 ksf for AASHTO Group II Loading. Use the following default soil parameters and groundwater elevation for foundation design in the absence of a site-specific subsurface investigation in accordance with this project special provision.

Total Unit Weight = 120 pcf
Friction Angle = 30 degrees
Cohesion = 0 psf

Assume the groundwater elevation is at a depth of 7 feet below the ground surface. If the groundwater is encountered at a depth shallower than 7 feet, the overhead sign foundation shall be redesigned based upon the actual field conditions. The default soil parameters and allowable pressures shall not apply to very soft or loose soil, muck (generally, SPT blow counts per foot less than 4), weathered rock or hard rock (generally, SPT refusal). If soft or loose soil, muck, weathered rock or hard rock conditions are present, a site-specific subsurface investigation and foundation design shall be required in accordance with this project special provision.

Design spread footings in accordance with Sections 4.4.1 through 4.4.10, allowable stress design method, of the *AASHTO Standard Specifications for Highway Bridges* (including interims). Restrict uplift due to the eccentricity of the loading to one corner of the footing and the tension area shall not exceed 25% of the total bearing area of the spread footing.

Design drilled piers in accordance with Sections 4.6.1 through 4.6.5, allowable stress design method, of the *AASHTO Standard Specifications for Highway Bridges* (including interims). If drilled piers are designed for skin friction only, increase the required length of each drilled pier a minimum of 6 inches to allow for sediment. If drilled piers are designed for end bearing, no additional length is required; however, the drilled piers shall be subject to the cleanliness requirements in Bottom Cleanliness under "Drilled Pier Construction:" below. Clearly state on the plans whether end bearing was accounted for in the foundation design.

Calculate expected vertical, lateral and torsional movements for single drilled pier foundations. Provide drilled pier foundations 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. Also, use a factor of safety of 2.0 for lateral and torsion failure. Preliminary design methods described in Section 13.6.1.1 of the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals* (including interims) shall be used to incorporate a factor of safety in foundation design for lateral failure. Wings shall be required to increase torsion resistance for cantilever signs supported by a single drilled pier.

If a site-specific subsurface investigation is performed, use only an NCDOT Highway Design Branch Pre-Qualified Geotechnical Engineering Firm to provide a site specific foundation design.

**B) Subsurface Investigation**

The Design-Build Team may elect to conduct a site specific subsurface investigation at each proposed overhead sign foundation location in lieu of using the default soil parameters and allowable pressures referenced above. In this case, and subject to the requirements below, perform a boring at each overhead sign foundation location and provide boring data on an NCDOT Standard Boring Log form. Download this form from the NCDOT site at

http://www.ncdot.org/doh/preconstruct/highway/geotech/contractserv/investigation/Documents/BoringLogs.zip.

A licensed geologist or a professional engineer registered in the State of North Carolina and employed by an NCDOT Highway Design Branch pre-qualified Geotechnical Engineering Firm shall seal each boring log report. Use only an NCDOT Highway Design Branch pre-qualified Geotechnical Engineering Firm to conduct the subsurface investigation. Perform the investigation only after rough grade (within 3 feet of final grade) is achieved. Locate each boring within 3 feet of the center of the overhead sign foundation. Drill the boring to a minimum depth of 10 feet below the required spread footing bearing or drilled pier tip elevation, whichever is deeper. Conduct Standard Penetrating Tests at 1 foot, 2.5 feet, 5 feet, 7.5 feet, 10 feet and every 5 feet after 10 feet below the rough grade in accordance with ASTM D-1586. A boring may be terminated above the minimum depth required (10 feet below the foundation elevation) if one of the following conditions occur: (a) a total of 100 blows have been applied in any 2 consecutive 6-inch intervals; (b) a total of 50 blows have been applied with less than 3 inches of penetration.

**C) Foundation Construction**

Excavate footings for overhead sign structures in accordance with the applicable provisions of Section 410 of the 2006 *Standard Specifications for Roads and Structures*. Construct footings for overhead sign structures in accordance with Section 825 of the 2006 *Standard Specifications for Roads and Structures*. Construct all footings with Class A concrete. Where rectangular forms are used, use forms that have a chamfer strip at all corners for at least that distance protruding above finished ground. Use chamfers, which measure one-inch along the diagonal face.

Securely brace anchor bolts positioned in the form and hold in proper position and alignment. Provide a rubbed finish on concrete surfaces to be exposed above finished ground in accordance with Section 825-6 (D) of the 2006 *Standard Specifications for Roads and Structures*. Do not erect overhead sign structures on foundations until the concrete has reached a minimum compressive strength of 3000 psi. Determine concrete compressive strength by nondestructive test methods or compressive strength tests made in accordance with AASHTO T22 and T23. Furnish equipment used for nondestructive tests and obtain Engineer's approval prior to performing the tests.

## D) Drilled Pier Construction

### Excavation

Perform excavations for drilled piers to the required dimensions and lengths including all miscellaneous grading and excavation necessary to install the drilled pier. Depending on the subsurface conditions encountered excavation in hard rock, weathered rock or removal of boulders and debris may be required.

Dispose of drilling spoils as directed by the Engineer and in accordance with Section 802 of the 2006 *Standard Specifications for Roads and Structures*. Drilling spoils consist of all material excavated including water or slurry removed from the excavation either by pumping or with augers.

Construct drilled piers within the tolerances specified herein. If tolerances are exceeded, provide additional construction as approved by the Engineer to bring the piers within the tolerances specified. Construct drilled piers such that the axis at the top of the piers is no more than 3 inches in any direction from the specified position. Build drilled piers within 1% of the plumb deviation for the total length of the piers. When a grade beam is not required at the top of a pier, locate the top of pier elevation between 18 inches above and 6 inches above the finished grade elevation. Form the top of the pier such that the concrete is smooth and level.

If unstable, caving or sloughing soils are anticipated or encountered, stabilize drilled pier excavations with steel casing and / or polymer slurry. Steel casing may be either the sectional type or one continuous corrugated or non-corrugated piece. All 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 specified pier size and a minimum wall thickness of 1/4 inch. Extract all temporary casings during concrete placement in accordance with this project special provision unless the Design-Build Team chooses to leave the casing in place in accordance with the requirements below.

Any steel casing left in place will be considered permanent casing. When installing permanent casing do not drill or excavate below the tip of the permanent casing at any time such that the permanent casing is against undisturbed soil. The Design-Build Team may excavate a hole with a minimum diameter of 12 inches smaller than the specified size of the pier in order to facilitate permanent casing installation provided the sides of the excavation do not slough during drilling such that the hole diameter becomes larger than the inside diameter of the casing. Permanent steel casings shall only be allowed for full span overhead signs as approved by the Engineer and prohibited for cantilever overhead signs. No additional compensation will be paid for permanent casing.

If the Design-Build Team elects to use polymer slurry to stabilize the excavation, use one of the polymers listed in the table below:

| PRODUCT | MANUFACTURER |
|---|---|
| SlurryPro EXL | KB Technologies Ltd<br>3648 FM 1960 West<br>Suite 107<br>Houston, TX 77068<br>(800) 525-5237 |
| Super Mud | PDS Company<br>105 West Sharp Street<br>El Dorado, AR 71730<br>(800) 243-7455 |
| Shore Pac GCV | CETCO Drilling Products Group<br>1500 West Shure Drive<br>Arlington Heights, IL 60004<br>(800) 527-9948 |

Use slurry in accordance with the manufacturer's guidelines and recommendations unless approved otherwise by the Engineer. The Design-Build Team should be aware that polymer slurry might not be appropriate for a given site. Polymer slurry shall not be used for excavations in very soft or loose soils. If the excavation can not be stabilized with polymer slurry, the Engineer may require a site-specific subsurface investigation (if not done during design) and the use of steel casing. No additional time or compensation will be provided if steel casing and / or polymer slurry are required to stabilize the excavation.

Construct all drilled piers such that the piers are cast against undisturbed soil. If a larger casing and drilled pier are required as a result of unstable or caving material during drilling, backfill the excavation before removing the casing to be replaced. No additional time or compensation will be provided for substituting a larger diameter drilled pier in order to construct a drilled pier cast against undisturbed soil.

Any temporary steel casing that becomes bound or fouled during pier construction and cannot be practically removed may constitute a defect in the drilled pier. Improve such defective piers to the satisfaction of the Engineer by removing the concrete and enlarging the drilled pier, providing a replacement pier or other approved means. All corrective measures including redesign as a result of defective piers shall not be cause for any claims or requests for additional time or compensation.

**Bottom Cleanliness**

If the plans indicate end bearing was used in the design, after a drilled pier excavation is complete, and immediately before concrete placement, demonstrate acceptable bottom cleanliness of the drilled pier excavation to the Engineer for

approval. Provide any equipment, personnel and assistance required for the Engineer to inspect the drilled pier excavation. The pier excavation bottom shall be considered clean if no portion of the bottom area has more than 3 inches of sediment as determined by the Engineer.

**Reinforcing Steel**

Completely assemble a cage of reinforcing steel consisting of longitudinal and spiral bars and place cage in the drilled pier excavation as a unit immediately upon completion of drilling unless the excavation is entirely cased. If the drilled pier excavation is entirely cased down to the tip, immediate placement of the reinforcing steel and the concrete is not required.

Lift the cage so racking and cage distortion does not occur. Keep the cage plumb during concrete placement operations and casing extraction. Check the position of the cage before and after placing the concrete.

Securely crosstie the vertical and spiral reinforcement at each intersection with double wire. Support or hold down the cage so that the vertical displacement during concrete placement and casing extraction does not exceed 2 inches.

Do not set the cage on the bottom of the drilled pier excavation. Place plastic bolsters under each vertical reinforcing bar that are tall enough to raise the rebar cage off the bottom of the drilled pier excavation a minimum of 3 inches.

In order to ensure a minimum of 3 inches of concrete cover and achieve concentric spacing of the cage within the pier, tie plastic spacer wheels at five points around the cage perimeter. Use spacer wheels that provide a minimum of 3 inches "blocking" from the outside face of the spiral bars to the outermost surface of the drilled pier. Tie spacer wheels that snap together with wire and allow them to rotate. Use spacer wheels that span at least two adjacent vertical bars. Start placing spacer wheels at the bottom of the cage and continue up along its length at maximum 10-foot intervals. Supply additional peripheral spacer wheels at closer intervals as necessary or as directed by the Engineer.

**Concrete**

Begin concrete placement immediately after inserting reinforcing steel into the drilled pier excavation.

a. Concrete Mix

Provide the mix design for drilled pier concrete for approval and, except as modified herein, meeting the requirements of Section 1000 of the 2006 *Standard Specifications for Roads and Structures*.

Designate the concrete as Drilled Pier Concrete with a minimum compressive strength of 4500 psi at 28 days. The Design-Build Team may use a high early strength mix design as approved by the Engineer. Make certain the cementitious material content complies with one of the following options:

- Provide a minimum cement content of 640 lbs / $yd^3$ and a maximum cement content of 800 lbs / $yd^3$; however, if the alkali content of the cement exceeds 0.4%, reduce the cement content by 20% and replace it with fly ash at the rate of 1.2 LB of fly ash per LB of cement removed.

- If Type IP blended cement is used, use a minimum of 665 lbs / $yd^3$ Type IP blended cement and a maximum of 833 lbs / $yd^3$ Type IP blended cement in the mix.

Limit the water-cementitious material ratio to a maximum of 0.45. Do not air-entrain drilled pier concrete.

Produce a workable mix so that vibrating or prodding is not required to consolidate the concrete. When placing the concrete, make certain the slump is between 5 and 7 inches for dry placement of concrete or 7 and 9 inches for wet placement of concrete.

Use Type I or Type II cement or Type IP blended cement and either No. 67 or No. 78M coarse aggregate in the mix. Use an NCDOT approved water-reducer, water-reducing retarder, high-range water-reducer or high-range water-reducing retarder to facilitate placement of the concrete, if necessary. Do not use a stabilizing admixture as a retarder in Drilled Pier Concrete without prior approval of the Engineer. Use admixtures that satisfy AASHTO M194 and add admixtures at the concrete plant when the mixing water is introduced into the concrete. Redosing of admixtures shall not be permitted.

Place the concrete within 2 hours after introducing the mixing water. Ensure that the concrete temperature at the time of placement is 90 F or less.

b. Concrete Placement

Place concrete such that the drilled pier is a monolithic structure. Temporary casing may be completely removed and concrete placement may be temporarily suspended when the concrete level is within 42 to 48 inches of the ground elevation to allow for placement of anchor bolts and construction of grade beam or wings. Do not pause concrete placement if unstable caving soils are present at the ground surface. Remove any water or slurry above the concrete and clean the concrete surface of all scum and sediment to expose clean, uncontaminated concrete before inserting the anchor bolts and conduit. Resume concrete pouring within 2 hours.

Do not dewater any drilled pier excavations unless the Engineer approves the dewatering and the excavation is entirely cased down to tip. Do not begin to remove the temporary casing until the level of concrete within the casing is in excess of 10 feet above the bottom of the casing being removed. Maintain the concrete level at least 10 feet above the bottom of casing throughout the entire casing extraction operation except when concrete is near the top of the drilled pier elevation. Maintain a sufficient head of concrete above the bottom of casing to overcome outside soil and water pressure. As the temporary casing is withdrawn, exercise care in maintaining an adequate level of concrete within the casing so that fluid trapped behind the casing is displaced upward and discharged at the ground surface without contaminating or displacing the drilled pier concrete. Exerting downward pressure, hammering or vibrating the temporary casing is permitted to facilitate extraction.

Keep a record of the volume of concrete placed in each drilled pier excavation and make it available to the Engineer.

After all the pumps have been removed from the excavation, the water inflow rate determines the concrete placement procedure. If the inflow rate is less than 6 inches per half-hour, the concrete placement shall be considered dry. If the water inflow rate is greater than 6 inches per half-hour, the concrete placement shall be considered wet.

- Dry Placement: Before placing concrete, make certain the drilled pier excavation is dry so the flow of concrete completely around the reinforcing steel can be certified by visual inspection. Place the concrete by free fall with a central drop method where the concrete is chuted directly down the center of the excavation.

- Wet Placement: Maintain a static water or slurry level in the excavation before placing concrete. Place concrete with a tremie or a pump in accordance with the applicable parts of Sections 420-4 and 420-5 of the 2006 *Standard Specifications for Roads and Structures*. Use a tremie tube or pump pipe made of steel with watertight joints. Passing concrete through a hopper at the tube end or through side openings as the tremie is retrieved during concrete placement is permitted. Use a discharge control to prevent concrete contamination when the tremie tube or pump pipe is initially placed in the excavation. Extend the tremie tube or pump pipe into the concrete a minimum of 5 feet at all times except when the concrete is initially introduced into the pier excavation. If the tremie tube or pump pipe pulls out of the concrete for any reason after the initial concrete is placed, restart concrete placement with a steel capped tremie tube or pump pipe.

Once the concrete in the excavation reaches the same elevation as the static water level, placing concrete with the dry method is permitted. Before

changing to the dry method of concrete placement, remove any water or slurry above the concrete and clean the concrete surface of all scum and sediment to expose clean, uncontaminated concrete.

Vibration shall only be permitted, if needed, in the top 10 feet of the drilled pier or as approved by the Engineer. Remove any contaminated concrete from the top of the drilled pier and wasted concrete from the area surrounding the drilled pier upon completion.

c. Concrete Placement Time

Place concrete within the time frames specified in Table 1000-2 of the 2006 *Standard Specifications for Roads and Structures* for Class AA concrete except as noted herein. Do not place concrete so fast as to trap air, water, fluids, soil or any other deleterious materials in the vicinity of the reinforcing steel and the annular zone between the rebar cage and the excavation walls. Should a delay occur because of concrete delivery or other factors reduce the placement rate to maintain some movement of the concrete. No more than 45 minutes shall be allowed between placements.

**E) Scheduling and Restrictions**

If caving or sloughing occurs, no additional compensation will be provided for additional concrete to fill the resulting voids.

During the first 16 hours after a drilled pier has achieved its initial concrete set as determined by the Engineer, do not drill adjacent piers, do not install adjacent piles and do not allow any heavy construction equipment loads or “excessive” vibrations to occur at any point within a 20 foot radius of the drilled pier.

In the event that the procedures described herein are performed unsatisfactorily, the Engineer reserves the right to shut down the construction operations or reject the drilled piers. If the integrity of a drilled pier is in question, use core drilling, sonic or other NCDOT approved methods at no additional cost to the Department and under the direction of the Engineer. Dewater and backfill core drill holes with an approved high strength grout with a minimum compressive strength of 4500 psi. Propose remedial measures for any defective drilled piers and obtain approval of all proposals from the Engineer before implementation. No additional time or compensation will be provided for losses or damage due to remedial work or any investigation of drilled piers found defective or not in accordance with this project special provision or the plans.

**ROADWAY SCOPE OF WORK** (08-10-2010)

The Design-Build Team shall design and construct the project such that the functionality and capacity shown on the Functional Design Map dated March 30, 2010 distributed by the NCTA, is maintained or exceeded, except as otherwise noted herein. Modifications to the interchange configurations shown on the March 30, 2010 Functional Design Map that eliminate a ramp, including loops, and / or change a ramp type shall require an approved Formal Alternative Technical Concept. (Reference the Instructions to Proposers)

The design and construction of this project shall accommodate one additional median lane in each direction along the new location portion of the project corridor to the extent that items such as gantries and bridges and, to the greatest extent practicable, conduit and lighting, do not require relocation or replacement at the time that this future improvement is made. To the greatest extent practicable, drainage structures in the median shall be located to minimize horizontal adjustment to these drainage features during future widening. The Design-Build Team shall discuss in the Technical Proposal all conduit, lighting, and drainage that will require adjustment when the future median lanes are constructed. The Design-Build Team shall not waste any unsuitable materials in any areas of future widening.

**Project Details**

- Unless noted otherwise elsewhere in this scope of work, the Design-Build Team shalll design and construct a controlled access freeway facility from US 74 near I-485 to US 74 between the towns of Wingate and Marshville as shown on the March 30, 2010 Functional Design Map.

- For the approximately one-mile section of the mainline along existing US 74 on the west end of the project, the Design-Build Team shall design and construct a six-lane facility for US74 Bypass with ten-foot paved median shoulders, four-foot of which shall be full depth paved shoulder and six-foot of which shall be partial depth paved shoulder. Along this six-lane section, the Design-Build Team shall install double faced concrete barrier in accordance with Roadway Standard Drawing No. 854.02. The proposed frontage roads within this six-lane section shall be designed to minimize right of way impacts and be located adjacent to an elevated US 74 Bypass. Strong community preference includes the currently proposed elevated, wall-supported design. Therefore, the elevated sections of US 74 Bypass shall be supported by retaining walls and is a requirement of the RFP. Alternates to the wall concept will be entertained only through an ATC.

- For the mainline on new location, the Design-Build Team shall design and construct a four–lane facility with a 46-foot median. Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall design and construct the -L- Line, -Y- Lines, ramps, loops, auxiliary lanes, collector-distributors and cul-de-sacs providing the same or better access, widening and improvements shown on the March 30, 2010 Functional Design Map. Unless noted otherwise elsewhere in this RFP, the section of mainline on new location shall be designed and constructed to meet a 70-mph design speed for a rolling urban freeway. For the section of mainline on new location that ties to existing US 74, the

horizontal and vertical curvature immediately adjacent to existing US 74 only, shall be designed and constructed to meet a minimum 60-mph design speed for a rolling urban freeway. The Design-Build Team shall provide all design criteria in the Technical Proposal. The limits of -Y- Line and service road construction shall be of sufficient length to tie to existing facilities based upon the current NCDOT guidelines and standards.

- The design and construction of existing roadways not addressed in the *Final Year 2035 Build Traffic Operations Technical Memorandum* dated April 2009, as modified by the *Final Addendum to Year 2035 Build Traffic Operations Technical Memorandum,* shall be based upon the most recent AADT provided by the NCDOT projected by an annual growth factor of 3.6% per year to year 2035.

- Facilities that have more than one functional classification shall be designed and constructed to the functional classification with a higher movement hierarchy.

- The March 30, 2010 Functional Design Map was designed using the 2035 design year toll traffic forecasts. Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall incorporate the 2035 toll traffic analysis recommendations provided by NCTA in the design of the facility. All intersection turn lane lengths shall meet the current NCDOT standards where vehicle storage does not govern or the storage lengths shown in the *Final Year 2035 Build Traffic Operations Technical Memorandum* dated April 2009, as modified by the *Final Addendum to Year 2035 Build Traffic Operations Technical Memorandum* dated February 2010, whichever is greater. This determination shall be made by calculating the recommended treatment for turn lanes, incorporating the minimum deceleration lengths, as defined in the NCDOT Design Manual (Reference Section 9-1, Figure F-4A) and comparing the calculated values with the minimum turn lane lengths. The storage lengths noted in the aforementioned Technical Memorandum exclude the taper length.

- Excluding the US 601 interchange, the Design-Build Team may design and construct interim -Y- line facilities based on the 2025 toll traffic provided by the NCTA for the -Y- Lines from and including -Y116- eastward to the end of the project, provided the requirements noted below are met. The Department will not honor any requests for additional contract time or compensation for any efforts associated with the interim facilities, including but not limited to public involvement, additional design effort, additional construction effort and / or additional environmental agency coordination and approvals.

    - The Design-Build Team shall develop a traffic analysis, based on the aforementioned 2025 toll traffic, for all interim facilities that demonstrate the facility will operate satisfactorily.

    - All interim -Y- Line facilities must accommodate the ultimate design based on the 2035 toll traffic. For all interim -Y- Line facilities, the Design-Build Team shall prepare functional horizontal and vertical designs for the ultimate

facilities, based on 2035 traffic, and include associated right of way limits on the Right of Way Plans.

- All interim -Y- Line structures over the mainline must allow future widening, to one side only, to accommodate the ultimate design based on 2035 toll traffic.

- As defined in this RFP, when sidewalk and/or bicycle accommodations are required or are to be accommodated on a facility, the interim -Y- Line facilities shall include the required sidewalk, required sidewalk accommodations, and / or required bicycle accommodations.

- Structures on the mainline over -Y- Lines shall be long enough to accommodate the ultimate -Y- Line design based on 2035 toll traffic.

- All interim -Y- Line structures must accommodate the vertical clearances required for the ultimate widened facilities.

- The US 601 interchange design and construction shall be compatible with the design shown on the U-4024A (US 601) Public Hearing Map.

- Along the -L- Line, the Design-Build Team shall design and construct interchanges at US 74, Indian Trail-Fairview Road (SR 1520), Unionville-Indian Trail Road (SR 1367), Rocky River Road (SR 1514), US 601, NC 200 and Austin Chaney Road (SR 1758) as indicated on the March 30, 2010 Functional Design Map. The Design-Build Team shall design and construct an interchange at Forest Hills School Road (SR 1754), as indicated on the March 30, 2010 Functional Design Map; or design and construct roadways that provide the movements and capacity of the aforementioned interchange to and from existing US 74, west of the project, to the US 74 Bypass.

- Between Matthews Indian Trail Road and existing US 74, the Design Build Team shall design the four-lane divided facility depicted on the March 30, 2010 Functional Design Map and include the necessary right-of-way limits on the plans. The Design Build Team shall construct the two western lanes of McKee Road to provide two-lane, two-way traffic. To the extent practicable, items constructed shall accommodate the future expansion to the four-lane divided facility with minimal rework and / or throw away construction. The McKee Road northern design and construction terminus shall be located north of -Y111A-, at approximately Station 21+00 -Y111-.

- The Design-Build Team will not be required to design or construct Forest Hills School Road between Phifer Road (SR 1753) and existing US 74.

- Unless noted otherwise elsewhere in this RFP, along the -L- Line, the Design-Build Team shall design and construct 14-foot outside shoulders, 4-foot of which shall be full depth paved shoulder and 8-foot of which shall be partial depth paved shoulder. Excluding the six-lane section at the west end of the project, the Design-Build Team shall design and construct 6-foot median shoulders, 4-foot of which shall be full depth paved

shoulder along the -L- Line. (Reference the Pavement Management Scope of Work found elsewhere in this RFP). The Design-Build Team shall provide milled rumble strips along the -L- Line inside and outside paved shoulders, including acceleration, deceleration and auxiliary lanes and ramps to the back of the gore (12-foot width), in accordance with the July 2006 NCDOT *Roadway Standard Drawings*. (Reference the Pavement Management Scope of Work found elsewhere in this RFP)

- The Design-Build Team shall design and construct one-lane ramps that provide a minimum 16-foot lane width. The Design-Build Team shall design and construct two lane ramps that provide minimum 12-foot lanes. Unless noted otherwise elsewhere in this RFP, all ramps shall have 12-foot inside shoulders, four-foot of which shall be full depth paved shoulders. Unless noted otherwise elsewhere in this RFP, all ramps shall have 14-foot outside shoulders, four-foot of which shall be full depth paved shoulders. The Design-Build Team shall design and construct one-lane loops that adhere to Exhibit 3-51, *Design Widths of Pavements for Turning Roadways*, shown in AASHTO's *A Policy on Geometric Design of Highways and Streets* (2004) - Case II / Condition C. Unless noted otherwise elsewhere in this RFP, 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 10-foot berm. The minimum loop design shall be 30-mph with a minimum 230-foot radius.

- The exit loop angular offsets shown on the March 30, 2010 Functional Design Map at Indian Trail - Fairview Road (SR 1520), Rocky River Road (SR 1514), Austin Chaney Road (SR 1758) and Forest Hills School Road (SR 1754) may be eliminated.

- At the locations noted below, the Design-Build Team shall design and construct single exclusive turn lanes that accommodate a future second exclusive turn lane. As shown on the March 30, 2010 Functional Design Map, the Design-Build Team shall prepare functional horizontal and vertical designs for the future dual turn lanes and make a determination of the additional right of way required for the widening.

    - Frontage Road and McKee Road (future dual right turn lanes)
    - Monroe Connector / Bypass EB Loop at SR 1514 (Rocky River Road) (future dual left turn lanes)
    - Monroe Connector / Bypass EB Ramp at US 601 (future dual left turn lanes)
    - Monroe Connector / Bypass EB Ramp at NC 200 (future dual left and right turn lanes)

- With the exception of the Unionville – Indian Trail Road (SR 1367) and Forest Hills School Road (SR 1754) ramps, all ramps shall be designed and constructed to accommodate future loops with a minimum 230-foot radius.

- McIntyre Road connectivity to Austin-Cheney Road shall be maintained. As an option to locating McIntyre Road beneath the bridges over Meadows Branch, McIntyre Road may be re-aligned to utilize the existing NCDOT right of way to connect to Austin-Cheney Road.

- The travel lane width of one-lane collector-distributors shall be 16 feet.

- The Design-Build Team shall provide keyed in concrete monolithic channelization islands at all at-grade intersections with restricted movements.

- The Design-Build Team shall design and construct all lane drops from the outside edge of pavement.

- The Design-Build Team shall provide turn arounds on all roads that are dead-ended.

- Functional classifications that have a defined usable shoulder width shall have the appropriately wider overall shoulder width.

- The Monroe Connector/Bypass is a full control of access facility. The Design-Build Team must obtain NCTA approval of all deviations from the proposed control of access shown on the March 30, 2010 Functional Design Map. The Design-Build Team shall delineate the control of access on their Right of Way Plans for the NCTA and the Department's review and acceptance. The Design-Build Team shall be responsible for coordinating with, and obtaining approval from, the Engineer for the control of access fence placement. The Design-Build Team shall be responsible for the design and installation of the control of access fence in accordance with the Roadway Design Manual. The Design-Build Team shall install chain-link control of access fence in areas that will be adjacent to pedestrian traffic. The Design-Build Team shall install woven wire control of access fence at all other locations. (Reference the Aesthetic Design Guide dated July 2010)

- The Design-Build Team shall be responsible for designing and constructing service roads in accordance with the requirements below:

  - A service road study was conducted, the results of which were incorporated into the March 30, 2010 Functional Design Map. Excluding Service Roads SR 10, SR 11, SR 13 and SR 14, the Design-Build Team shall include the design and construction of all the service roads shown on March 30, 2010 Functional Design Map. To provide more economical access to landlocked parcels, the Design-Build Team may modify the alignments of the required service roads.

  - For Service Roads SR2A, SR2B, SR2C, SR7 and SR8, the Design-Build Team shall include lump sum costs for the design and construction as a single activity for each service road in their cost-loaded CPM. If during the right of way acquisition process, it is determined that these service roads are not economically viable, the NCDOT shall have the option to alter the contract to delete the design and construction of these service roads.

- Any variations in the functional design and / or construction methods that nullify any decisions reached between the NCTA and the Environmental Agencies; and / or require

additional coordination with the Environmental Agencies shall be the sole responsibility of the Design-Build Team. The NCTA will not allow any contract time extensions or additional compensation associated with any coordination or approval process resulting from design and / or construction modifications.

- The Design-Build Team shall not further impact any cultural, historical, or otherwise protected landmark beyond that shown on the March 30, 2010 Functional Design Map. The Design-Build Team's design or construction shall not require right of way or easements from the aforementioned features unless shown on the March 30, 2010 Functional Design Map.

- The Design-Build Team shall be responsible for developing a Design Noise Study, noise wall balloting, public involvement, geotechnical investigations, design, sound barrier wall envelopes, and construction in accordance with the requirements set out below:

  - For the purpose of the Technical and Price Proposals, the Design-Build Team shall determine and identify in the Technical Proposal the location and quantity (square footage for each wall) of sound barrier walls required based on the current NCDOT and FHWA Policies.

  - Following contract execution, the Design-Build Team shall be responsible for completing a Design Noise Study that incorporates the Design-Build Team's design, for the FHWA and NCDOT review and approval. This Design Noise Study shall be based on the NCDOT and FHWA Policies in effect at the time of the performance of this Design Noise Study. All preconstruction activities associated with this work shall be included in the lump sum amount bid for the entire project. For construction activities, an adjustment in contract amount due to any increases or decreases in the amount of sound barrier wall, directly resulting from future changes to the NCDOT or FHWA Noise Policies, will be compensated in accordance with Section 104 of the Standard Special Provision entitled Division One.

  - The FHWA is in the process of updating their Procedures for Abatement of Highway Traffic Noise and Construction Noise (23 CFR Part 772). (A Notice of Proposed Rulemaking was published in the Federal Register on September 17, 2009 - http://edocket.access.gpo.gov/2009/E9-22386.htm). The NCDOT is also in the process of updating their Traffic Noise Abatement Policy. The revised Federal Regulations are expected to be effective in July 2010, and NCDOT anticipates their policy revisions to be effective by early 2011.

  - For informational purposes only, the *Traffic Noise Technical Memorandum* (March 2009) and *Traffic Noise Technical Memorandum Addendum* (January 2010) will be provided to the Design-Build Team to assist in their determination of anticipated noise impacts and preliminary sound barrier wall locations. It should be noted that these memoranda were prepared prior to the Date of Public Knowledge (Record of Decision approval date). As such, the Design Noise Study shall include a noise impact analysis for all developments that obtained a building permit prior to the Date

of Public Knowledge. If feasible and reasonable, the Design-Build Team shall be responsible for designing and constructing sound barrier walls for the aforementioned developments.

- As shown in Section 2-8 of the NCDOT Design Manual, the Design-Build Team shall provide a vehicular access break at all cut and fill transitions. The area accessing these breaks, as well as through the breaks, shall be constructed at 4:1 or flatter slopes and be gate protected. At all access breaks, the ends of the sound barrier wall shall be overlapped a minimum distance equal to four times the width of the access break.

- Unless noted otherwise elsewhere in this RFP, the maximum allowable cut and fill slopes shall be 2:1 (H:V). The slopes in the interchange area shall follow the requirements set forth in *the Roadway Design Guidelines for Design-Build Projects* located on the NCDOT Design-Build website.

- The Design-Build Team shall drain all ponds located partially or completely within the right of way and easements. The Design-Build Team, in consultation with the North Carolina Department of Environmental and Natural Resources' (DENR) Division of Water Quality (DWQ), shall develop and execute a plan for restoration of the drained pond to a natural stream and / or wetland; or fill the pond if the aforementioned environmental agency deems a restoration plan is not feasible.

- The Design-Build Team shall inform the NCTA, in writing, of any proposed changes to the March 30, 2010 Functional Design Map, previously reviewed submittals or the Design-Build Team's Technical Proposal and obtain approval prior to incorporation. The Design-Build Team shall note in the Technical Proposal any proposed deviations to the preliminary design shown on the March 30, 2010 Functional Design Map, except for changes specified herein. The Design-Build Team shall be responsible for any activities, as deemed necessary by the Department or the FHWA, resulting from changes to the March 30, 2010 Functional Design Map, including but not limited to, public involvement and NEPA re-evaluation and coordination with other stakeholders. The NCTA will not honor any requests for additional contract time or compensation for completion of the required activities resulting from changes to the NCTA functional design.

- Design exceptions shall not be allowed for the -L- line, including all ramps, loops, and collector-distributors. NCDOT prefers not to have design exceptions for the -Y- Lines and service roads. If the Design-Build Team anticipates any design exceptions for the -Y- Lines or service roads, 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 NCDOT and FHWA. If conceptual approval is obtained, the Design-Build Team shall be responsible for the development and approval of all design exceptions.

- The Design-Build Team shall submit Structure Recommendations and Design Criteria for NCTA and FHWA review and acceptance prior to submittal of the Preliminary Plans. 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, NCDOT State Roadway Design Engineer. The design speed for all roadways shall be the greater of the minimum design speed for the facility type or the anticipated / actual posted speed plus five-mph.

- All guardrail and cable guiderail placement shall be in accordance with the July 2006 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 that are 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.

- Unless otherwise noted in this RFP, the Design-Build Team shall design and construct bridge rail offsets that are the greatest of (1) as indicated in the NCDOT *Roadway Design Manual*, (2) equal to the entire width of the approach roadway paved shoulders, or (3) equal to the width to accommodate the future sidewalk as required in the Structure Scope of Work found elsewhere in this RFP. For long bridges that do not require future sidewalk accommodations, bridge rail offsets may be reduced from the aforementioned requirements (1) and (2) in accordance with the NCDOT *Roadway Design Manual*.

- The Design-Build Team shall design and construct five-foot sidewalks, wheel chair ramps and curb & gutter at the following locations:

  - McKee Road (Y-111) on the left (west) side from Matthews Indian Trail Road to the intersection with Y-111A
  - Stallings Road (Y-113) on the right (east) side from Station 23+00± to across Y-114- and continuing along the left (north) side of –Y114- from Stallings Road (Y-113) to the end of radius at Station 26+00±
  - Indian Trail Fairview Road (Y-107) on right (east) side from Station 30+00± to Station 50+00±
  - Unionville-Indian Trail Road (Y-102) on the left (west) side beginning at Station 29+00±, to Poplin Road (Y-203) and continuing along Poplin Road (Y-203) on the left (west) side to 30 ft. beyond the intersection of existing Poplin Road
  - All sidewalk and curb and gutter shall terminate at the intersection radius point

- The Design-Build Team shall design and construct an extension of the existing 10-foot multi-use concrete path right of US 74 (Y-112) to the property line of Parcel 100 at approximately Station 27+00.

- On the following facilities, the Design-Build Team shall design and construct 14-foot wide outside lanes in both directions throughout the project limits:

  - Indian Trail Fairview Road (Y-107)
  - Unionville-Indian Trail Road (Y-102)
  - Poplin Road (Y-203) (Shown as Service Road SR15 on the Preliminary Plans provided by the NCDOT)

- 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.

- Within the vehicle recovery area, the Design-Build Team shall design and construct single face concrete barrier in front of all retaining walls, all elements acting as a retaining wall and all sound barrier walls that are subject to vehicular impact.

- Excluding haul roads, the Design-Build Team shall design and construct resurfacing grades for all roadways impacted by construction. All resurfacing grades shall adhere to the design criteria and standards, provide all required pavement wedging (Reference the Pavement Management Scope of Work found elsewhere in this RFP) and adhere to the minimum requirements noted below:

    - 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.

    - 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 resurface all existing facilities to the limits of pavement marking obliterations / revisions.

- At all ramp and loop intersections, the design vehicle for all turning movements shall be a WB-65. The design vehicle for all other turning movements shall be a WB-50.

- Twenty-two sites of concern were identified in the *GeoEnvironmental Impact Evaluation Report*. After each of the parcels with identified contamination are acquired and cleared of all above ground structures, the Department will remove all underground storage tanks and contaminated material from the right of way within 60 days of written notification that the structures have been removed. Suitable backfill will be placed by the Department at the same time. Contaminated soil within the construction limits will be removed by the Department to the limits necessary to complete the construction project. All remaining contaminated soil will be left in place and undisturbed. The Department will obtain the appropriate identification numbers and sign the shipping manifests as the generator.

Unknown contaminated sites encountered during construction shall be addressed by Article 107-26 of the 2006 NCDOT *Standard Specifications for Roads and Structures.*

**General**

- The design shall be in accordance with the 2004 AASHTO *A Policy on Geometric Design of Highways and Streets*, 2002 NCDOT *Roadway Design Manual*, July 2006 *NCDOT Roadway Standard Drawings*, or as superseded by detail sheets located at http://ncdot.gov/doh/preconstruct/ps/std_draw/06details/default.html, *Roadway Design Policy and Procedure Manual, Roadway Design Guidelines for Design-Build Projects*, 2006 *North Carolina Standard Specifications for Roads and Structures*, the 2002 AASHTO *Roadside Design Guide, 3rd Edition* and 2006 *Chapter 6 Update* and other pertinent NCTA guidelines references in this RFP.

- If the NCDOT *Roadway Design Manual*, the 2004 AASHTO *A Policy on Geometric Design of Highways and Streets*, the 2006 *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 otherwise noted elsewhere in this RFP. Roadways that require Ditch Typical B or C, as shown in the NCDOT *Roadway Design Manual*, shall be designed with the minimum ditch front slope width or the ditch front slope width of the existing roadway, which ever is greater. In case of conflicting design parameters in the various resources, the proposed design shall adhere to the most conservative values.

- A sag vertical curve low point shall not be located on any bridge or approach slab.

- The Monroe Connector / Bypass Project shall be administered as a "Full Oversight Project" except as amended in the provided Project Management Plan.

- 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 NCTA or NCDOT may have special details available that can be provided to the Design-Build Team upon request.

**Information Supplied**

- Copies of the DEIS (Draft Environmental Impact Statement), FEIS (Final Environmental Impact Statement), and the latest list of environmental commitments, municipal agreements and all pertinent approvals and correspondence will be provided. Unless noted otherwise elsewhere in this RFP, the Design-Build Team shall adhere to all commitments stated in the environmental documents.

- Electronic surveys to the Design-Build Team will be provided. Any supplemental surveys, including but not limited to additional topography, existing and proposed roadway, structure sites, underground and overhead utilities, existing and proposed

drainage and wetland delineation shall be the responsibility of the Design-Build Team to acquire and process. 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 the facilities. All supplemental SUE work shall be the responsibility of the Design-Build Team.

- The March 30, 2010 Functional Design Map for the project will be provided. The Design-Build Team is cautioned that these maps and designs 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 NCTA functional design, the use of portions of the NCTA functional design or modifications to the NCTA functional design.

- The NCTA will provide a Geotechnical Subsurface Investigation for the Project. 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)

- The NCTA will provide final pavement design alternates for the project. The Design-Build Team shall be responsible for all temporary pavement designs. (Reference the Pavement Management Scope of Work)

- Geoenvironmental information will be provided as follows:

    1. GeoEnvironmental Impact Evaluation Report dated April 17, 2008
    2. Preliminary Site Assessments for Sites 1 through 5 as follows:
        - 12518 East Independence Boulevard
        - 12701 East Independence Boulevard
        - 13025 East Independence Boulevard
        - 13024 East Independence Boulevard
        - 13415 East Independence Boulevard
    3. Right of Way Recommendations dated September 11, 2009
    4. Supplemental Right of Way Recommendations dated February 16, 2010

## STRUCTURE SCOPE OF WORK (08-10-2010)

### Project Details

The Design-Build Team shall be responsible for the design and construction of all structures necessary to complete the project, including the following features intersecting the mainline:

- McKee Road
- Stallings Road
- US 74 EB
- US 74 WB
- Stinson Hartis Road
- Indian Trail-Fairview Road
- Secrest Shortcut Road
- Faith Church Road
- Unionville-Indian Trail Road
- South Fork Crooked Creek
- Rocky River Road
- Willis Long Road
- Roanoke Church Road
- Fowler Road
- US 601 (Concord Highway)
- Deese Road
- Stewarts Creek
- NC 200
- Olive Branch Road
- Richardson Creek
- Rays Fork
- Monroe Ansonville Road
- Old Williams Road
- Austin Chaney Road
- Meadow Branch and Wetlands
- Ansonville Road
- Forest Hills School Road
- CSX Railroad and US 74 WB

The Design-Build Team shall design and construct all bridges at the following locations:

- Rocky River Road over South Fork Crooked Creek
- -HRCA- at US 74 EB and WB

The March 30, 2010 Functional Design Map details a bridge on Rocky River Road over South Fork Crooked Creek. The bridge will not be required unless the proposed roadway construction extends on or across the existing bridge to obtain an acceptable transition to the existing roadway.

The March 30, 2010 Functional Design Map details a bridge on Forest Hills School Road over CSX Railroad. As noted in the Roadway Scope of Work, the Design-Build Team will not be required to design and construct Forest Hills School Road between Phifer Road (SR 1753) and existing US 74. Therefore, the bridge on Forest Hills School Road over CSX Railroad will not be constructed.

All bridges shall meet approved Roadway typical sections and grades. Bridge geometry (width, length, skew, span arrangement, etc.) shall be in accordance with approved Structure Recommendation and approved Hydraulic Bridge Survey Reports.

For bridges crossing over Monroe Connector/Bypass, any interior bents in the median shall be located at the center of the median or placed to account for future lane widening.

The Design-Build Team shall coordinate with the town of Indian Trail, and design and construct a pedestrian underpass for a future greenway at approximate Station 425+00. The underpass shall have a minimum interior width of 10 feet and a minimum interior height of 12 feet.

The bridges over the Monroe Connector/Bypass shall have sufficient length and vertical clearance to accommodate future loops in the locations required in the Roadway Scope of Work.

All bridges shall have sufficient width, length, and barrier rail to provide sidewalk and bicycle accommodations constructed as part of this project as noted in the Roadway Scope of Work.

Bridge lengths and widths shall be designed and constructed to accommodate future sidewalk with a total 10 ft. wide berm at the following locations:

- Stinson Hartis Road (Y-116) on the left (west) side
- Faith Church Road (Y-110) on the right (east) side (and two foot future widening on both sides for bicycle accommodations)
- US 601 (Y-302) on both sides
- Austin Chaney Road (Y-308) on the right (east) side

Bridge lengths over Rays Fork shall accommodate a future 10 ft. wide greenway on the east side of Rays Fork with a minimum of 12 feet vertical clearance.

The bridges over CSXT shall have span lengths to allow for one future track on both sides of the existing track on 15 ft. centers.

The minimum vertical clearance over CSXT is 23'-0". The minimum vertical clearance over all roadways shall be at least that shown in the Roadway Design Manual per the given facility type. All vertical clearances shall be set to accommodate future widening of those facilities identified for future widening in this RFP.

A live load rating chart for girders will be required on the bridge plans. The load rating shall be in accordance with the August 21, 2009 LRFR Load Factors (Rev. Dec. 2009) memo and AASHTO's Manual for Bridge Evaluation.

The Design-Build Team is responsible for wall envelopes, design, and construction of all retaining walls necessary to construct the project.

The Design-Build Team is responsible for all culverts and culvert extensions necessary to complete the project. The Design-Build Team shall adhere to all permit, FEMA, and hydraulic design criteria when designing culverts and culvert extensions.

All bridge rails shall satisfy the appropriate NCHRP test level for that facility. Any bridge rail adjacent to sidewalk or future sidewalk shall be a minimum of 42 inches high above the sidewalk surface. Any bridge rail adjacent to multi-use path or future multi-use path shall be a minimum of 54 inches high. Mandatory Aesthetic Treatments are required. Reference Aesthetic Design Scope of Work.

The Design-Build Team shall be responsible for the design and construction of all sound barrier walls required by the Final Design Noise Report, including any geotechnical investigations necessary to design the foundations. The Design-Build Team shall be responsible for the wall envelope details. Reference Roadway Scope of Work.

The anticipated sound barrier wall locations are as follows:

- Eastbound side of mainline which is East of Indian Trail-Fairview Road, West of Secrest Shortcut Road, near the Acorn Woods Subdivision
- Eastbound side of mainline which is East of Roanoke Church Road, West of Fowler Road, near the Avondale Park Subdivision
- Westbound side of mainline which is East of Ansonville Road, near the Glencroft Subdivision.

**Aesthetics Design**

Bridges, retaining walls, sound barrier walls and signs/gantries shall have Mandatory Aesthetic Treatments as required by the Aesthetics Design Scope of Work found elsewhere in this RFP.

**All Electronic Tolling (AET) Infrastructure**

The Design-Build Team shall be responsible for the design and construction of the infrastructure required to support the toll collection system. Reference the AET Infrastructure Scope of Work found elsewhere in this RFP.

**General**

Design shall be in accordance with the latest edition of AASHTO *LRFD Bridge Design Specifications*, NCDOT Structure Design Manual (including policy memos), and NCDOT Bridge Policy Manual. Reinforced concrete box culverts may be designed using AASHTO LFD. Construction and materials shall be in accordance with the current NCDOT *2006 Standard Specifications for Roads and Structures*, NCDOT Structure Design Unit Project Special Provisions, and NCDOT Structure Design Unit Standard Drawings.

The Design-Build Team's primary bridge design firm shall be on the NCDOT Highway Design Branch's list of firms qualified for structure design and maintain an office in North Carolina.

Alternate designs, details, or construction practices (such as those employed by other States, but not standard practice in North Carolina) are subject to NCDOT review and shall be evaluated on a case by case basis.

The following will not be allowed on the project:

- Cored slab or precast box beams
- Monotube sign support structures
- Casting of conduit in the bridge decks
- Casting of conduit in outside railing unless otherwise required by the Lighting Scope of Work
- Attachment of sign structures to bridges
- Empirical deck design method
- Prefabricated arch culverts and aluminum box culverts
- Fracture critical structures

**PAVEMENT MANAGEMENT SCOPE OF WORK** (08-04-10)

The Design-Build Team shall choose from the mainline pavement alternates presented in this scope of work unless otherwise submitted and approved as an Alternate Technical Concept. The mainline pavement type (asphalt or concrete) shall be consistent throughout the limits of the mainline. Once the pavement type for the entire mainline is chosen, the pavement structure per segment of the mainline may vary in accordance with the alternates provided herein or as otherwise submitted and approved as an Alternate Technical Concept. The Design-Build Team shall commit to the pavement design presented in the Technical Proposal. The selection of an asphalt mainline pavement or concrete mainline pavement will be binding for the duration of the contract. The pavement design for the mainline and mainline shoulders is divided into three segments along the project as follows:

Mainline and Mainline Shoulders from Beginning of Project (~ -L- Sta. 124+00) to -L- ~ Sta. 183+75)

The Design-Build Team shall use (consistently throughout these limits) one of the following alternates for the construction of the -L- line travel lanes:

| Alternate 1 | Alternate 2 | Alternate 3 | Alternate 4 |
|---|---|---|---|
| 3.0” S9.5D | 3.0” S9.5D | 3.0” S9.5D | 13.5” Concrete |
| 4.0” I19.0D | 4.0” I19.0D | 4.0” I19.0D | 3.0” PADC |
| 12.5” B25.0C | 8.0” B25.0C | 6.5” B25.0C | 1.25” SF9.5A |
| Subgrade Stab. | 10.0” ABC | 8.0” CTABC | Subgrade Stab. |
| | Subgrade Stab. | Subgrade Stab. | |

For Alternates 1, 2, and 3, the inside shoulder and the first four feet of the outside paved shoulder shall use the travel lane pavement design, except that the outside shoulders may include 3.0” of S9.5B or S9.5C in lieu of the 3.0” of S9.5D. The pavement design for the remaining eight feet of the outside paved shoulder shall consist of:

3.0” S9.5D, S9.5C, or S9.5B
4.0” I19.0D or I19.0C
5.0” B25.0C

For Alternate 4, three options for the shoulder pavement are shown below. The option (asphalt, jointed concrete, or roller-compacted concrete) chosen by the Design-Build Team for the shoulders shall be consistent throughout the project. Both outside and inside shoulders shall use the same option.

**Option 1:** 3.0” S9.5D, S9.5C, or S9.5B
3.0” I19.0D or I19.0C
7.5” minimum B25.0C

**Option 2:** A minimum thickness of 10.5” jointed concrete, without dowels, with a joint spacing matching the adjacent mainline pavement. This option shall be anchored to the mainline pavement with tie bars.

**Option 3:** 8” roller-compacted concrete (RCC) and a minimum thickness of 6.75” of ABC. The 8” roller-compacted concrete shall have a joint matching every second joint of the adjacent travel lane pavement.

Mainline and Mainline Shoulders from -L- ~ Sta. 183+75 to -L- ~ Sta. 830+00 (at NC 200)

The Design-Build Team shall use (consistently throughout these limits) one of the following alternates for the construction of the -L- line travel lanes:

| Alternate 1 | Alternate 2 | Alternate 3 | Alternate 4 |
|---|---|---|---|
| 3.0” S9.5C | 3.0” S9.5C | 3.0” S9.5C | 12.5” Concrete |
| 4.0” I19.0C | 4.0” I19.0C | 4.0” I19.0C | 3.0” PADC |
| 10.0” B25.0C | 5.5” B25.0C | 4.0” B25.0C | 1.25” SF9.5A |
| Subgrade Stab. | 10.0” ABC | 8.0” CTABC | Subgrade Stab. |
| | Subgrade Stab. | Subgrade Stab. | |

For Alternates 1, 2, and 3, the inside shoulder and the first 4 feet of the outside shoulder shall use the travel lane pavement design, except that the outside shoulders may include 3.0” of S9.5B in lieu of the 3.0” of S9.5C. The pavement design for the remainder of the outside shoulder shall consist of:

3.0” S9.5C or S9.5B
4.0” I19.0C
4.0” B25.0C

For Alternate 4, three options for the shoulder pavement are shown below. The option (asphalt, jointed concrete, or roller-compacted concrete) chosen by the Design-Build Team for the shoulders shall be consistent throughout these limits. Both outside and inside shoulders shall use the same option.

**Option 1:** 3.0” S9.5C or S9.5B
3.0” I19.0C
6.5” minimum B25.0C

**Option 2:** A minimum thickness of 9.5” jointed concrete, without dowels, with a joint spacing matching the adjacent mainline pavement. This option shall be anchored to the mainline pavement with tie bars.

**Option 3:** 8” roller-compacted concrete (RCC) and a minimum thickness of 5.75” of ABC . The 8” roller-compacted concrete shall have a joint matching every second joint of the adjacent travel lane pavement.

Mainline and Mainline Shoulders for the Remainder of –L-

The Design-Build Team shall use (consistently throughout these limits) one of the following alternates for the construction of the -L- line travel lanes:

| Alternate 1 | Alternate 2 | Alternate 3 | Alternate 4 |
|---|---|---|---|
| 3.0” S9.5C | 3.0” S9.5C | 3.0” S9.5C | 11.0” Concrete |
| 4.0” I19.0C | 4.0” I19.0C | 4.0” I19.0C | 3.0” PADC |
| 8.0” B25.0C | 3.5” B25.0C | 3.0” B25.0C | 1.25” SF9.5A |
| Subgrade Stab. | 10.0” ABC | 8.0” CTABC | Subgrade Stab. |
| | Subgrade Stab. | Subgrade Stab. | |

For Alternates 1, 2, and 3, the inside shoulder and the first 4 feet of the outside shoulder shall use the travel lane pavement design, except that the outside shoulders may include 3.0” of S9.5B in lieu of the 3.0” of S9.5C. The pavement design for the remainder of the outside shoulder shall consist of:

3.0” S9.5C or S9.5B
4.0” I19.0C
4.0” B25.0C

For Alternate 4, three options for the shoulder pavement are shown below. The option (asphalt, jointed concrete, or roller-compacted concrete) chosen by the Design-Build Team for the shoulders shall be consistent throughout the project. Both outside and inside shoulders shall use the same option.

**Option 1:** 3.0” S9.5C or S9.5B
3.0” I19.0C
5.0” minimum B25.0C

**Option 2:** A minimum thickness of 8.0” jointed concrete, without dowels, with a joint spacing matching the adjacent mainline pavement. This option shall be anchored to the mainline pavement with tie bars.

**Option 3:** 8” roller-compacted concrete (RCC) and a minimum thickness of 4.25” of ABC. The 8” roller-compacted concrete shall have a joint matching every second joint of the adjacent travel lane pavement.

Concrete pavement for the travel lanes shall be doweled jointed concrete with 15 ft. uniform joint spacing.

The Design-Build team shall specify the pavement designs chosen for the travel lanes and shoulders in their Technical Proposal.

The full width of the inside and outside shoulders throughout the ORT tolling zones, where loop detection will be utilized, shall be same pavement design as the adjacent travel lane pavement. The

ORT Toll Zone limits are defined as the pavement beginning 100 feet prior to the first ORT gantry span and extending through the toll zone and a length of 100 feet beyond the second ORT gantry span for a minimum length of 250 linear feet.

If concrete pavement is used for the mainline, the concrete pavement through the ORT tolling zones shall not contain metal reinforcement, metal dowel bars, metal tie-bars, metal mesh reinforcement or electro-magnetic field emitting wiring/cabling within the pavement. Dowel bars and tie bars within the ORT tolling zones shall be non-metallic. The Design Build Team shall coordinate with the toll integrator and adjust the transverse joint spacing layout, within the ORT tolling zone, to avoid detection loop constructability or operation issues. Do not exceed 22 feet between any two transverse joints.

Subgrade Stabilization shall be to a minimum depth of 8 inches for lime and 7 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.

Other pavement designs for this project are listed in the table below:

| **LINE** | **Surface** | **Intermediate** | **Base** | **ABC** | **Stab.** |
|---|---|---|---|---|---|
| Y111 (MCKEE Road) | 3.0” S9.5B | 3.0” I19.0B | ----- | 10.0” | No |
| Y113 (Stallings Road) | 3.0” S9.5B | 2.5” I19.0B | 5.0” B25.0B | ----- | No |
| East and West. Frontage Roads | 3.0” S9.5C | 4.0” I19.0C | 3.0” B25.0C | 8.0” | No |
| US 74 (West End) | 3.0” S9.5C | 4.0” I19.0C | 6.0” B25.0C | 10.0” | No |
| Ramps(between Frontage Rd & -L-), Ramps A, B, C, and D at Y201, Ramp A & Ramp D @ Y204, Ramp, A & Ramp D @ NC 200, Ramp B & Ramp C @ A.C. Rd, Y310 (Forest Hills School Rd), and Ramp B & Ramp C @ Y310 | 3.0” S9.5B | 2.5” I19.0B | ----- | 8.0” | No |
| Y107 (Indian Trail Fairview Rd) | 3.0” S9.5B | 4.0” I19.0B | 3.0” B25.0B | 8.0” | No |
| Ramp B & Ramp C @ Y107 and Austin Chaney Rd | 3.0” S9.5B | 3.0” I19.0B | ----- | 8.0” | No |
| Loop B & Loop C @ Y107, Y201 (Unionville Indian Trail Rd), Y204 (Rocky River Rd), Loop A & Loop D @ Y204, and Loop B & Loop C @ A.C. Rd | 3.0” S9.5B | 4.0” I19.0B | ----- | 8.0” | No |
| US 601 | 3.0” S9.5C | 4.0” I19.0C | 5.5” B25.0C | 10.0” | No |
| Ramp A, Ramp B, & Ramp C @ US 601 and Loop A & Loop C @ US 601 | 3.0” S9.5C | 4.0” I19.0C | ----- | 8.0” | Yes |
| Loop A & Ramp C @ NC 200 | 3.0” S9.5B | 4.0” I19.0B | ----- | 10.0” | No |
| NC 200 | 3.0” S9.5C | 4.0” I19.0C | 3.0” B25.0C | 8.0” | No |
| US 74 (East End) | 3.0” S9.5C | 4.0” I19.0C | 5.0” B25.0C | 8.0” | No |
| Service Roads (SR 5 and SR 61) | 3.0” S9.5B | 2.5” I19.0B | | 8.0” | |

| | | | | | |
|---|---|---|---|---|---|
| All other Service Roads | 3.0” S9.5B | | | 8.0”* | |

* Prime Coat required

Warm mix asphalt will not be permitted on the mainline, ramps, loops, or any -Y- lines on the Strategic Highway Corridor.

The minimum depth for overlaying the existing pavement on the -Y- Lines where asphalt is used as a final surface shall be the full thickness of surface course as given in the above table. For the -Y- Lines noted in the table above, the Design-Build Team may substitute an asphalt base course layer for an ABC layer. If such an alternative is proposed, the Design-Build Team shall use an asphalt base course mix that matches the asphalt base course mix specified for the roadway. If an asphalt base course mix is not specified, the Design-Build Team shall use B25.0B base course. The additional thickness of the asphalt base course, used as a substitute for the ABC layer, shall be equal to half of the proposed ABC thickness specified for the roadway. The Design-Build Team shall maintain the same pavement design throughout the -Y- Line construction limits. In the Technical Proposal, the Design-Build Team shall specify the base option chosen (ABC vs. asphalt) for all -Y- Lines. The Design-Build Team may substitute an asphalt base coarse layer for an ABC layer, as described above, for tie ins and narrow widening.

On all ramps, the adjacent through lane pavement structure design shall extend to the back of the gore (12-foot width).

Longitudinal joints of all surface course layers shall not be located in the final traffic pattern wheel path. 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.

Unless noted otherwise elsewhere in this RFP, the minimum widened width shall be six feet. The minimum 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 NC Turnpike Authority 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 Engineer for review and acceptance or rejection.

The Design-Build Team shall be responsible for the design of all temporary pavements and for the evaluation of existing shoulders and roadways regarding their suitability for carrying traffic during construction, if necessary. In the event that the existing shoulders and 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. Temporary pavements shall be

designed in accordance with the most recent version of the North Carolina DOT Pavement Design Procedure. Temporary pavement designs are to be submitted for review and comments using the contract submittal process. The expected duration for traffic on temporary pavement must be included as part of the submittal

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% or steeper grade shall be constructed with 1.5" S9.5B and 8" ABC. Unless otherwise noted above, the Design-Build Team shall adhere to the following for all driveway construction:

For existing gravel and soil driveways, use 8" ABC.
For existing asphalt driveways, use 1.5" S9.5B and 8" ABC.
For existing concrete driveways, use 6" 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.

The Design-Build Team shall be responsible for the design and construction of shoulder drains and outlets. Shoulder drains shall be placed to drain the entire pavement structure. Where only widening to one side of a facility is required by this RFP, only the widened side will require shoulder drains. The shoulder drain design and outlet locations are to be submitted to the Transportation Program Management Director for review and acceptance or rejection.

For mainline asphalt pavement, shoulder drains shall be provided on the both sides of typical crown sections, on the low side of superelevated sections, throughout all sag vertical curves, throughout crest vertical curves located in cut sections, and where the grade is less than 1%.

For mainline concrete pavement, continuous shoulder drains and outlets shall be used. Shoulder drains shall be provided on both sides of typical crown sections, and on the low side of superelevated sections.

Outlets shall be provided approximately every 300 feet. In the median, if drainage structures are spaced at more than 300 feet, the outlet spacing may be increased to 500 feet in those areas.

The Design-Build Team shall pave from the edge of the proposed paved shoulder to the face of all guardrails with 6" of ABC (or 4" B25.0B or B25.0C), a split seal and at least one lift 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 guardrail, the Design-Build Team may use the adjacent travel lane pavement design.

The Design-Build Team shall provide incidental milling of the end of existing pavement to provide a smooth transition to the proposed pavement.

**Alternate Technical Concepts – Mainline Pavement Design Only**

Alternative Technical Concept proposals that provide an alternate mainline pavement design will be considered subject to the following restrictions:

- Proposed pavement designs must have at least a 30 year design life established using the current NCDOT Pavement Design Procedure or the 1993 AASHTO Guide for Design of Pavement Structures.
- The design in the ATC must be sealed by a professional engineer that has experience in pavement design. The ATC submittal shall include a brief resume or description of the designer's pavement design experience.
- The design parameters shown in the table below shall be used.

| Design Parameter | Flexible | Rigid |
|---|---|---|
| | | |
| Design Life | 30 years | 30 years |
| Initial Serviceability | 4.2 | 4.5 |
| Terminal Serviceability (Design Year ADT >80,000) | 3.0 | 3.0 |
| Terminal Serviceability (Design Year ADT<80,000) | 2.75 | 2.75 |
| * Reliability | 95% | 95% |
| * Overall Standard Deviation | 0.45 | 0.35 |
| Truck Factor-Duals | 0.3 | 0.3 |
| Truck Factor-TTST | 1.15 | 1.60 |
| Lane Distribution Factor (Two lanes per direction) | 0.9 | 0.9 |
| Lane Distribution Factor (Three or more lanes per direction) | 0.8 | 0.8 |

* Applies to 1993 AASHTO Guide only.

- Clear and convincing support must be provided for choices made for design parameters not included in the table above.
- All pavement designs shall include chemical stabilization of the subgrade.
- Concrete pavement designs shall include a permeable drainage layer and a separator layer below the drainage layer.

ATCs complying with the above restrictions will be evaluated by the technical review panel in accordance with the usual ATC process, with the exception that NCDOT will return responses within 15 business day. The NCTA reserves the right to engage a recognized pavement design expert to assist with the ATC evaluations.

Calculation sheets for the pavement designs contained herein will be provided, along with the current NCDOT Pavement Design Procedure

## HYDRAULICS SCOPE OF WORK (07-28-10)

**Project Details**

The Design-Build Team shall:

- Employ a private engineering firm that is prequalified with the NCDOT for Hydraulic Design to perform all hydraulic design work required by this contract.
- Upon acceptance of the Preliminary Roadway Plans, hold a pre-design meeting with the NCDOT, including the Hydraulic Review Engineer.
- Design Stormwater Controls and develop a Stormwater Management Plan using Best Management Practices per the latest NCDOT Stormwater Best Management Practices Toolbox.
- Design all Storm Drainage systems using Geopak Drainage.
- Provide Culvert and Bridge Survey Reports for structures in accordance with the guidelines in the General section below.
- Design bridge drainage without the use of Bridge Scuppers (open-grated inlets). If a closed drainage system is used on a bridge, the closed drainage system shall use vertical pipes through the deck, installed at the flow line, and shall be consistent with that shown in the current NCDOT Stormwater Best Management Practices Toolbox.
- Prepare a CLOMR or MOA package for any FEMA regulated streams impacted by the design. No construction activity shall occur in FEMA regulated floodplains prior to the CLOMR or MOA approval. NCFMP is the review authority for the MOA package and associated model. The NCTA will not allow direct contact between the Design-Build Team and the representatives of NCFMP and their contractors either by phone, e-mail or in person without representatives from the NCTA and the NCDOT Hydraulics Unit. . Should NCFMP not approve the MOA, the Design-Build Team will be required to obtain a CLOMR. The NCTA will not allow any contract time extensions or additional compensation associated with the CLOMR or MOA process. The NCTA will be responsible for all associated fees.
- Provide sealed As-Built Plans for structures in FEMA regulated floodplains that adhere to the approved FEMA submittal.
- Conduct an interagency hydraulic design review meeting and an interagency permit impacts meeting prior to submittal of the environmental permit applications. All work resulting from the hydraulics and permit reviews shall be the responsibility of the Design-Build Team. The Design-Build Team shall provide roadway plans and permit impact sheets to the Transportation Program Management Director a minimum of five weeks prior to the applicable interagency meetings. The Design-Build Team shall take minutes of each meeting and provide them to the Department within three business days.
- Prepare the permit drawings and impact summary sheets for submittal of the USACE 404 Permit and NCDWQ Section 401 Permit applications.

- The Project passes through the hazardous spill basin boundary for Lake Twitty. Therefore, the Design-Build Team shall incorporate hazardous spill basins in this area during final design including any additional right of way required for adequate storage and maintenance. The Design-Build Team shall consider long-term maintenance in the design.

- The NCDWQ has stated a preference for any bifurcated tributaries that cross the mainline in close proximity to one another (e.g. plan sheets 71 and 72), be combined on the upstream side of the mainline and pass through one pipe/culvert under the mainline.

**General**

Design in accordance with criteria provided in the North Carolina Division of Highways *Guidelines for Drainage Studies and Hydraulics Design-1999* and the addendum *Handbook of Design for Highway Drainage Studies-1973*, North Carolina Department of Transportation "Stormwater Best Management Practices Toolbox – 2008" and the North Carolina Division of Highways Hydraulics Unit website:

**http://www.ncdot.org/doh/preconstruct/highway/hydro/**

**Materials Provided**

The following data is provided for information purposes only. Procedures, standards, policies and existing conditions are subject to change.

- Bridge Survey Reports
- Culvert Survey Reports
- CLOMR information

**GEOTECHNICAL ENGINEERING SCOPE OF WORK** (7-10-10)

## 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 Highway Design Branch List. The prequalified geotechnical firm shall prepare foundation design recommendation reports for use in designing structure foundations, roadway foundations, retaining walls, sound barrier foundations, overhead sign structure foundations, overhead sign structures, 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*. If the Engineer of Record cannot demonstrate the aforementioned LRFD experience, then the design must undergo a peer review by an individual with such experience. In such case, the reviewer must be a registered Professional Engineer, but not necessarily in the State of North Carolina. Prior to the first geotechnical design submittal, the Design-Build Team shall provide a letter to the NCDOT Design-Build Office that documents the reviewer's LRFD experience for review and acceptance. Furthermore, with each geotechnical design submittal, the reviewer shall provide a sealed letter stating that he / she has carefully reviewed and approved the specific submittal details.

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 that 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 for review. The Design-Build Team shall provide the final Subsurface Investigation report in electronic and hardcopy format to the NCDOT for its records.

A minimum of 2 standard penetration test (SPT) / rock core borings shall be required per bent for all bridges except dual bridges. A minimum of 3 SPT / rock core borings shall be required across the roadway typical section, at each bent location for dual bridges. All borings shall be located within 100 feet of the centerline of each bent location to be counted for these minimum requirements. Extend all borings to a depth below the foundation element required 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 construction.

The maximum spacing between borings for retaining walls and sound barrier walls shall be 200 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 height of the wall. Boring depths for sound barriers shall be equal to the maximum height of the wall or to SPT refusal.

The Design-Build Team is permitted to design bridges on this project using software that accounts for the structural effects of soil / pier interaction.

## II. DESCRIPTION OF WORK:

Unless otherwise noted herein, the Design-Build Team shall design foundations (except sign foundations), embankments, slopes, retaining walls, and sound barriers 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 *Structure Design 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:

**www.ncdot.org/doh/preconstruct/highway/geotech/LRFD_Driven_Pile_Foundation_Design_Policy.pdf**

For *Geotechnical Guidelines For Design-Build Projects*, the Design-Build Team shall adhere to the guidelines located at the following website:

**http://www.ncdot.org/doh/preconstruct/altern/design_build/default.html**

### A. Structure Foundations

Key in spread footings of structures crossing streams a minimum of full depth below the 100-year design scour elevation and provide scour protection in accordance with scour protection detail in the NCDOT *Structure Design Manual*.

Permanent steel casings shall be required for drilled piers that are constructed in six inches or more of water. Permanent steel casings are required for drilled piers constructed on sloped stream banks subject to degradation from flooding.

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

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 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 with a sufficient embedment in soil and/or rock to achieve “fixity”.

Design sound barrier foundations in accordance with current allowable stress design AASHTO Guide Specifications for Structural Design of Sound Barriers. A minimum factor of safety of 1.5 shall be required for shaft embedment depths.

## B. Roadway Foundations

Unless otherwise noted herein, all unreinforced proposed fill slopes shall be 2:1 (H:V) or flatter except bridge end bent slopes (see Section A – Structure Foundations). All proposed soil cut slopes shall be 2:1 (H:V) or flatter, unless the slopes are designed with adequate reinforcement to provide the required stability. If steeper than 2:1 (H:V), all reinforced cut slopes, rock cuts and fill slopes may only be used if detailed design calculations and a slope stability analysis are submitted to the NCDOT Geotechnical Engineering Unit, via the Transportation Program Management Director, for review and acceptance prior to construction.

Design and construct bridge approach embankments such that no more than two inches of settlement shall occur after the waiting periods end. Soil improvement techniques to mitigate long term settlement problems or to transfer the embankment load to a deeper bearing stratum are allowed. 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.*

Embankment settlement monitoring shall be required when a waiting period of more than one month is recommended in the foundation design recommendation reports. 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.

Reinforced bridge approach fills in accordance with the NCDOT standard shall be required for end bents on all bridges.

Mitigate all unsuitable soils to the extent that is required to improve the stability of the proposed embankment or subgrade. Use suitable materials to backfill undercut areas except when utilizing Aggregate Subgrade. For undercut backfilling in water, use Select Material, Class III.

## C. Permanent Retaining Wall Structures

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:

**http://www.ncdot.org/doh/preconstruct/highway/geotech/msewalls/07-12-18_MSE_Retaining_Walls_Policy.pdf**

Design and construct permanent retaining walls, with the exception of gravity 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:

**http://www.ncdot.org/doh/preconstruct/highway/geotech/provnote/**

For each retaining wall, with the exception of gravity walls, submit a wall layout and design. The wall layout submittal shall include 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.
- Calculations for bearing capacity, global stability and settlement.
- Details of conflicts with utilities and drainage structures.
- Roadway plan sheets showing the wall (half size).
- Roadway cross sections showing the wall (half size).
- Traffic control plans showing the wall (half size).

Gravity walls shall be designed and constructed in accordance with the NCDOT Structure Standard Drawings and the NCDOT *2006 Standard Specifications*. Gravity walls shall be identified in the roadway foundation design

recommendation report. Cast-in-place cantilever walls shall be designed and constructed in accordance with the NCDOT *2006 Standard Specifications.* Conceptual wall layouts and wall designs shall be submitted for NCDOT for review and acceptance.

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. Any slopes behind walls shall be 2:1 (H:V) or flatter.

Drainage over the top of retaining walls shall not be allowed. Sags in the top of walls are not permissible. 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 can not be directed away from the back or front of the wall. A paved concrete ditch with a minimum depth of six inches shall be required at the top of walls when slopes steeper than 6:1 (H:V) intersect the back of walls.

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 six inches above where the finished or existing grade intersects the back of the wall. A fence shall be required on top of the facing, coping or barrier or immediately behind the wall, if there is no slope behind the wall.

Deep foundations shall be used for end bents when abutment retaining walls are employed. When using abutment retaining walls, design and construct the end bent and the wall independent of each other. When using abutment retaining walls, the end bent foundation shall be designed and constructed with one of the following deep foundations: (1) a single row of plumb piles with brace piles battered toward the wall, (2) a single row of plumb piles with MSE reinforcement connected to the back of the cap, (3) a double row of plumb piles or (4) drilled piers. If fill is required around piles or drilled piers, install foundations before placing any fill. Wing walls independent of abutment retaining walls shall be required unless accepted otherwise by the NCDOT. Do not consider lateral support from any fill placed around drilled piers behind abutment retaining walls when analyzing end bent stability. All pile foundations for end bents with abutment retaining walls shall penetrate minimum 10 feet into natural ground. For bearing piles behind such retaining walls, the penetration can be reduced to 5 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* and the *Temporary Shoring* Special Provision. The only submittal required to use the standard sheeting design is the "Standard Shoring Selection Form".

Design and construct temporary retaining walls in accordance with the applicable NCDOT *Project Special Provision* available upon request by the Design-Build Team. 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 *2006 Roadway Standard Drawing* Detail No. 1170.01.

## III. CONSTRUCTION REQUIREMENTS:

All construction and materials shall be in accordance with the NCDOT *2006 Standard Specifications* and current NCDOT *Project Special Provisions* unless otherwise stated in this scope of work. The Design-Build Team shall be responsible for investigating, proposing and incorporating remedial measures for any construction problems related to foundations, retaining walls, subgrades, settlement, slopes, and construction vibrations. The NCDOT Geotechnical Engineering Unit shall review and accept these proposals.

The Design-Build Team shall be responsible for any damage or claim caused by construction, including damage caused by vibration (see Article 107-15 NCDOT *2006 Standard Specifications for Roads and Structures*). The Design-Build Team shall be responsible for deciding what, if any, pre and post-construction monitoring and inventories need to be conducted to satisfy their liability concerns. Any monitoring and inventory work shall be performed by a qualified private engineering firm experienced in the effects of construction on existing structures.

The prequalified geotechnical firm that prepared the foundation designs shall review the embankment settlement monitoring data a minimum of once a month and issue a letter prior to releasing the embankment from the waiting period. Waiting periods may not be ended until less than 0.10 inches of settlement is measured over a period of four weeks. Submit the settlement monitoring data to the Transportation Program Management Director prior to issuing the release letter.

The prequalified geotechnical firm that prepared 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 to the NCDOT for review prior to beginning construction.

Perform hammer approvals with GRLWEAP Version 2002 or later and in accordance with the NCDOT LRFD Driven Pile Foundation Design Policy. Provide pile driving inspection charts or tables for all approved pile hammers.

Limit driving stresses in accordance with the AASHTO LRFD *Bridge Design Specifications*. If a tip elevation is noted on the plans, drive piles to the minimum required driving resistance and tip elevation. Otherwise, drive piles to the minimum required driving resistance and a penetration into natural ground of at least 10 ft. Unless otherwise approved, stop driving piles when refusal is reached. Refusal is defined as 240 blows per foot or any equivalent set.

Perform Pile Driving Analyzer (PDA) testing using a NCDOT prequalified company to develop pile driving inspection charts or tables. For each permanent bridge that includes driven pile bents or driven pile footings, perform a minimum of one (1) PDA test (dual bridges are counted as one structure) 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 locations of specific piles to be tested must be accepted by the NCDOT prior to any PDA test. Perform PDA tests in accordance with ASTM D 4945-89, Standard Test Method for High Strain Dynamic Testing of Piles and this scope of work.

Analyze data with the Case Pile Wave Analysis Program (CAPWAP), version 2006 or later. At a minimum, analysis is required for a hammer blow near the end of initial drive and for each restrike and redrive. Additional CAPWAP analysis may be required as determined by the Engineer.

Meet the guidelines for NCDOT PDA reports from the Geotechnical Engineering Testing Contract for PDA test reports. To obtain a list of pre-approved Geotechnical Engineering Testing Contract companies to perform PDA testing and guidelines for PDA test report, contact the Geotechnical Engineering Unit at 919-250-4088. PDA testing may be performed by a technician, but PDA testing must be overseen and the reports sealed by a Professional Engineer registered in the State of North Carolina. Submit a complete PDA report sealed by the professional engineer who performed the test to the foundation design firm. The foundation design firm shall develop pile driving inspection charts or tables for acceptance by the NCDOT prior to pile installation.

For drilled-in piles, the following additional requirements apply:

1. Prequalification of contractors is not required for pile excavation or drilled-in pile holes that are 30 inches in diameter or less.

2. Use Class A Concrete in accordance with Article 1000-4 of the NCDOT *2006 Standard Specifications for Roads and Structures* except as modified herein. Provide concrete with a slump of 6 to 8 inches. Use an approved high-range water reducer to achieve this slump. Perform pile excavation to specified elevations shown on the plans. Excavate holes with diameters that will result in at least 3 inches of clearance all around piles. Before filling holes, support and center piles in excavations and

when noted on the plans, drive piles to the required driving resistance. Remove any fluid from excavations and fill holes with concrete.

3. Blasting for core removal is only permitted when approved by the Engineer. Dispose of drilling spoils in accordance with Section 802 of the NCDOT *2006 Standard Specifications for Roads and Structures* and as directed by the Engineer. Drilling spoils consist of all excavated materials including fluids removed from excavations by pumps 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 details 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 should consist of clean watertight steel of ample strength to withstand handling and driving stresses and the pressures imposed by concrete, earth and backfill. Use steel casings with an outside diameter equal to the hole size and a minimum wall thickness of ¼ inch.

4. Check the water inflow rate at the bottom of holes after all pumps have been removed. If the inflow rate is less than 6 inches per half hour, remove any fluid and free fall concrete into excavations. Ensure that concrete flows completely around piles. If the water inflow rate is greater than 6 inches per half hour, propose and obtain acceptance of a procedure for placing concrete before filling holes. Place concrete in a continuous manner and remove all casings.

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 the NCDOT *Drilled Piers Special Provision*. The Design-Build Team shall inspect drilled piers using their Shaft Inspection Device (SID) for any pours using the wet method of concrete placement and for any drilled pier excavations that have remained open greater than 24 hours. 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 as needed. The Department will determine which piers will be CSL tested. Submit CSL test information and results to the Geotechnical Engineering Unit, via the Transportation Program Management Director, for review and acceptance.

The prequalified geotechnical firm that prepared the original design shall perform any changes to the foundation designs. All changes shall be based upon additional information, subsurface investigation and / or testing. Drilled pier tip elevations shall not be changed during construction unless the prequalified geotechnical firm that prepared 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. Send copies of revised designs including additional subsurface information, calculations and any other supporting documentation sealed by a professional engineer registered in the State of North Carolina to the NCDOT for review.

Conduct proofrolling in accordance with Section 260 of the 2006 *Standard Specifications for Roads and Structures.*

Send copies of any inspection forms related to foundations, settlement or retaining walls to the NCDOT for review.

# TRAFFIC MANAGEMENT SCOPE OF WORK (08-02-2010)

## I. Traffic Management Plans

### A. Design Parameters

The Design-Build Team shall prepare the Traffic Management Plans which includes the Temporary Traffic Control Plan, the Traffic Operations Plan, the Public Information Plan as it relates to the Traffic Control Devices, and temporary pavement markings for this project following the parameters listed below:

1. For additional information regarding the components of the Traffic Management Plan, review the Work Zone Safety and Mobility Policy found on the Work Zone Traffic Control Website at:
   http://www.ncdot.gov/doh/preconstruct/wztc/

2. Maintain the same number of existing traffic lanes using a minimum 11-foot wide lane on all roadways, except when lane/road closures are permitted during construction operations as permitted by time restrictions noted elsewhere in this Scope of Work. Under structures only, maintain a minimum 1-foot wide paved shoulder.

   Maintain existing lane and shoulder widths on all two-lane roadways.

   Maintain 4’ wide paved inside and outside shoulder on I-485 unless temporary barrier is placed on the paved shoulder.

3. All traffic control devices shall be placed /located a minimum 2-foot offset (shy distance) from the edge of travel lane.

4. Show temporary barrier system on the Traffic Management Staging Concept. Temporary barrier systems shall be designed in accordance with the following requirements:

   - Perform an Engineering Study to determine the need for temporary barrier that considers clear zone distances, roadway geometry, anticipated construction year traffic volumes, traffic speeds, roadside geometry, workers safety, pedestrian safety, etc. in accordance with FHWA Final 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.

     http://ncdot.org/doh/preconstruct/wztc/DesRes/English/DesResEng.html

- The Design-Build Team shall determine, and adhere to, the length of need, flare rate, clear zone and possible deflection of the proposed temporary barrier system in accordance with NCHRP-350 deflections from crash testing.

- The Design-Build Team shall not place temporary barrier systems utilized for traffic control on unpaved surfaces.

5. The design speed for temporary alignments of NC, US and Interstate routes shall not be lower than the current posted speed limit.

6. The lowest allowable design speed for temporary alignments on secondary roads shall be the higher of 10 mph below the posted speed limit or 35 mph.

7. Roadway Standard Drawing 1101.11 shall be used for calculating the length of temporary merge and shift tapers on existing roadways only. All other temporary alignments shall adhere to the *NCDOT Roadway Design Manual*, 2004 AASHTO *A Policy on Geometric Design of Highways and Streets* and the most current *Highway Capacity Manual*.

   Changes in super elevations should be avoided in the travel lane and shall not exceed 0.04 between edge lines of any direction of travel.

8. Maintain access to all residences, schools, emergency services and businesses at all times.

9. Traffic traveling in the same direction shall not be split (i.e. separation by any type of barrier, bridge piers, existing median, etc.).

10. Prior to incorporation, obtain written approval from the Engineer for all road closures. The Design Build Team shall not place US 74, US 74 Bypass or I-485 traffic on an offsite detour. Offsite detours will be allowed for girder installation and certain drainage construction as described in ICT # 4 on Stallings Road, Austin Chaney Road, Secrest Shortcut Road, Indian Trail/ Fairview Road, Unionville Indian Trail Road, Rocky River Road, US 601 and NC 200. Offsite detours will be allowed on other roads as described elsewhere in this Scope of Work.

11. Prior to incorporation, all offsite detour routes shall be approved in writing by the Engineer and adhere to the following requirements:

    - All detour routes shall be investigated, 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, and investigating pavement structural adequacy.

    - 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.

- The Design-Build Team shall minimize the requests for offsite detours. All proposed offsite detours shall be included in the Technical Proposal, providing justification for using such detours along with duration. Possible detour warrants could include, but are not limited to, road closures due to substandard horizontal or vertical clearance limits, grade changes at tie-in locations and oversize and / or overweight limits.

- Submit the detour route and all associated sign designs for review and acceptance prior to incorporation.

12. 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) and required minimum clear zone widths as follows:

| **Roadway** | **Minimum Clear Width** |
|---|---|
| I-485 | 20 feet |
| All roadways, including ramps and loops | 18 feet |

13. The Design-Build Team shall utilize Changeable Message Signs (CMS) as follows:

- Provide a minimum of four (4) CMS's and operate when needed to display pertinent traffic information relevant to work zone conditions (i.e. road closures, traffic detours, public information, traffic management, access management etc). The location of these CMS's will be determined by the operations requiring the advance warning. These CMS's shall be in addition to any other devices provided by the Department and operated by the Traffic Management Center (TMC). The Design-Build Team shall coordinate with the TMC if and when alternate route or detour information needs to be displayed.
  - All CMSs shall have the functionality to be controlled remotely by the TMC and operated in the field by the Design-Build Team
  - For Alternate and/or detour routes, CMS locations and CMS messages shall be reviewed and approved by the Engineer prior to incorporation

- These CMSs shall be in addition to any other CMSs required by the Roadway Standard Drawings.

- The Design-Build Team shall show approximate CMS locations, along with the respective messages that have been coordinated with the TMC, in the Traffic Management Plans.

14. The Design-Build Team shall provide a smooth pavement surface for traffic at all times.

15. The toll facility shall not be open to traffic until the project is substantially complete and toll equipment is operational. During construction, the toll facility shall not be used for temporary offsite detours.

16. The Design-Build Team shall take steps to minimize disruptions to existing roadway facilities during construction and shall demonstrate how the design, traffic control phasing and construction minimizes inconvenience to the motorist on these facilities.

17. For all areas affected by construction, the Design-Build Team shall develop and submit to the Engineer for approval a Congestion and Incident Management Plan. The plan shall include coordination with emergency response providers such as law enforcement, fire, and EMS services. This plan shall also include project contact information, potential detour routes, towing services, and other associated information.

18. The Design-Build Team shall investigate pedestrian facilities and maintain facilities during construction.

**B. Traffic Management Plan requirements:**

The Design-Build Team shall select a Private Engineering Firm (PEF) that has experience designing and sealing Traffic Management Plans for the North Carolina Department of Transportation (NCDOT) on comparable projects. The Design Build Team shall list projects in the Technical Proposal including a description and similarity to the subject project that the Traffic Management Designer developed.

The Design-Build Team shall develop Traffic Management 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 Traffic Management Plans shall adhere to the "Design-Build Submittal Guidelines" and the "Guidelines for Preparation of Traffic Control and Pavement Marking Plans for Design-Build Projects", which by reference are incorporated herein and are a part of the contract. These documents are available on the Design-Build website.

The Work Zone Traffic Control web site contains useful information that may be needed for the design of the Traffic Management Plans and Pavement Marking Plans.

**http://www.ncdot.org/doh/preconstruct/wztc/**

The Staging Concept shall meet the Contract requirements before the first phase submittal can be submitted. Construction shall not begin until the first phase submittal meets the requirements of the contract. Construction shall not begin on subsequent phase submittals until they meet the requirements of the Contract. Any changes to the staging concept after reviewed, will require a submittal for review prior to any future phasing submittals can be submitted. All submittals shall follow the *2006 NCDOT Roadway Standard Drawings, 2006 Standard Specifications for Roads and Structures*, the "*Guidelines for Preparation of Traffic Control and Pavement Marking Plans for Design-Build Projects*", *Manual for Uniform Traffic Control Devices*, and the "*Design-Build Submittal Guidelines*".

## II. Project Operations Requirements

The following are Time Restrictions and notes that shall be included with the Traffic Management Plans General Notes, unless noted otherwise elsewhere in this RFP:

### Time Restrictions

1. **Intermediate Contract Time #1 and #2 for Lane Narrowing, Closure, Holiday and Special Event Restrictions.**

As a minimum, the Design-Build Team shall maintain existing traffic patterns and shall not close or narrow a lane during the times below. When traffic is placed into the final pattern for any roadway, that will become the minimal traffic pattern and the following time restrictions shall still apply.

| Road Name | Time Restrictions |
|---|---|
| US 74<br>US 74 Bypass<br>I-485<br>Ramps and Loops | Monday through Friday<br>6:00am to 8:00pm<br><br>Saturday and Sunday<br>9:00am to 8:00pm |
| Other -Y- Lines | Monday through Friday<br>6:00 a.m. to 9:00 a.m.<br>and<br>4:00 p.m. to 6:00 p.m. |

The Design-Build Team shall not install, reset, and / or remove any traffic control device during the times listed above.

In addition to the lane narrowing and closure restrictions stated above for all roads, during holidays, holiday weekends, special events, or any other time when traffic is unusually heavy on the roadways listed herein as directed by the Engineer, the

Design-Build Team shall not close or narrow a lane of traffic, detain the traffic flow or alter the traffic flow on the aforementioned facilities. As a minimum, these requirements / restrictions apply to the following schedules:

(a) For New Year's between the hours of 6:00 a.m. December 31st to 8:00 p.m. January 3rd. If New Year's Day is on a Friday, Saturday, Sunday or Monday then until 8:00 p.m. the following Tuesday.

(b) For Easter, between the hours of 6:00 a.m. the Friday before Easter and 8:00 p.m. the Tuesday after Easter.

(c) For Memorial Day, between the hours of 6:00 a.m. the Friday before Memorial Day to 8:00 p.m. the Wednesday after Memorial Day.

(d) For Independence Day, between the hours of 6:00 a.m. July 3rd and 8:00 p.m. July 6th. If Independence Day is on a Friday, Saturday or Sunday, between the hours of 6:00 a.m. the Thursday before Independence Day and 8:00 p.m. the Tuesday after Independence Day.

(e) For Labor Day, between the hours of 6:00 a.m. the Friday before Labor Day to 8:00 p.m. the Wednesday after Labor Day.

(f) For Thanksgiving, between the hours of 6:00 a.m. the Tuesday before Thanksgiving to 8:00 p.m. the Tuesday of the following week.

(g) For Christmas, between the hours of 6:00 a.m. the Friday before the week of Christmas Day and 8:00 p.m. the following Tuesday after the week of Christmas Day.

(h) For any NASCAR event at the Charlotte Motor Speedway, between the hours of 6:00 a.m.,the Wednesday before the 1st track event, until 8:00 p.m. the day after the last track event.

**Liquidated Damages for Intermediate Contract Time #1 for the above lane narrowing, lane closure, holiday and special event time restrictions for US 74, US 74 Bypass, and I-485, including ramps/loops are $5,000 per 30-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 -Y- Lines are $1,000 per hour or any portion thereof.**

**2. <u>Intermediate Contract Time #3 and #4 for Road Closure Restrictions for Construction Operations.</u>**

As a minimum, the Design-Build Team shall maintain the existing traffic pattern for all roadways and follow the road closure restrictions 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.

The Design-Build Team shall not close any direction of travel for the following roads during the times noted below. Closure of these roads or any ramps shall only be allowed for the operations listed in this intermediate contract time restriction.

| Road Name | Time Restrictions |
|---|---|
| US 74<br>US 74 Bypass<br>I-485<br>Ramps and Loops<br>Other -Y- Lines | Monday through Friday<br>6:00 a.m. to 10:00 p.m.<br>and<br>Saturday and Sunday<br>9:00 a.m. to 9:00 p.m. |

Maximum road closure duration of **30 minutes** shall be allowed for the roadways listed in this ICT for the following operations:

- Traffic shifts to complete tie-in work and placement of pavement markings and markers
- Installation of overhead sign assemblies and / or work on existing overhead sign assemblies over travel lanes
- Signal pole installation and cable installation required across travel lanes
- Drainage construction that cannot be accomplished utilizing a lane closure and/or flagging operation
- Placement of bridge girders

Offsite detours will be allowed for the -Y- lines specifically listed in Design Parameter #10 for the sole purpose of girder installation or drainage construction that cannot be accomplished utilizing a lane closure and/or flagging operation. Time restrictions still apply; however, the 30-minute maximum duration does not apply when approve offsite detour is in use.

During an approved offsite detour for roads other than those specifically listed in Design Parameter #10, the day and time restrictions do not apply. The duration of the road closure, listed in the Technical Proposal, will be used to determine the date and time the road will be reopened. This date and time will be used to access liquidated damages according to ICT #4.

Proposed road closures for any road within the project limits shall be approved by the Engineer prior to incorporation in the Traffic Management Plans.

**Liquidated Damages for Intermediate Contract Time #3 for the above road closure time restrictions for US 74, US 74 Bypass, and I-485 including ramps/loops is $2500.00 per 15-minute period or any portion thereof.**

**Liquidated Damages for Intermediate Contract Time #4 for the above road closure time restrictions for -Y- Lines is $500.00 per 15-minute period or any portion thereof**

**Hauling Restrictions**

The Design-Build Team shall adhere to the hauling restrictions noted in the NCDOT 2006 *Standard Specifications for Roads and Structures.*

The Design-Build Team shall conduct all hauling operations as follows:

- The Design-Build Team shall not haul against the flow of traffic of an open travelway unless an approved temporary traffic barrier or guardrail protects the work area.
- The Design-Build Team shall not haul during the holiday and special events time restrictions listed in Intermediate Contract Time #1.
- Haul vehicles shall not enter and / or exit an open travel lane at speeds more than 10 mph below the posted speed limit.
- All entrances and exits for hauling to and from the work zone shall follow the Roadway Standard Drawing.
- Roads used as hauling access points to the project shall be limited to locations chosen by the Design-Build Team and approved by the Department. Hauling entrances, exits and crossing shall be shown on the Transportation Management Plan.
- Single vehicle hauling and multi-vehicle hauling shall not be allowed ingress and egress from any open travel lane during the following time restrictions. The following hauling time restrictions apply only where egress and / or ingress occur between the work areas and any travel lane of the roads noted below, this includes hauling across roadways. Hauling operations that are conducted entirely behind a temporary traffic barrier or guardrail are allowed at all times and are excluded from the following time restrictions:

**For Single and Multiple Vehicle Hauling**

| Road Name | Day and Time Restrictions |
|---|---|
| US 74 and US 74 Bypass, All Other -Y- Lines (Only Left turn movements from roadways to project site is restricted during these hours) | Monday through Friday 6:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m. |

Hauling across a roadway will require Traffic Control and is subject to the 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 materials to and from the site and hauling of materials within NCDOT right of way.

The Design Build Team shall monitor peak periods during construction and minimize hauling during these times beyond the times listed above.

**B. Lane and Shoulder Closure Requirements**

The Design-Build Team shall not install more than 1 mile of lane closures 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 all roads, the Design-Build Team shall not install more than one lane closure in any one direction.

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 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 NCDOT *2006 Roadway Standard Drawing* No. 1101.04, 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 5 feet of an open travel lane, the Design-Build Team shall close the nearest open travel lane using NCDOT *2006 Roadway Standard Drawing* No. 1101.02, 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 10 feet of an open travel lane, the Design-Build Team shall close the nearest open travel lane using NCDOT *2006 Roadway Standard Drawing* No. 1101.02, 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 close the lane using the appropriate roadway standard drawing from the NCDOT *2006 Roadway Standard Drawings.* The Design-Build Team shall conduct the work so that all personnel and / or equipment remain within the closed travel lane.

The Design-Build Team shall not perform work involving heavy equipment within 15 feet of the edge of travelway when work is being performed behind a lane closure on the opposite side of the travelway.

## C. 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 and / or use proper traffic control setup to protect traffic from the drop off as follows:

- Elevation differences that exceed 2 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 3 inches on roadways with posted speed limits less than 45 mph and with a paved shoulder four-foot wide or less.
- Refer to the 2002 *AASHTO Roadside Design Guide* for proper treatment of all other conditions.

Do not exceed a difference of 2 inches in elevation between open lanes of traffic for nominal lifts of 1.5 inches. Install advance warning "UNEVEN LANES" signs (W8-11) 500 feet in advance and a minimum of every half mile throughout the uneven area.

## D. 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 for public information requirements.)

## E. Signing

The Design-Build Team shall install advance work zone warning signs when work is within 100 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 signs 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 be responsible for the installation and maintenance of all detour signing. 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) are in place at all times during construction, as required by the *MUTCD*.

**F. 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.

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.

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.

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).

At acceleration ramps / loops, 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 rails and temporary barrier systems and include this information in the appropriate plans.

## G. 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 is shown on NCDOT Work Zone Traffic Control website at http://www.ncdot.org/doh/preconstruct/wztc/. The use of any devices that are not shown on the Approved Product List shall require written approval from the Transportation Management Director.

In tangent sections, channelizing device spacing shall not exceed a distance in feet equal to twice the posted speed limit. At intersections and driveway radii, channelization devices shall be spaced 10 feet on-center and 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 2006 *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.

When a CMS is placed within the clear zone, provide proper delineation and protection for the traveling public.

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.

## H. Temporary Pavement Markings, Markers and Delineation

The Design-Build Team shall provide Temporary Pavement Markings 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 Qualified Products List. The list is available at http://www.ncdot.org/doh/preconstruct/traffic/congestion/sign/. The use of any devices that are not shown on the Qualified Products List shall require approval from the Director of the Transportation Program Management Unit.

The Design-Build Team shall install pavement markings and markers in accordance with the NCDOT 2006 *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 marking on all roadways. For roadways that do not have existing pavement marking, install temporary pavement markings that are the same width as required in the Pavement Marking Scope of Work for the final pavement marking.

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 Existing Structures | Minimum of Paint | Raised Temporary |
| Proposed Structures | Cold Applied Plastic (Type IV) | Raised Temporary |

The Design-Build Team may use any type of pavement markings on the NCDOT Qualified Products List for temporary pattern. However, the Design-Build Team shall maintain a minimum retroreflectivity for pavement markings on all roads (existing and temporary) at all times during construction, as follows:

| | |
|---|---|
| White: | 125 mcd / lux / m2 |
| Yellow: | 100 mcd / lux / m2 |

When using Cold Applied Plastic (Type IV) pavement markings, place temporary raised markers half on and half off edgelines and centerlines to help secure the tape to the roadway. Markers shall be spaced the appropriate distance apart as described by the 2006 *Roadway Standard Drawing* 1250.01, Sheet 1 of 3.

Prior to opening a roadway to traffic on facilities that the installation of a proposed monolithic island has not occurred, outline the location of the proposed monolithic island with the proper color pavement marking and delineate the proposed monolithic island with drums.

Place at least 2 applications of paint for a temporary traffic pattern that will remain in place over three (3) months. Place additional applications of paint upon sufficient drying time, as determined by the Engineer.

Tie proposed pavement marking lines to existing pavement marking lines.

Replace any pavement markings that have been damaged by the end of each day's operation.

The Design-Build Team shall not place temporary markings on any final asphalt pavement surface unless the temporary markings are placed in the exact location of the final pavement marking.

The Design-Build Team shall remove all conflicting markings or markers prior to shifting traffic to a new pattern.

Unless noted otherwise elsewhere in this RFP, removal of the temporary pavement markings on asphalt surfaces shall be accomplished by an NCDOT approved system to minimize damage to the road surface. All temporary pavement markings on concrete pavement shall be removed by water blasting. Temporary pavement markings shall not be obliterated with any type of Black Pavement Markings (paint or other material). The Design-Build Team shall remove 100% of all temporary pavement markings without removing more than 1/32-inch of the pavement surface.

## I. Temporary Traffic Signals

Use the following notes if the Design-Build team recommends using temporary signals for maintenance of traffic.

- Notify the Engineer two months before a traffic signal installation by others is required.
- Shift and revise all signal heads as shown on the approved Design Build signal plans.

## J. Miscellaneous

Provide portable temporary lighting to conduct night work in accordance with the NCDOT 2006 *Standard Specifications for Roads and Structures*.

Provide proper drainage for all temporary alignments and / or traffic shifts.

Law enforcement officers may be used to help protect workers and road users, and to maintain safe and efficient travel through the work zones. 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 address where and why law enforcement officers will be used. 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 Department will not grant an ordinance for a $250 penalty for speeding in the work zone for this project.

The Department will not grant a speed reduction ordinance for this project.

The Design-Build Team shall be responsible for all required temporary shoring, including but not limited to 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 5 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 Traffic Control Staging Concept. The Design-Build Team shall install temporary traffic barrier as shown on a detail available from the Work Zone Traffic Control Unit 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 Section websites have more information on temporary shoring. (Notes related to Temporary Shoring are not required in the General Notes sheet for the Traffic Management Plan)

**http://www.ncdot.org/doh/preconstruct/highway/geotech/formdet/standards.html**

**http://www.ncdot.org/doh/preconstruct/wztc/DesRes/English/TemporaryShoring/TempShoring.pdf**

The Design-Build Team shall adhere to the additional shoring requirements located on the Work Zone Traffic Control Section and Geotechnical Engineering Unit websites.

The Design-Build Team shall identify on the appropriate traffic control detail where temporary shoring will be used by providing station limits, offsets, the type of shoring and where temporary traffic barrier will be located if needed.

## K. Traffic Control Supervisor

The Design-Build Team shall furnish a Traffic Control Supervisor for the project who is knowledgeable of Traffic Control Plan design, devices and application, and has full authority to ensure traffic is maintained in accordance with the plans and specifications.

The Design-Build Team shall identify a Traffic Control Supervisor in their Technical Proposal that has the following qualifications:

(A) A minimum 24 months of On-the-Job Training in supervision and work zone set up and implementation on similar projects.

(B) 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 be capable of performing the following:

(1) Be available and on call at all times to 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 Traffic Management Center personnel in Mecklenburg County to ensure proper messages are displayed on the CMSs and DMSs.
(4) Provide traffic control setup that ensures safe traffic operations and workers' safety throughout the construction area.
(6) Attend all scheduled traffic control coordination meetings, as required by the Engineer.
(7) Monitor traffic delays and backups within the work zone. Coordinate with the TMC as required by this Scope of Work. (Reference Design Parameter #13)

## PAVEMENT MARKINGS SCOPE OF WORK (07-30-2010)

### General

The Design-Build Team shall prepare Final Pavement Marking Plans in accordance with the 2003 edition of the *Manual on Uniform Traffic Control Devices (MUTCD)*, the NCDOT Roadway Standard Drawings (July 2006), *"Guidelines for Preparation of Traffic Control and Pavement Marking Plans for Design-Build Projects"*, and the *"Design-Build Submittal Guidelines"* and the contract 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 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).*

### Final Pavement Marking Project Limits

The Final Pavement Marking Plans shall address any required modifications to existing pavement markings located outside the project limits to ensure appropriate tie-ins. The Design-Build Team shall be responsible for installing 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 and markers until the Final Pavement Marking Plans are submitted for review and acceptance.

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 Engineer.

The Design-Build Team shall install pavement markings and markers in accordance with the NCDOT 2006 *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 |
|---|---|---|
| -L- Edgelines and Ramps | Polyurea with Highly Reflective Elements* | Snowplowable (Raised on bridge decks) |
| -Y- Lines and Service Roads | Thermoplastic or Polyurea with Standard Beards | (Raised)** |

*On concrete pavements, also provide black contrast skip lines.

**Provide snowplowable markers for existing roads that currently have snowplowable markers.

All US routes and the Monroe Bypass require 50% wider markings, i.e., lane lines, edge lines and skips shall be 6 Inches wide.

Use water blasting or grinding to remove all residue and surface laitance on all concrete surfaces prior to placing pavement marking materials.

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.

## SIGNING SCOPE OF WORK (07-30-10)

### General

The signing shall be designed, fabricated, and constructed by the Design-Build Team in accordance with the latest edition of the 2009 *Manual on Uniform Traffic Control Devices (MUTCD)*, the *NC Supplement to the MUTCD*, *NCDOT Standard Specifications for Roads and Structures (July 2006)*, the *NCDOT Roadway Standard Drawings (July 2006*, the latest *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals* published by AASHTO, "Guidelines for Preparation of Signing Plans for Design-Build Projects", "Design-Build Submittal Guidelines", NCTA's Monroe Connector / Bypass Signing Schematic dated August, 2010, and NCTA's Toll Facility Signing Requirements.

### Signing Plan Requirement

The Design-Build Team shall select a Private Engineering Firm (PEF) that has experience in designing Signing Plans for NCDOT on projects comparable to this project. NCTA shall provide the Design-Build Team with the Monroe Connector / Bypass Signing Schematic dated August, 2010 and the Toll Facility Signing Requirements for the Monroe Connector / Bypass corridor for the Design-Build Team's use in developing its signing plan. The Design-Build Team shall not eliminate any signing shown in the Monroe Connector / Bypass Signing Schematic dated August, 2010.

At a minimum, the Design-Build Team shall include preliminary or conceptual plans along existing US 74 from the beginning of the project, including frontage roads, to the limits of Inset B on the Signing Schematic dated August, 2010. These plans shall include all signs, including Type D, E, and F signs.

### Signing Project Limits

The Design-Build Team shall be responsible for the design, fabrication and installation of all toll road and standard signs required on US 74 Bypass, I-485, US 74, US 601, NC 200-Morgan Mill Road, Indian Trail-Fairview Road, Unionville Indian Trail Road, Rocky River Road, Austin Chaney Road, Forest Hills Schools Road, all ramps, loops, and -Y- Lines.

The Design-Build Team shall also be responsible for the design, fabrication and installation of all signs required beyond the construction limits of the mainline, all -Y- Lines and all cul-de-sacs to ensure adequate advance signage and spacing is provided.

The posted speed limit for this facility shall be 65 MPH.

### Sign Design

The Design-Build Team shall be responsible for all Type A, B, and D sign designs, fabrication and installation for ground mounted signs including temporary "All Traffic Exit" signing. The Design-

Build Team shall be responsible for sizing, fabricating, locating and installing all Type E (warning and regulatory signs) and Type F signs (route marker assemblies), and milemarkers.

The Design-Build Team shall be responsible for the design, fabrication and installation of all signs required for superstreet traffic pattern. A detail for superstreet signing may be found at the following website:

**http://www.ncdot.org/doh/preconstruct/traffic/congestion/docs/superstreet.pdf**

The Design-Build Team shall design, fabricate and install milemarkers every half mile on the project. Each milemarker location shall have two milemarkers mounted back to back on one U-post on the outside shoulder for each direction of travel on the mainline. The milemarker designs shall be in accordance with the Intermediate Enhanced Reference Location Signs (D10-5) referenced in the *Standard Highway Signs (2004 Edition)*.

The Design-Build Team shall design, fabricate and install Thru Bolts for Type A Signs in accordance with the NCDOT Roadway Standard Drawing No. 901.10 dated January 2008. The revised Roadway Standard Drawing is located at the following website:

**http://www.ncdot.org/doh/preconstruct/traffic/congestion/SIGN/signstd/**

All sign designs shall be included in the Signing Plans. All sign designs shall be prepared using the 5.1 version of GuidSign software. The latest GuidSign updates are located at the following website:

**http://www.ncdot.org/doh/preconstruct/traffic/congestion/SIGN/default.html**

**Electronic Toll Collection Signing**

The Design-Build Team shall be responsible for the design, fabrication, and installation of all toll road signs in accordance with the Toll Facility Signing Requirements (TS-1 and TS-2) provided by the NCTA. The background for toll guide signs shall be green. Electronic Toll Collection Signing logo pictographs, provided by NCTA, shall be used on the ETC signs. Design of signs containing logos shall be in accordance with Chapter 2F of the *MUTCD*.

**Customer Service Center Signing**

The Design-Build Team shall be responsible for the design, fabrication, and installation of all Customer Service Center signs including mainline, ramp, and trailblazer signs in accordance with the Toll Facility Signing Requirements (TS-3) provided by the NCTA. Electronic Toll Collection Signing logo pictographs, provided by NCTA, shall be used on the Customer Service Center signs.

**Logo Signs**

The Design-Build Team is responsible for reconfiguring the Logo signing for I-485 Exit 51 according to the Monroe Connector / Bypass Signing Schematic dated August, 2010. This includes removal of existing Logo signs, designing, locating, and installing new Logo signs (blue service

signs with specific business panels included on signs), and relocating existing Logo business panels.

**Sign Maintenance**

The Design-Build Team shall maintain all existing ground mounted and overhead signs that are affected by construction, including temporary installations of Guide and Logo Signs on supports, overhead assemblies, foundations, lighting systems and any other element of the sign system in accordance with Section 908-3(C) of *2006 Standard Specifications for Roads and Structures* to ensure signs are properly maintained and visible during project construction. If damage occurs to the Logo Signs or the business panels during construction or installation, notify the Division Logo Coordinator as soon as possible. The Design-Build Team shall be responsible for replacement of Logo Signs or Logo business panels should damage occur. If the Logo Signs are removed and disposed of per the RFC signing plans, the business panels on the signs shall be removed and returned to the Division Logo Coordinator. The order of preference for Logo Signs shall be maintained during project construction (see MUTCD section 2F.02).

**Temporary Signs**

The Design-Build Team shall be responsible for designing, fabricating, and installing temporary signs and supports. Reference the Signing Section of the Traffic Management Scope of Work found elsewhere in this RFP for additional temporary signing requirements.

**Sign Locations**

The Design-Build Team shall be responsible for determining the station locations for all signs. To avoid sign placement in locations where their usefulness will be short-lived, the Design-Build Team shall coordinate the proposed sign locations with existing and future projects through NCTA and NCDOT.

**Ground Mounted Support Designs**

The Design-Build Team is responsible for all design, fabrication, and installation of ground mounted supports and signs. The latest version of the support program is located at the following website:

http://www.ncdot.org/doh/preconstruct/traffic/congestion/SIGN/default.html

Exit Gore signs shall be erected on omni-directional breakaway supports.

**Overhead Sign Assemblies**

The Design-Build Team shall be responsible for the design, fabrication, and installation of new overhead sign assemblies for the project as identified on the Monroe Connector / Bypass Signing Schematic dated August, 2010.

The Design-Build Team may modify existing overhead sign assemblies to accommodate proposed signs if the following conditions are met:

- Aesthetic treatments, as may be required; and
- A structural analysis is performed for any sign structure where the total area of all sign panels on the structure exceeds the original design wind load area for that structure which satisfies the NCTA that the existing structure can accommodate the proposed sign panels in accordance with the latest version of the latest AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals; or
- Demonstration that the total area of all sign panels on the structure does not exceed the original design wind load area for that structure.

The Design-Build Team shall prepare shop drawings for NCTA and the NCDOT Transportation Program Management Unit's review of all modified overhead sign structures.

The windspeed for the overhead sign assembly designs is 90 MPH. The Design-Build Team is responsible for calculating the windload area for the overhead sign assemblies. The windload area will be equal with the proposed sign panel height and width on the overhead sign assemblies. Include exit panels as part of the sign height when calculating the windload area. The coordination with future projects and sign messages shall be considered when designing and fabricating overhead sign assemblies.

Based upon the signs depicted in the NCTA's Monroe Connector / Bypass Signing Schematic dated August, 2010, the windload area for several overhead signs is anticipated to exceed 800 square feet, which is permissible.

Overhead Sign Assemblies denoted with an asterisk on the Monroe Connector / Bypass Signing Schematic dated August, 2010 shall be designed, fabricated and installed in accordance with the Aesthetics Design Scope of Work.

The Design-Build Team shall design, fabricate, and install overhead sign supports and foundations in accordance with the Standard Special Provisions for Overhead Sign Supports and Overhead Sign Foundations found elsewhere in this RFP.

The Design-Build Team shall be responsible for designing, fabricating and installing median barrier footing and median transitional barrier in accordance with the *2006 Roadway Standard Drawing No 854.05* for any new overhead sign assembly that will replace an existing assembly mounted on median barrier.

The Design-Build Team shall justify the bottom edge of all signs on each assembly in a horizontal plane.

Monotube sign support structures shall not be allowed.

**Pedestal Overhead Sign Assemblies**

The Design-Build Team has the option to design pedestal overhead sign assemblies for advance guide signs on multi lane facilities as an alternative to cantilever overhead sign assemblies. Signs with exit directional and "EXIT ONLY" designation shall not utilize pedestal assemblies.

The Design-Build Team shall use pedestal overhead assemblies for DMS signs. Pedestal DMS sign assemblies shall include aesthetic considerations consistent with the overhead sign structures.

Pedestal overhead sign assemblies shall have a minimum 20 feet offset from the edge of travel lane to the centerline of the support. The Design-Build Team shall install guardrail or other approved protection for the overhead sign support.

The Design-Build Team shall design, fabricate, and install pedestal sign supports and foundations in accordance with the Standard Special Provisions for Overhead Sign Supports and Overhead Sign Foundations found elsewhere in this RFP.

**Overhead Sign Supports for Freeways**

On freeway facilities, overhead sign supports shall be located 40 feet from the edge of the outside travel lane to the center of the sign support. If the 40-foot distance cannot be obtained, the overhead sign supports shall be located a minimum 20 feet from the outside travel lane and protected by guardrail or another NCDOT approved positive protection barrier.

**Overhead Sign Sheeting**

The Design-Build Team shall design and fabricate overhead signs using Type VIII, IX or XI reflective sheeting for the legends (text) and background. The Type of sheeting selected by the Design-Build Team shall be consistent throughout the project.

No overhead sign lighting is required for advance guide or exit directional overhead signs.

**Guardrail or Other Protection for Signs and Overhead Assemblies**

The Design-Build Team shall be responsible for determining, designing and installing any protection for proposed and existing sign supports.

**Signing Roadway Standards, Typical Sheets and Specifications**

Signing roadway standards and typical sheets to be used in summarizing quantities, standard specifications, and compiling Type E and F signs can be located at the following website:

**http://www.ncdot.org/doh/preconstruct/traffic/congestion/SIGN/default.html**

The Design-Build Team shall incorporate the appropriate information onto these sheets and submit them to NCTA and the NCDOT Transportation Program Management Director for review and acceptance.

**Removal and Disposal of Existing Signs**

The Design-Build Team shall be responsible for determining existing signs that will no longer be needed upon completion of the project, on -Y- lines and project tie-ins. The Design-Build Team shall be responsible for removal and disposal of these signs and supports. The Design-Build Team shall show and note these signs on the signing plan view sheets.

**Signing Construction Revisions**

Any construction revision must be submitted to NCTA and the NCDOT Transportation Program Management Unit for review prior to incorporation.

**Toll Road and DMS Assemblies**

The Design-Build Team shall determine exact station locations for Toll Road and DMS assemblies; prepare structure line drawings to include dead load, DMS notes and details, and design windspeed; complete field verification; and provide conduit and all other requirements for overhead sign assemblies to be approved by NCTA.

**SIGNALS SCOPE OF WORK** (08-10-10)

## I. GENERAL

The Design-Build Team shall design and prepare plans for new traffic signal installations and revisions to existing traffic signals. This work shall include, but not be limited to, the preparation of Traffic Signal Plans, Electrical and Programming Details, Utility Make-Ready Plans, Wireless Communication Plans and Project Special Provisions. These plans shall be prepared in accordance with the "*Design-Build Submittal Guidelines*" and the "*Guidelines for Preparation of Traffic Signal & Intelligent Transportation System Plans on Design-Build Projects*" available on the Design-Build website.

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 similar projects on which the PEF has developed ITS & Signal Plans. The PEF must be prequalified for ITS (signal system design), Traffic Signal Design and Electrical Detail design work under the ITS & Signals Unit's normal prequalification procedure.

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 NCDOT ITS & Signals Unit after this pre-design meeting has occurred.

The Design-Build Team shall coordinate and implement all signal designs at the appropriate time as directed by the Engineer. The Design-Build Team shall maintain, monitor and adjust the traffic signals as needed throughout the project. The Design-Build Team shall also be responsible for the design and implementation of all temporary signal designs needed to maintain traffic during construction. The Design-Build Team shall maintain full actuation, as well as system communications, of all traffic signals on this project during the life of the project.

The Design-Build Team shall be responsible for providing a safe and economical design for the public. The Design-Build Team shall be responsible for ensuring that all plans and designs conform to the current design standards of the Intelligent Transportation Systems & Signals Unit. All signal cable shall be 7 conductor. All plans and associated design material and specifications shall be reviewed and accepted by NCDOT before installation.

The Design-Build Team shall deliver all existing cabinets and contents that are not reinstalled or reused on this project to the Division 10 Traffic Services Office located at 903 Coble Avenue, Albemarle, NC 28001.

## II. TRAFFIC SIGNALS

The Design-Build Team shall revise and upgrade seven (7) existing traffic signals and install six (6) new traffic signals. Refer to Section III for the system interconnection requirements. The Design-Build Team may use video detection for temporary traffic patterns during construction. However, the traffic signal detection for the final traffic patterns shall be inductive loop

detection. The traffic signal work required and signal communications requirements at each intersection are listed below.

| Existing Signals (7) | | |
|---|---|---|
| **Signal Number** | **Intersection Description** | **Work Requirements** |
| **10-0599** | US 74<br>Andrew Jackson Hwy<br>at<br>SR 1365<br>Stallings Road | The Design-Build Team shall upgrade these existing traffic signals to match all temporary construction phasing and the proposed final traffic pattern. This may require, but not be limited to, signal phasing changes, signal head changes, installation of an auxiliary file, closed loop system detectors and system interconnection equipment. The Design-Build Team may reuse the existing controllers and cabinets during the temporary construction phases (10-1720 currently uses a NEMA controller), however new 2070L controllers and new cabinets shall be installed for the final traffic pattern at all signalized intersections. All traffic signals must remain in full operation during all temporary construction phases.<br><br>The Design-Build Team shall coordinate all Flashing Yellow Arrow signal recommendations with the Division Traffic Engineer and the Regional Traffic Engineer prior to final design and installation.<br><br>Vehicle detection, as noted above, shall be maintained for all movements throughout the life of the project.<br><br>The Design-Build Team shall use **wood poles** as signal supports for all temporary construction phases and for the final traffic patterns, except that metal mast arms shall be used for Signal 10-0599. |
| **10-0550** | US 74<br>Andrew Jackson Hwy<br>at<br>SR 1520<br>Indian Trail – Fairview Rd | |
| **10-1533** | SR 1367<br>Unionville Indian Trail Road<br>at<br>SR 1501<br>Secrest Short Cut Road | |
| **10-1725** | SR 1501<br>Secrest Shortcut Rd<br>at<br>SR 1007<br>Rocky River Rd | |
| **10-1720** | US 601<br>Concord Hwy<br>at<br>SR 1504<br>Ridge Rd /<br>Baucom Deese Rd | |
| **10-1295** | US 74<br>Andrew Jackson Hwy<br>at<br>SR 1754<br>Forest Hills School Road | |
| **10-1340** | US 74<br>Andrew Jackson Hwy<br>at<br>Cuddy Rd /<br>Entrance to Cuddy Farm Plant | |

| Proposed Signals (6) | | |
|---|---|---|
| **Signal Number** | **Intersection Description** | **Work Requirements** |
| **10-2089** | Monroe Bypass<br>EB Ramp<br>at<br>SR 1520<br>Indian Trail-Fairview Road | The Design-Build Team shall design and install a new, fully actuated traffic signal at each location listed in this table. Each design shall include a new 2070L controller in a new cabinet. The cabinet shall include an auxiliary output file, closed loop system detectors and system interconnection equipment.<br><br>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 Division Traffic Engineer and the Regional Traffic Engineer prior to final design and installation.<br><br>Vehicle detection shall be designed for all movements.<br><br>The Design-Build Team shall use **wood poles** as signal supports.<br><br>Upon placing each signal in operation (includes temporary operation if necessary), install the required wireless communication system equipment as described in Section III. |
| **10-2090** | Monroe Bypass<br>WB Ramp<br>at<br>SR 1520<br>Indian Trail-Fairview Road | |
| **10-2087** | Monroe Bypass<br>EB Ramp/Loop<br>at<br>SR 1007<br>Rocky River Road | |
| **10-1820** | Monroe Bypass<br>EB Ramp<br>at<br>US 601 | |
| **10-1821** | Monroe Bypass<br>WB Ramp<br>at<br>US 601 | |
| **10-2088** | Monroe Bypass<br>EB Ramp<br>at<br>NC 200 | |

## III. SIGNAL COMMUNICATIONS

The Design-Build Team shall install and / or maintain a spread spectrum wireless communication system which serves as the communications medium between existing traffic signals and/or new traffic signals as required below to form Closed Loop Traffic Signal Systems.

Each Wireless Closed Loop Signal System shall utilize 900 MHz spread spectrum radio as the communications medium. The signals for each system are listed below:

| Signal System #1 – Existing US 74 (Indian Trail) Signal System | | |
|---|---|---|
| **Signal Number** | **Intersection Description** | **Work Requirements** |
| **10-0599** | US 74<br>Andrew Jackson Hwy/<br>Independence Blvd<br>at<br>SR 1365<br>Stallings Road | These signals are **existing** and are currently operating as part of an existing wireless closed loop signal system. Maintain communications with the existing closed loop signal system during all construction phases of the project. The master controller for the existing closed loop signal system is located at the intersection of US 74 at Harris Teeter Distribution Center Entrance / Faith Church Road (Signal Number 10-0713) |
| **10-0550** | US 74<br>Andrew Jackson Hwy/<br>Independence Blvd<br>at<br>SR 1520<br>Indian Trail Fairview Road | |

# New Standalone Wireless Closed Loop Signal Systems:

| Signal System #2 – Indian Trail-Fairview Rd. at US 74 Monroe Bypass System | | |
|---|---|---|
| **Signal Number** | **Intersection Description** | **Work Requirements** |
| **10-0778**<br><br>**(existing isolated signal)** | SR 1520<br>Indian Trail-Fairview Road<br>at<br>SR 1501<br>Secrest Shortcut Rd. | The Design-Build Team shall interconnect the **existing** signal and the new signals to form a standalone closed loop traffic signal system using wireless communications. The Design-Build Team shall also install a GPS time lock in the master controller cabinet. |
| **10-2089** | Monroe Bypass<br>EB Ramp<br>at<br>SR 1520<br>Indian Trail-Fairview Road | |
| **10-2090** | Monroe Bypass<br>WB Ramp<br>at<br>SR 1520<br>Indian Trail-Fairview Road | |

| Signal System #3 – SR 1007 (Rocky River Road) at Monroe Bypass System | | |
|---|---|---|
| **Signal Number** | **Intersection Description** | **Work Requirements** |
| **10-0754**<br><br>**(existing isolated signal)** | SR 1514<br>Rocky River Road<br>at<br>SR 1367<br>Unionville Indian Trail Rd | The Design-Build Team shall interconnect the **existing** signals and the new signal to form a standalone closed loop traffic signal system using wireless communications. The Design-Build Team shall also install a GPS time lock in the master controller cabinet. |
| **10-2087** | Monroe Bypass<br>EB Ramp/Loop<br>at<br>SR 1007<br>Rocky River Road | |
| **10-1725**<br><br>**(existing isolated signal** | SR 1501<br>Secrest Shortcut Rd<br>at<br>SR 1007<br>Rocky River Rd | |

| Signal System #4 – US 601 at Monroe Bypass System | | |
|---|---|---|
| **Signal Number** | **Intersection Description** | **Work Requirements** |
| **10-1720**<br><br>**(existing isolated signal)** | US 601<br>at<br>SR 1504<br>Ridge Rd /<br>Baucom Deese Rd | The Design-Build Team shall interconnect the **existing** signal and the new signals to form a standalone closed loop traffic signal system using wireless communications. The Design-Build Team shall also install a GPS time lock in the master controller cabinet. |
| **10-1820** | Monroe Bypass<br>EB Ramp<br>at<br>US 601 | |
| **10-1821** | Monroe Bypass<br>WB Ramp<br>at<br>US 601 | |

**Communications Plans and Project Special Provisions**

Prior to construction, the Design-Build Team shall provide a detailed set of Communications Plans and Project Special Provisions for the Department's review and acceptance. No

construction related to the installation of the communications system shall begin until NCDOT has accepted the RFC Plans and Specifications.

Prior to installing any new Spread Spectrum Wireless Radio Systems equipment, the Design-Build Team shall perform a Radio Path Site Survey Test. The Design-Build Team shall ensure that the test evaluates the Signal Strength (dBm), Fade Margin (dB), Signal-to-Noise Ratio, Data Integrity (poll test) and a complete frequency spectrum scan. The Design-Build Team shall ensure that the Radio Path Site Survey Test is performed using the supplied brand of radio equipment to be deployed. During the initial Radio Path Signal Strength Test, the Engineer may determine, at no additional cost, that a repeater station shall be necessary to complete the intended link. The Design-Build Team shall submit the test results to the Engineer for review and acceptance. The Design-Build Team shall submit copies of the test results and colored copies of the frequency spectrum scan along with an electronic copy of this information. The Engineer will approve final locations of all antennas and any necessary repeater stations.

The Design-Build Team shall install all antenna in such a manner that avoids conflicts with other utilities (separation distances in accordance with the guidelines of the NESC) and as specified in the antenna manufacturer's recommendations.

The Communications Plans and Project Special Provisions shall consist of the four major items listed below:

- Wireless Signal System Strength Test
- Wireless Communications Plans that include the type and size of antennas and their mounting heights.
- Project Special Provisions
- Catalog Cut Sheets

## ENVIRONMENTAL PERMITS SCOPE OF WORK (08-06-10)

The NCTA will obtain a conceptual US Army Corps of Engineers Section 404 Permit and a NC Department of Natural Resources (NCDENR), Division of Water Quality (DWQ) Section 401 Water Quality Certification for the project corridor. This conceptual permit is based on the current functional design plans for the project. Final permits will be required prior to construction. The Design-Build Team may pursue permit modifications to the Monroe Connector (west of US 601) independent of the Monroe Bypass (east of US 601) or vice versa. This scope of work outlines the Design-Build Team's responsibilities related to the final permitting of the project.

### General

The NCTA will not allow direct contact between the Design-Build Team and representatives of the environmental agencies either by phone, e-mail or in person, without representatives of the NCTA or the NCDOT Transportation Program Management Unit present. A representative from NCTA and the NCDOT Transportation Program Management Unit shall be included on all correspondence.

The Design-Build Team shall be responsible for preparing all documents necessary for the NCTA to obtain the final environmental permits for the project. Major permit modifications are required for the US Army Corps of Engineers Section 404 Permit and the NCDENR, Division of Water Quality (DWQ) Section 401 Water Quality Certification. The Design-Build Team shall also acquire an NCDENR State Stormwater Permit. 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 permitted investigative borings covered under Nationwide Permit # 6).

The Design-Build Team may begin other 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. Upon consultation with the NCDOT Project Development and Environmental Analysis (PDEA) Natural Environment Unit, a meeting may be required with the permitting agencies prior to beginning work.

NCTA is utilizing a SAFETEA-LU Section 6002 compliant Project Coordination Plan for coordinating with environmental resource and regulatory agencies on this project. This process is being used in lieu of the Merger 01 Process, and while it includes the same general milestones as the Merger 01 Process, written concurrence from agency representatives is not required to advance the project development and permitting process. NCTA has advanced the project through identification of avoidance and minimization measures (equivalent to Concurrence Point 4A in the Merger 01 Process).

The Design-Build Team shall be responsible for advancing the project through the remainder of hydraulic design and permit impact reviews (equivalent to Concurrence Point 4B and 4C). Any variations in the NCTA's proposed design and/or construction methods that require additional coordination with the environmental agencies shall be the sole responsibility of the Design-Build Team. The NCTA shall not allow any contract time extensions associated with this additional coordination. The Design-Build Team shall follow the appropriate details in the document titled

"Project Coordination Plan for the Monroe Connector/Bypass Project" contained in Appendix A-5 of the Draft EIS as well as the document titled "Merger 01 Implementation Team – Merger 01 Process Information" which will be provided to the teams on the Reduced Candidates List.

The Design-Build Team shall provide roadway plans and permit impact sheets (half-size plans) to the NCDOT Director of Transportation Program Management a minimum of five weeks before the respective meetings.

The Design-Build Team shall clearly identify in their Technical Proposal what months they would like the NCTA to schedule agency coordination meetings to review the hydraulic design and permit drawings. Failure on the part of the Design-Build Team to meet these dates as identified in their Technical Proposal, places all responsibility for associated delays solely on the Design-Build Team.

Unless otherwise noted 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 agency coordination meetings and shall be held accountable for meeting all permit conditions. The Design-Build Team shall be required to staff any personnel the Design-Build Team deems necessary to provide permit compliance.

The Design-Build Team shall develop and implement an Environmental and Permit Monitoring Plan. The Design-Build Team shall engage the person that prepared the project permit, unless otherwise approved, to provide impartial environmental and permit monitoring services during each phase of construction, including but not limited to construction runoff water quality device inspections, hazardous material spill reporting and response, compliance with USACE Section 404 Permit requirements, NCDENR 401 Certifications, and notifications of archaeological discoveries. This individual shall also be responsible for coordinating, leading and preparing minutes for monthly resource agency field reviews.

**Major 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, including those resulting from agency coordination, and 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 NCTA as part of the permit application package. The Design-Build Team shall be responsible for developing the permit application for all jurisdictional impacts. The permit application shall include all utility relocations. The permit application shall consist of, at a minimum, the following:

- Cover Letter
- Minutes from the agency coordination meetings to review the hydraulic design and permit impacts
- Permit drawings
- Half-size plans
- Completed forms (Section 404 ENG 4345, etc.) appropriate for impacts

In addition to the above, the Design-Build Team shall provide an electronic package of the 401 Certification application and drawings to USACE and DWQ concurrent with the paper copies. Guidance for preparing these electronic documents will be provided by the NCTA.

Direct coordination between the Design-Build Team, the NCDOT's Director of Transportation Program Management, NCTA and the NCDOT PDEA Natural Environment Unit 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 NCTA and the NCDOT's Director of Transportation Program Management for review and approval. The NCTA will subsequently forward the package to the appropriate agencies to have the permit application placed on public notice.

The Design-Build Team may pursue permit modifications to the Monroe Connector (west of US 601) independent of the Monroe Bypass (east of US 601), for a total of two permit modification packages for the project. The Design-Build Team shall not submit additional applications to further develop a "staged permitting" process to expedite construction activities in a phased fashion.

Any temporary construction measures, including de-watering, construction access, etc. shall be addressed in the permit application. Impacts that result from so-called temporary measures may not be judged to be temporary impacts by the agencies. These issues must be addressed and reviewed by NCTA prior to the agency coordination meetings to review the hydraulic design and permit impacts and resolved with the agencies during these meetings.

The Design-Build Team shall clearly indicate the location of and impacts of haul roads and utility relocations on jurisdictional areas. The Design-Build Team shall identify all proposed borrow and waste sites. These details shall be included in the permit application data. Further, the Design-Build Team shall describe the methods of construction of all structures. The description of the temporary impacts (haul roads, utility relocations, work bridges, etc.) shall include restoration plans, schedules, and disposal plans. This information shall be included in the permit application. This information shall also be part of the data presented at the agency coordination meetings for hydraulic design and permit impacts review.

The NCTA hereby commits to ensuring, to the greatest extent possible, that the footprint of the impacts in areas under the jurisdiction of the federal Clean Water Act shall not be increased during the Design-Build effort. All fill material shall be immediately 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 NCTA 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.

**Major Permit Timeframe**

The Design-Build Team should expect it to take up to 11 months to accurately and adequately complete all designs necessary for permit application, submit the permit application request and obtain approval for the permits from the environmental agencies. Agency review time will be approximately 90 days from receipt of a "complete" package. No requests for additional contract time or compensation shall be allowed if the permits are obtained within this 11-month period. With the exception of location and survey work, utility relocations in upland areas, and separately permitted investigative borings no mobilization of men, materials, or equipment for site investigation or construction of project shall occur prior to obtaining the permits, either within the 11-month period or beyond the 11-month period. This limitation does not preclude the off-site fabrication of bridge members or equipment. The NCTA 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 men, materials (or ordering materials), or equipment prior to obtaining all permits. The NCTA 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 Notice to Proceed.

The Design-Build Team needs to be aware that the timeframes listed above to review any permit applications and/or modifications begin only after a fully complete and 100% accurate submittal.

**Mitigation Responsibilities of the Design-Build Team**

The NCTA will be responsible for compensatory mitigation for unavoidable impacts to wetlands and surface waters due to project construction not to exceed the amount denoted in the North Carolina Ecosystem Enhancement Program (EEP) acceptance letter dated June 24, 2010.

The Final EIS identifies four potential on-site mitigation sites. The Design-Build Team shall submit to the NCTA anticipated right-of-way limits that would be required to include these sites. In addition, the Design-Build Team shall provide the approximate acreage of the additional right-of-way, beyond that needed to construct the project, which would be needed to purchase each on-site mitigation site. This information shall be submitted no later than 7 weeks prior to the hydraulics review meeting with the environmental agencies. The NCTA will then make a determination of the economic feasibility of these sites and advise the Design-Build Team of any on-site mitigation that shall be included in the Design-Build Team's permit application. The NCTA will provide any narrative and details to the Design-Build Team for the permit application. In the event that on-site mitigation at any of these four sites requires additional work by the Design-Build Team, said work will be paid for in accordance with Section 104-8(A) of the Standard Special Provision entitled Division One.

Any changes proposed by the Design-Build Team to any design or construction details provided by the NCTA or NCDOT shall be approved by the NCTA prior to being submitted to the environmental regulatory and resource agencies for their approval. Unless directed by the NCTA, should additional jurisdictional impacts result from revised design/construction details, 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 shall be approved by the agencies and such approval shall require, at a minimum, the preparation and approval of a mitigation plan before permits are approved and before construction shall commence.

The Design-Build Team shall analyze all new areas to be impacted that have not been analyzed during the NEPA process and preparation of permit applications. This analysis shall include performing all environmental assessments. These assessments shall require the Design-Build Team to engage the services of a competent 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, Rapanos forms, compensatory mitigation, FEMA compliance, and historical, archaeological, and cultural resources surveys in these areas. The environmental consultant shall obtain concurrence through NCTA from the United States Fish and Wildlife Service to document compliance with Section 7 of the *Endangered Species Act* for those species requiring such concurrence. In addition, the Design-Build Team shall identify additional mitigation required; identify the amount of time the modification will take beyond the 11-month period; and fulfill any other regulatory agencies' requirements to obtain the permit. Any contract extensions resulting from additional environmental assessments required by the Design-Build Team's design and/or construction details impacting areas outside those previously analyzed through the NEPA Process shall be solely at the NCTA's discretion.

If any staging areas are located outside the project right-of-way, the Design-Build Team shall engage the services of a competent 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.

**Commitments**

The NCTA is committed to incorporating all reasonable and practicable design features to avoid and minimize wetland impacts and to provide full compensatory mitigation of all wetland impacts. Avoidance measures were taken during the planning and NEPA Process and minimization measures were incorporated as part of the project's functional design. The Design-Build Team shall incorporate these avoidance and minimization features, plus any minimization identified during agency coordination efforts, into the design.

Prior to any utility relocation and throughout construction of the project, the Design-Build Team shall clearly demark the two Schweinitz's Sunflower populations identified in the Project Commitments of the Final EIS with a tree protection fence. A field meeting with the Department shall be held in order to assist the Design-Build Team with the demarcation of this area. Disturbance of the Sunflower population shall be prohibited, including disturbance by utility relocation / construction. Upon completion of construction, the Design-Build Team shall install woven wire fence and place "No Mowing" signs as directed by the NCTA to permanently protect these two populations.

If any construction staging, storage, refueling, borrow pit or spoil areas are chosen with the Goose Creek or Six Mile Creek watersheds, the Design-Build Team will notify the NCTA, who will coordinate with the NCDOT Division Environmental Officer and USFWS to develop BMPs for each site to avoid/minimize the potential for adverse effects.

The Design-Build Team shall implement a turbidity water quality testing program for the main stem of Stewarts Creek to evaluate the performance of BMPs. The turbidity testing program shall be submitted to NCTA for review and approval prior to implementation. At a minimum, testing shall be completed upstream and downstream of the construction area to determine periodic baselines, as well as during and after qualifying storm events. A qualifying storm event is defined as having ½" of rain or more over any 24 hour period. For qualifying storm events, a minimum of 3 samples per day shall be taken to characterize discharges associated with construction activity from the entire project disturbed area. After construction begins in the area, results of the testing shall be furnished to the Engineer on a monthly basis or when requested by the Engineer.

All work by the Design-Build Team shall be accomplished in strict compliance with the plans submitted with the Section 404 and 401 permit applications and in compliance with all conditions of all permits and certifications issued by the 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.

As a condition of the 401 permit, where construction of the project requires draining of any ponds, the Design-Build Team shall develop a Pond Drainage Plan and submit to the NCTA and the environmental regulatory agencies for approval to include but not limited to pond size, past use, and control structure of the pond; classification, buffer requirements and flow of the receiving waters; procedures and rate of water drawdown; sediment control measures; water quality monitoring procedures; any plant or wildlife species concerns or considerations and fish relocation plan. This drainage plan shall also address procedures avoiding the inundation of a receiving body of water with deoxygenated or nutrient rich water resulting in impacts to aquatic life or algae bloom and procedures for maintaining downstream channel stability. Verify if the ponds being drained or ponds downstream and receiving the drainage water are on the NC DENR Dam Safety Inventory List. If such ponds are contained in the NC DENR Inventory List, follow all NC DENR Dam Safety procedures.

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 planning documents, all permits and interagency meetings.

**Archeological Sites**

If the Design-Build Team discovers any previously unknown historic or archeological remains while accomplishing the authorized work, they shall immediately notify the NCTA and NCDOT Staff Archaeologist who will initiate the required State/Federal coordination. A representative from the NCDOT Transportation Program Management Unit shall also be notified. All questions regarding these sites shall be addressed to Mr. Matthew Wilkerson, NCDOT PDEA Human Environment Unit, Archaeology Section.

**RAILROAD COORDINATION SCOPE OF WORK** (07-10-10)

Unless a distinction is made, it is the NCTA's intention that whenever this scope of work references "Railroad" this would be synonymous with CSX Transportation. The Design-Build Team shall be responsible for coordinating all Railroad design and construction details on Railroad right of way, including protection and adjustments to existing and proposed railroad crossing surface and roadbeds, as needed. Coordination shall include any necessary agreements required by the NCTA, NCDOT and / or Railroad. The Design-Build Team shall be responsible for performing the Railroad work and for all costs associated with this work to include, but not be limited to, crossing surfaces, materials, insurance, flagging, and impacts to existing at-grade crossings, gates, and other appurtenances, unless otherwise detailed herein.

Coordinate with any utility owners within the Railroad right of way and accommodate such utilities during the bridge design and track work detailed herein.

The Design-Build Team shall be responsible for making application, securing, obtaining and associated fees for any permits for the conduit installation within the railroad right of way. The permits shall be obtained in the NCTA's name. NCTA shall be responsible for any reoccurring annual fees that may be associated with such conduit installation.

**Preparation for Construction within the Existing Railroad Right of Way**

I. The Design-Build Team shall be required to use the following guidelines and any other guidelines as required by the Railroad.

(A) *AREMA Manual for Railroad Engineering*
(B) *CSX Public Project Information dated 5/4/2007 with updated CSXT Criteria for Overhead Bridges dated 9/14/07*
(C) *Federal Aid Policy Guide 23 CFR 140I*
(D) *Federal Aid Policy Guide 23 CFR 646*
(E) *NCDOT Construction Manual*
(F) Article 107-9 of the Standard Special Provision, Division One, contained elsewhere in this RFP
(G) *North Carolina Administrative Code* Section T19A: 02B, 0150 through 0158
(H) *CSX Transportation Special Provisions for Protection of Railway Interest*
(I) *CSX Design and Construction Standard Specifications*
(J) *CSX Construction Submission Criteria (dated 4-3-09)*

II. The Design-Build Team shall be responsible for verifying the number of trains per day and maximum speed allowed.

**Arrangements for Protection and Adjustments to Existing and Proposed Railroad Crossing Surface and Roadbeds:**

I. The Design-Build Team shall not commence any work on the Railroad right of way until all agreements have been executed, insurance acquired and approved, and all construction plans have been approved by the Railroad.

The Design-Build Team shall make the necessary arrangements with the Railroad that are required to protect against property damage that may result in loss of service, expense, or life. The Design-Build Team shall be responsible for all damage to the Railroad resulting from their operations and the Railroad 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. The typical coverage required is **$5,000,000** Per Occurrence and **$10,000,000** in Aggregate coverage Per Annual Policy Period. The Design-Build Team shall be responsible for verifying and obtaining the appropriate insurance and / or coverage with the Railroad. Additional Design-Build Team insurance responsibilities, including those for all subcontractors, are detailed in the standard CSX Transportation Railroad Agreement provided to the short-listed teams.

II. The NCDOT and NCTA have a preliminary engineering agreement with CSXT. After award of the Contract, the Design-Build Team will be responsible for coordinating and obtaining a new preliminary engineering agreement prior to any review of project documents. The Design-Build Team will also be responsible for obtaining the construction agreement with CSXT. The Design-Build Team shall be required to use the Standard NCDOT Cost Agreement and Insurance Special Provision forms that will be supplied by the NCDOT Utility Unit Railroad Section upon request.

III. The Design-Build Team will be responsible for coordinating and obtaining a construction agreement using the standard NCDOT agreement with CSX. After negotiations between the Design-Build Team and the Railroad have been finalized, the Design-Build Team shall submit agreements executed by CSX and final plans approved by CSX to NCTA's Chief Engineer for plan approval and final agreement execution by NCTA and/or NCDOT, prior to authorizing railroad work. After approval by NCTA and/or NCDOT, one copy of the executed agreement will be returned to the Design-Build Team and one copy forwarded to the Engineer, prior to any construction work by the Design-Build Team or Railroad.

**Coordination with CSX Transportation:**

The Design-Build Team shall coordinate with Shelby L. Stevenson, Principal Engineer - Public Projects, CSX Transportation, 500 Water Street (J-301), Jacksonville, Florida 32202, (904) 359-1177. Prior to award of the contract, contact with the railroad shall be made through NC Turnpike Authority using the email address, **designbuild_monroe@ncturnpike.org**. After award of the contract, the Design-Build Team will be provided contact information for obtaining plan approval and a partially executed legal agreement with CSX Transportation, the NCTA, and the NCDOT Department of Transportation as the parties in the agreement for overhead bridges crossing CSX Transportation in the vicinity of US 74. The NCTA and NCDOT will review the engineering and construction agreements prior to submittal to the Railroad. The NCTA and NCDOT will execute and distribute the engineering and construction agreements within 14 calendar days of receipt. The agreements shall include necessary Force Account items such as preliminary engineering, construction engineering, flagging, and signal and communication lines. The NCTA will be responsible for payment of the Railroad Force Account work listed above; however, the Design-Build Team shall reimburse the NCTA for all flagging costs. This reimbursement shall be included in the lump sum price bid for the project. Upon request, the NCTA will provide copies of the railroad's invoices to the Design-Build Team for review. The Design-Build Team shall have ten (10) days to provide comments to the NCTA, after which the NCTA will pay the invoice. The Design-Build Team shall be responsible for maintaining records to verify the invoice items.

The preliminary plan submittal to the Railroad shall include bridge plans, preliminary track work plans, the Railroad's "Overhead Bridge Crossing Data," appropriate roadway plan sheets showing impacts to the Railroad's right of way, erosion control plans, temporary shoring and drainage calculations for any drainage on or across the Railroad's right of way. A minimum of five **(5)** half-size sets of preliminary plans and data shall be submitted to AECOM on behalf of CSX Transportation through the NCTA. If the Railroad requires RFC's and / or final plans, then **five (5)** half size sets shall be provided to the Railroad. If any re-submittals of plans or any additional information is required, **five (5)** half size sets shall be submitted to the Railroad. The Design-Build Team shall submit signed and sealed design calculations with the final design to AECOM for review and acceptance. Working Drawings affecting the Railroad's operations and / or right of way shall follow submittal process as outlined in the 2006 NCDOT Standard Specifications for Roads and Structures and / or Special Provisions.

Upon completion of the CSX Transportation structure, the Design-Build Team shall submit coordinately correct as-built drawings and details to NCTA and CSX Transportation. Additionally, five (5) half size hard copies of the as-built plans shall be submitted to the Railroad.

# EROSION AND SEDIMENTATION CONTROL SCOPE OF WORK (08-09-2010)

## Authority

The NCDOT Roadside Environmental Unit (REU) has the authority to (1) identify special needs for this project, including the acquisition of additional right-of-way; (2) mandate special details to be included in the design plans or special provisions; (3) conduct on site plan reviews for compliance and require design changes to accommodate field changes; (4) inspect all construction sites including waste and borrow pits and haul roads; and (5) issue violation notifications or cease and desist orders. The NCDOT REU will also retain authority in plan, detail, and special provision review and acceptance.

## General

The NCTA and NCDOT REU 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 NCTA and 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 *NCDENR - Erosion and Sediment Control Planning and Design Manual* for erosion control design guidelines not addressed in this Scope of Work.

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. 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
5. Take into account existing topography and show contour lines

6. Utilize Temporary Rock Silt Checks Type 'B' (TRSC-B) to reduce velocity in existing ditches with spacing of 250 feet divided by percentage of ditch grade. Also utilize TRSC-Bs in proposed TSDs and temporary diversions (TD)
7. Protect existing streams; do not place erosion control devices in live streams
8. Provide adequate silt storage for 3600 cubic feet per disturbed acre and sediment basins shall be sized with surface area equal to 435 square feet per cubic foot per second (cfs) of the peak inflow rate, Q25, using 25-year peak rainfall data (*NCDENR - Erosion and Sediment Control Planning and Design Manual* or NOAA's National Weather Service web site http://hdsc.nws.noaa.gov/hdsc/pfds/orb/nc_pfds.html for partial duration (ARI) time series type). A Sediment Basin Designer Spreadsheet will be provided by the NCDOT Roadside Environmental Unit (REU) upon request.
9. Design Riser Basins to the following standards:
   a. Surface Area shall be determined by Equation A(sq. feet) = Q25(cfs) * 435
   b. Volume requirement shall be 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 1 ft. from the bottom of the basin
   e. See *NCDENR - Erosion and Sediment Control Planning and Design Manual* for additional design criteria
10. Skimmer Basins shall 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, Q25, using the 25-year peak rainfall data (*NCDENR - Erosion and Sediment Control Planning and Design Manual* or NOAA's National Weather Service web site http://hdsc.nws.noaa.gov/hdsc/pfds/orb/nc_pfds.html for partial duration (ARI) time series type). A Skimmer Basin Designer Spreadsheet will be provided by the NCDOT Roadside Environmental Unit (REU) upon request.
11. Show 50-foot Environmentally Sensitive Area (ESA) around North Fork Crooked Creek and all unnamed tributaries to North Fork Crooked Creek on Clearing & Grubbing EC Plans only.
12. Follow NCDOT Design Standards in Sensitive Watersheds for implementing erosion and sediment control BMPs along the entire project. This document differs from the NCAC Section 15A Part 04B.0124.
13. The minimum and maximum length to width ratio of all Sediment Basins shall be 2:1 and 6:1, respectively.
14. 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.
15. Include any culvert and / or pipe construction sequence plan sheets in the Clearing & Grubbing Erosion Control Plans; all pipes 48" or larger, or any combination of pipes

that total 48" or more 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.

16. Incorporate temporary sediment basins into permanent stormwater devices.
17. Utilize 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 Roadside Environmental Unit.
18. The Erosion and Sediment Control Plans shall incorporate devices utilizing PAM as stated in Item 17, or other approved Turbidity reduction methods, for all areas draining to North Fork Crooked Creek and unnamed tributaries to North Fork Crooked Creek.

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. Utilize TRSC-Bs to reduce velocity in existing and proposed ditches with spacing of 250 feet divided by percentage of ditch grade. Also utilize TRSC-Bs in proposed TSDs and TDs
5. Utilize temporary slope drains and earth berms at top of fill slopes 8 feet or higher and a fill slope grade of 3:1 or steeper, or where there are superelevations above 0.04 and fills are greater than 5 feet. Maximum slope drain spacing shall be 200 feet.
6. Utilize rock energy dissipater and / or silt basin at outlet of slope drain
7. 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
8. Provide adequate silt storage for 3600 cubic feet per disturbed acre and sediment basins shall be sized with surface area equal to 435 square feet per cubic foot per second (cfs) of the peak inflow rate, Q25, using 25-year peak rainfall data (*NCDENR - Erosion and Sediment Control Planning and Design Manual* or NOAA's National Weather Service web site http://hdsc.nws.noaa.gov/hdsc/pfds/orb/nc_pfds.html for partial duration (ARI) time series type). A Sediment Basin Designer Spreadsheet will be provided by NCDOT REU upon request
9. 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 ft/s, 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

10. Provide matting for erosion control on all fill slopes 2:1 or steeper
11. Design Riser Basins to the following standards:
    a. Surface Area shall be determined by Equation A(sq. feet) = Q25(cfs) * 435
    b. Volume requirement shall be 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 1 ft. from the bottom of the basin
    e. See *NCDENR - Erosion and Sediment Control Planning and Design Manual* for additional design criteria
12. Skimmer Basins shall 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, Q25, using the 25-year peak rainfall data (*NCDENR - Erosion and Sediment Control Planning and Design Manual* or NOAA's National Weather Service web site http://hdsc.nws.noaa.gov/hdsc/pfds/orb/nc_pfds.html for partial duration (ARI) time series type). A Sediment Basin Designer Spreadsheet will be provided by the NCDOT Roadside Environmental Unit (REU) upon request
13. Follow NCDOT Design Standards in Sensitive Watersheds for implementing erosion and sediment control BMPs along the entire project. This document differs from the NCAC Section 15A Part 04B.0124.
14. The minimum and maximum length to width ratio of all Sediment Basins shall be 2:1 and 6:1, respectively
15. Coir Fiber Baffles shall be installed in all silt basins and sediment dams at drainage outlets. For silt basins with a 20-foot or longer length, three Coir Fiber Baffles shall be installed with a spacing of 1/4 the basin length. For silt basins with a length less than 20 feet, a minimum of two Coir Fiber Baffles shall be installed, with a spacing of 1/3 the basin length. The Design-Build Team will not be required to show the individual baffles on the Erosion Control Plans, but shall be required to incorporate the Coir Fiber Baffle Detail on the Erosion Control Plans
16. Incorporate temporary sediment basins into permanent stormwater devices
17. Utilize 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 Roadside Environmental Unit.
18. The Erosion and Sediment Control Plans shall incorporate devices utilizing PAM as stated in Item 17, or other approved Turbidity reduction methods, for all areas draining to North Fork Crooked Creek and unnamed tributaries to North Fork Crooked Creek.

19. Streambank Reforestation for mitigation shall be shown as a cross hatched pattern and extend 50 ft. from the top of the stream bank.

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 such as temporary rock silt check type B, coir fiber baffle, skimmer basin, 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: 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 IIIA certified individual responsible for designing and / or reviewing Erosion and Sedimentation Control Plans

## IV. Special Provisions

A. Erosion Control Special Provisions are available at the following website:

**http://www.ncdot.org/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 Control / Stormwater Certification 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 REU will provide a sample set of Erosion and Sedimentation Control Plans (including any special details or special provisions used by the NCDOT REU) 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. Sufficient time shall be allowed for the Design-Build Team to make any changes to the Erosion and Sedimentation Control Plans deemed necessary by the NCDOT REU.

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.

F. 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 Division of Solid Waste Management (NCDENR). The Design-Build Team shall submit the permit number for waste / borrow sites covered by the Mining Act or regulated by DSWM (DENR) concurrently to NCTA and the Transportation Program Management Director and the Resident Engineer. For Reclamation Procedures, see:

**http://www.ncdot.org/doh/operations/dp_chief_eng/roadside/fieldops/downloads/Files/ContractedReclamationProcedures.pdf**

G. 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.

H. An accepted Erosion and Sedimentation Control Plan does not exempt the Design-Build Team from making every effort to contain sediment onsite.

I. Any Erosion Control Design revisions made during the construction of the project shall be submitted to NCDOT REU by the 15th of the month via the Transportation Program Management Director. At anytime requested by the Engineer or the 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.

J. The Design-Build Team shall comply with the *North Carolina Administrative Code Title 15 A Department of Environment and Natural Resources Chapter 4, Sediment Control*.

K. A pre-design meeting shall take place between the NCTA, NCDOT REU 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 REU. Erosion and Sedimentation Control Plan submittals shall only be reviewed and accepted by NCTA and NCDOT REU after the Erosion Control Pre-Design Meeting. The Design Build Team shall be required to submit a tentative Erosion and Sedimentation Control Plan submittal schedule at the pre-design meeting.

L. At 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 Plan pre-design meeting.

M. 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.

N. Erosion Control / Stormwater Certification shall be required according to the Project Special Provision found elsewhere in this RFP.

O. Prior to installation of any erosion control devices, the Design-Build Team shall verify boundaries of jurisdictional areas in the field and delineated with Safety Fence.
P. 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 REU for review and acceptance. Minor changes such as moving silt fence, adding or moving temporary ditches (unless adding new flow to a sediment basin), and adding or moving slope drains shall be reviewed by the Engineer in the field.

**Erosion and Sedimentation Control Incentives and Liquidated Damages:**

The Design-Build Team will be eligible for an incentive in the amount of $150,000.00 if construction operations have been performed in accordance with all environmental regulations and the Specifications, and the Design-Build Team does not receive any Immediate Corrective Actions (ICA), Continuances of Immediate Correction Action (CICA), Notices of Violation (NOV), and/or Cease and Desist (C&D) orders at any time during the project.

The Design-Build Team's first NOV or C&D violation shall result in a forfeiture of the entire incentive noted above. The Design-Build Team will forfeit $50,000.00 from the $150,000.00 incentive noted above for each ICA and/or CICA violation. After the entire $150,000.00 incentive is forfeited, Liquidated Damages in the amount of $12,500.00 per any type of violation shall be deducted from the lump sum bid amount due the Design-Build Team.

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 2006 *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.

# INTELLIGENT TRANSPORTATION SYSTEM (ITS) SCOPE OF WORK (08-10-2010)

## 1. GENERAL REQUIREMENTS

## 1.2 DESCRIPTION

### (A) Summary of Work

This section of the RFP will provide the NCTA Monroe Connector/Bypass with intelligent transportation system (ITS) devices and fiber-optic communications.

This ITS subsystem includes, but is not limited to:

- Closed circuit television (CCTV) cameras,
- Color, full-matrix dynamic message signs (DMS),
- Microwave vehicle detection systems (MVDS),
- Road weather information system (RWIS),
- Equipment installation and software integration in the new Joint Forces STOC facility on District Drive in Raleigh,
- NCTA TMC software to configure, control, and monitor ITS field devices and communications hardware, if current software cannot control,
- A multiple path Ethernet-based fiber-optic communications system comprised of approximately 20 cable miles of fiber-optic cable and associated conduit along Monroe Connector/Bypass for the toll collection and ITS systems.

The Design-Build Team shall be responsible for designing, furnishing, and installing the CCTVs, MVDS, and RWIS with metal poles and foundations. The Design-Build Team shall furnish and install the DMS signs on structures described elsewhere in this RFP.

The communications infrastructure will consist of underground conduit system including conduit, tracer wire, junction boxes, heavy-duty junction boxes, splice enclosures, and single-mode fiber-optic cable.

The Design-Build Team is to design and install the complete conduit system to service all ITS devices and toll facilties. Although the trunk line conduit system will run down only one side of the freeway, a fully redundant communications system will be provided by two leased circuits (by others). The Toll System Integrator will provide the leased connection to the NCTA Customer Service Center in Morrisville; this will also serve as the redundant/backup loop for the fiber-optic communications system. The interface/connection point shall be the Design-Build Team-provided routing switch located in the hub building at each end of the project. See Special Details in the ITS Concept Plans.

Two fiber-optic cables shall be installed in the conduit system; one for ITS equipment and the other for tolls equipment. Furnish and install fiber-optic splice/termination centers for both the tolls and ITS systems. The tolls equipment will be installed by others.

All communications between proposed ITS field devices and the local hub shall be Ethernet over single-mode fiber-optic cable. Design-Build Team shall furnish and install Ethernet edge switches, routing switches, and related electronics.

The Design-Build Team shall be responsible for determining the exact location of the ITS devices, conduit and junction boxes, obtaining Engineer's approval of the locations, installing

conduit, tracer wire, junction boxes, heavy-duty junction boxes, and developing and implementing test and coordination procedures. The basis of the design shall be the ITS Concept Plans provided by the NCTA.

Upon completion of the work, the Design-Build Team shall conduct field-testing of the communications system, ITS devices, and software and maintain all hardware and software until final acceptance by the NCTA.

The Design-Build Team shall be responsible for submitting applications, including application fees associated for any permits for the conduit installation. This will include, but not limited, any pole attachment fees, railroad and other right of way encroachment permits, and utility connection fees. The Design-Build Team shall obtain railroad right of way encroachment permits if it is necessary to enter or cross the railroad right of way to install fiber-optic cable in the ITS conduit across any railroad rights of way. All fees associated with crossing the railroad rights of way shall be structured as a one-time cost with no recurring annual fees. Any permits shall be obtained in NCTA's name.

**(B) Standard Specifications**

Conform to this Scope of Work and the North Carolina Department of Transportation (NCDOT) *Standard Specifications for Roads and Structures*, dated July 2006, herein after referred to as the "*Standard Specifications*", the NCDOT *Roadway Standard Drawings*, dated 2006 and the ITS Concept Plans. Conform also to *Typical Open Road Tolling (ORT) Facility Guidelines*. Conform to the regulations and codes described in Section 1700 of the *Standard Specifications*.

In the event of conflict between this Scope of Work and the *Standard Specifications*, this Scope of Work shall govern.

The 2006 *Standard Specifications* are revised as follows:

General Requirements (1098-1), Page 10-268, Subarticle 1098-1(h) - In the second paragraph, add, "use 200 amp meter base for underground electrical service".

Underground Conduit Construction Methods (1715-3), Page 17-10, Subarticle 1715-3(b) section (1), revise first paragraph, second sentence to "install rigid metallic conduit for all underground runs located inside railroad right-of-way."

Reference is made to the "Project Special Provisions for Signals and Intelligent Transportation Systems". The document can be found at the following link:

http://www.ncdot.org/doh/preconstruct/traffic/ITSS/ws/PSP.doc

This document is continually updated. The version that governs the Design-Build Team is the version in effect on the date of advertisement.

**(C) Systems Engineering**

The development of the plans, specifications, and estimates shall adhere to NCTA and NCDOT standards, specifications, and the requirements of the Metrolina Regional ITS Architecture as defined in the North Carolina Statewide ITS Strategic Deployment Plan. Develop a systems engineering document that defines the physical and functional requirements of the system to ensure consistency with the Metrolina Regional ITS Architecture and to ensure conformance with the requirements of 23 CFR 940.11.

### (D) 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 Electric 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).

## 1.3 MATERIALS

### (A) Qualified Products

Furnish new equipment, materials, and hardware unless otherwise required. Inscribe 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.

### (B) Observation Period

Warrant workmanship and Design-Build Team-furnished equipment for a 60-day observation period under the payment and performance bond from date of acceptance.

### (C) Wire and Cable

Furnish wire and cable on reels. When requested by NCTA, furnish samples of wire and cable to NCTA at no additional cost.

## 1.4 CONSTRUCTION COORDINATION

### (A) Introduction

This section addresses coordination issues that may affect this project.

### (B) Toll System Integrator

The Design-Build Team shall coordinate with the Toll System Integrator for design and construction issues and to schedule training.

### (C) Integration

NCTA ultimately will use and support the Smartlink statewide ITS software (by others). Others shall deploy that software in the STOC facility. This software package will control and manage all ITS field devices described herein. The software will integrate with NCDOT’s statewide Traveler Information Management System (TIMS). The package will also facilitate center-to-center (C2C) communications between NCDOT’s regional TMCs. Existing software packages used by the equipment at the current TMCs will be maintained for maintenance and troubleshooting. Smartlink will communicate with the devices using NTCIP drivers or via “black box” converters. The Design-Build Team shall closely coordinate with NCDOT’s Metrolina and Triangle Regional ITS Engineers regarding all matters of NCDOT’s local computing networking and ITS device operations and control.

It is anticipated the Smartlink will not be deployed by the time of the startup of the Monroe Connector/Bypass operations, therefore, Design-Build Team shall purchase, deploy and integrate

the necessary software to operate the ITS devices from the NCTA TMC at the STOC during the interim period of operation until Smartlink is ready. NCDOT owns licenses at the STOC for Daktronics *Vanguard 3.8*, Protronix *VideoPro*, and EIS WATER that the Design-Build Team may utilize if they wish. NCDOT expects to upgrade to *Vanguard 4.0* by December 2010. The Design-Build Team shall confirm what software and versions are in use. For other devices supplied, the Design-Build Team shall supply vendor software for testing, operation, and maintenance. NCDOT will not provide the software for the Design-Build Team for testing and MIB development. The Design-Build Team shall also be responsible for any MIB development and configuration if the NCDOT STOC does not already have MIBs for the device in question.

**(D) Regulations and Codes**

Furnish material and workmanship conforming to the *National Electric Code* (NEC), *National Electric 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 date of advertisement. 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, have all systems inspected and approved in writing by the authorized governmental electrical inspector for the area. Furnish written certification of the authorized inspector's approval to the Engineer. Inspection by the authorized governmental electrical inspector will 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, conform to AASHTO and ASTM standards in effect on the date of advertisement.

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.

Install meter bases and service disconnects as required by the NESC, NEC, local utility companies, and local ordinances. Install standoffs only when required and approved by the local utility companies. Where a standoff must be used, obtain the local utility company's approval prior to installing the standoff.

**(E) Utility Services**

Coordinate all work to ensure electrical power of proper voltage, phase, frequency, and ampacity is available to complete the work. 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. Obtain authorization for service in NCTA's name for NCTA-owned locations. Make application for service in NCTA's name for NCTA-owned locations.

The Design-Build Team will be responsible for all expenses associated with utility installation costs, hookups, etc. Once installed, NCTA will be responsible for monthly utility company usage charges prior to final acceptance.

### (F) Maintenance and Repair of Material

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 is defined as being able to arrive, fully equipped, at the work site within two hours ready to provide maintenance services.

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.

Maintain and repair all ITS devices and communications related equipment within the project construction limits until completion of the observation period and receipt of written notification of final acceptance of the project.

For all failures, malfunctions, or damages to equipment, begin necessary repairs within four hours of notification. Complete repairs within eight hours of notification. The inability to contact the supervisory employee or prearranged alternate will not extend repair time requirements.

Remove and replace all ITS devices and 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 and for all damages and malfunctions caused either directly or indirectly by the Design-Build Team's work activities.

In the event the Design-Build Team fails to perform in accordance with the Plans and Scope of Work within the time frame specified, NCTA reserves the right to perform maintenance and emergency service necessary to ensure continuous operation. Further, all expenses incurred by NCTA in implementing this option will be deducted from payment due the Design-Build Team, plus $2,500 liquidated damage per occasion, per day, or any portion thereof, until corrected.

Maintain system equipment until the completion of the 60-day observation period and the receipt of written notification from the Engineer of final acceptance of the project.

### (G) Wire and Cable

Comply with Section 1700-3 (J) of the *Standard Specifications*.

### (H) Grounding

Comply with Section 1700-3 (K) of the *Standard Specifications*.

### (I) Electrical Bonding

Comply with Section 1700-3 (L) of the *Standard Specifications*.

## 2. UNDERGROUND CONDUIT

### 2.1 DESCRIPTION

Furnish and install conduit for underground installation with tracer wire, miscellaneous fittings, all necessary hardware, marker tape, backfill, graded stone, paving materials, and seeding and mulching.

Provide conduit as needed to interconnect the ITS devices and toll facilities.

## 2.2 MATERIAL

### (A) General

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department's QPL.

Comply with Section 1098-4 of the *Standard Specifications*.

### (B) Conduit Types

Comply with Section 1098-4 of the *Standard Specifications*.

**High Density Polyethylene Conduit (HDPE)**

Provide HDPE conduit with an outer diameter to minimum wall thickness ratio that complies with ASTM D 3035, Standard Dimension Ratio (SDR) 13.5. Provide conduit that meets UL Standard 651B Continuous Length HDPE Conduit.

Comply with Section 1098-4 of the *Standard Specifications*.

### (C) Conduit Plugs, Sealing Putty, Pull Line, and Tracer Wire

Furnish duct plugs that provide a watertight barrier when installed in conduit. Furnish duct plugs sized in accordance with conduit installation requirements. Ensure each duct plug provides a means to secure a pull line to the end of the plug.

Comply with Section 1098-4 of the *Standard Specifications.*

Furnish moldable sealing putty that has the following characteristics:

- Contains no asbestos
- Designed for use with electrical and telecommunications cables house in conduits
- Adheres to various conduit materials, including PVC, HDPE and galvanized steel,
- Forms a moisture barrier
- Requires no mixing or additives (single-component) and requires no volatile solvents
- Can be applied by hand

Use moldable sealing putty in occupied conduit risers and cabinets.

Provide green insulated number 14 AWG, THWN, stranded copper wire to serve as tracer wire.

Comply with Subarticle 1400-2(H) Duct and Conduit Sealer of the *Standard Specifications*.

### (D) 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 which 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

## 2.3 CONSTRUCTION METHODS

### (A) General

Comply with Section 1715-3 of the *Standard Specifications*.

Install a minimum of two 2" conduits for all underground routes that are designated to convey a single 48-fiber communications cable. Install four 2" conduits for all underground routes that are designated to convey a pair of 48-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 conduits for all directional drill installations beneath roadways, railroad rights-of-way, 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.

### (B) 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.

### (C) Splicing and Coupling of HDPE Conduit

Install a continuous HDPE conduit free from splices or couplings between junction boxes whenever possible. However, splicing or coupling of HDPE conduit may be permitted, <u>subject to the prior approval of NCTA</u>, in the following situations:

- To complete an underground HDPE conduit run when the end of an HDPE reel is reached
- When transitioning from directional drill to trenching or from trenching to directional drill in an underground run while maintaining the same quantity and size of conduits in the run

Join the HDPE conduit ends by installing mechanical couplings in accordance with the manufacturer's instructions or by splicing the conduits using either a butt-fusion welder or an electro-fusion welder. Submit the proposed method of coupling or splicing the conduits to the Engineer for review and approval prior to joining any HDPE conduits.

Otherwise, install an oversized, heavy-duty junction box where the ends of the HDPE conduits meet in lieu of joining the ends through splicing and coupling. Install an oversized, heavy-duty junction box where the number of conduits in the underground run changes. For example, install an oversized, heavy-duty junction box where two directionally drilled conduits meet a single run of trenched conduit.

**(D) Bore and Jack**

Comply with Section 1715-3 of the *Standard Specifications*.

## 3. JUNCTION BOXES

### 3.1 DESCRIPTION

Furnish and install junction boxes (pull boxes) with covers, graded stone, grounding systems, and all necessary hardware.

### 3.2 MATERIALS

**(A) General**

Comply with Section 1411-3 Electrical Junction Boxes, except as follows:

Provide junction box covers with standard *NCTA* logos, pull slots and stainless steel pins. For standard size junction boxes, provide covers with *NCTA Electrical* logo. Provide covers with *NCTA Fiber Optic* logo on all oversized and special-sized, heavy-duty junction boxes that house fiber-optic communications cable along the project.

Do not provide sealant compound between junction boxes and covers.

Material, equipment, and hardware furnished under this section 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 custom splice boxes, adhere to "Submittal 'Requirements" in Section 20.2.

Refer to Section 545, "Graded Stone", of the *Standard Specifications*.

**(B) 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.

**(C) 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.

**(D) 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.

**(E) Loop Splice Boxes**

Provide loop splice boxes and covers with minimum inside dimensions of 36"(l) x 17"(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.

**(F) Custom Splice Boxes**

Provide larger boxes for specialized use near ORT Toll Zones that meet or exceed the Tier 15 requirements of ANSI/SCTE 77. Provide certification that testing methods are compliant with ANSI/SCTE 77.

### 3.3 CONSTRUCTION METHODS

Comply with Section 1411-3 Electrical Junction Boxes of the *Standard Specifications*, 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 ORT Toll Zones as shown in the ORT Project Specific Drawings.

## 4. WOOD POLES

### 4.1 DESCRIPTION

Furnish and install wood poles with grounding systems and all necessary hardware. Wood poles are for the sole purpose of bringing electric service just inside the right of way where it shall transition to underground conduit. The Design-Build team shall not use wood poles for mounting any ITS devices.

### 4.2 MATERIAL

**(A) General**

Material, equipment, and hardware furnished under this section must be pre-approved on the Department's QPL by the date of equipment installation.

Comply with Section 1082-4(G) of the *Standard Specifications*.

**(B) Service Pole**

Furnish Class 4 or better wood poles for bringing cable onto right of way from overhead source. Provide poles of sufficient length to attain the vertical clearance beneath the service drop required by the NESC and power company but no less than 25 feet in length. All electrical service assemblies shall be pedestal mounted as described in this Scope of Work.

### 4.3 CONSTRUCTION METHODS

Mark final pole locations and receive approval from the Engineer before installing poles. Unless otherwise required, locate poles in accordance with the following table:

| Speed Limit | Desirable Minimum Setback Distance | |
|---|---|---|
| | **From face of curb in curb & gutter section** | **From edge of travel way in shoulder section (no curb)** |
| ≤ 40 mph | 12 ft. | 14 ft. |
| 45-50 mph | 16 ft. | 18 ft. |
| ≥ 55 mph | 22 ft. | 22 ft. |

Within intersection radii, install poles a minimum of 7 feet behind face of curb or 10 feet from the edge of travel way where there is no curb. Field conditions may require the pole to be located at setback distances less than those listed above, subject to the approval of the Engineer, but in no case shall the pole be installed closer than 1.5 feet from face of curb. Measure the setback distance from the face of curb or edge of travel lane to the face of the pole.

Comply with Section 1720-3 of the *Standard Specifications*.

On new NCTA-owned poles, install a grounding system consisting of # 4 AWG solid bare copper wire that is exothermically welded to a ground rod. Install ground wire up pole to a point adjacent to the uppermost span. Use wire staples to secure ground wire to pole. Install ground rod at base of pole.

## 5. FIBER-OPTIC CABLE

### 5.1 DESCRIPTION

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. Provide two 48-strand single-mode fiber-optic cables in separate conduits, one for ITS and one for toll operations.

The exact location of conduit and junction boxes shall be determined by the Design-Build Team. Route the ITS and toll operations fiber-optic cables through each ORT (Open Road Tolling) mainline building and/or gantry facility. Route toll operations cable thru each ORT ramp building/facility/cabinet as well. All fiber strands of these cables shall terminate on separate patch panels provided by the Design-Build Team.

The toll operations cable shall extend no further than the last ORT building in each direction of the project. The ITS cable shall extend to the outer limits of the roadway project, or the outermost ITS device, whichever is furthest from the center of the project.

In the ITS trunk fiber-optic cable, reserve one tube of 12 strands for future use by NCDOT and one tube of 12 strands for future use by NCTA.

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. The Toll System Integrator shall energize the Tolls designated cable and connect equipment to it after acceptance.

## 5.2 MATERIALS

### (A) SMFO Communications Cable

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

Comply with Section 1098-10 of the *Standard Specifications*.

### (B) Drop Cable Assembly

Furnish drop cable assemblies to provide communications links between splice enclosures and Ethernet edge switches mounted in cabinets. Provide an assembly that is factory pre-assembled and factory pre-tested with the necessary drop cable length. Furnish a drop a cable assembly 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 routing switches to form an integral pre-assembled unit. Furnish a drop-cable assembly <u>that requires no field assembly, connectorization, or termination</u> 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 .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 3 feet in length with factory-assembled connectors matching the Ethernet edge and routing switches on each end for connecting Ethernet edge and routing 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 3 feet in field cabinets and 6 feet in the STOC and ORT Buildings. Ensure SMFO jumpers meet the operating characteristics of the SMFO cable with which they are to be coupled.

### (C) Communications Cable Identification Markers

Comply with Section 1098-10(C) of the *Standard Specifications*, with the exception of replacing "NCDOT" on the cable marker with "NCTA"

## 5.3 CONSTRUCTION METHODS

### (A) General

Comply with Section 1730-3(A) of the *Standard Specifications*.

### (B) Underground Installation

Comply with Section 1730-3(C) of the *Standard Specifications*.

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.

### (C) Installation of Drop Cable Assembly

Determine length of drop cable needed, including slack, to reach from termination point to termination point.

At below ground splice enclosures, coil at least 50 feet of slack cable for each cable entering and exiting the splice enclosure in the junction box where enclosure is located. Coil and store any drop cable in excess of what is needed for storage in the manhole or junction box in the base of the equipment cabinet, however store no more than 100 feet of extra 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 and/or video encoder 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" section of this Scope of Work when testing drop cable.

# 6. FIBER-OPTIC SPLICE CENTERS

## 6.1 DESCRIPTION

Furnish and install fiber-optic interconnect centers, fiber-optic splice enclosures, and all necessary hardware.

## 6.2 MATERIALS

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

### (A) Interconnect Center

Furnish compact, modular interconnect centers designed for rack mounting in open road tolling (ORT) buildings. Design and size interconnect centers to accommodate all fibers (used and unused) entering the ORT buildings.

Comply with Section 1098-11 of the *Standard Specifications*.

**(B) Splice Enclosure**

Comply with Section 1098-11 of the *Standard Specifications*.

## 6.3 CONSTRUCTION METHODS

**(A) General**

Comply with Section 1731-3 of the *Standard Specifications*.

**(B) Termination and Splicing within Interconnect Center**

Install interconnect centers with connector panels, splice trays, storage for slack cable or fibers, mounting and strain relief hardware, and all necessary hardware. Install one rack-mounted interconnect center for each trunk cable entering an ORT building in 19-inch communications racks in each ORT building. Coordinate with the Tolls Integrator on the placement of the racks.

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.

For all fibers designated for termination to a connector panel within an interconnect center, fusion splice the fibers to pigtails and connect the pigtails to connector panels.

Label all fiber-optic connectors, whether on jumpers, connector panels, or other equipment, to prevent improper connection. Obtain approval of fiber-optic connector labeling method.

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

**(C) Splice Enclosure**

Develop a cable-splicing plan to maximize cable performance and minimize the quantity of cable.

Install splice enclosures with splice trays, basket containment assemblies, racking for slack cable or fibers, mounting and strain relief hardware, and all other necessary hardware.

Comply with Section 1731-3(C) of the *Standard Specifications*.

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 ORT Buildings, neatly coil the spare cable and secure with tie wraps to the communications rack or cable trays.

# 7. ELECTRICAL SERVICE

## 7.1 DESCRIPTION

Install new electrical service to new ITS cabinets and devices. For ITS devices at ORT locations, utilize electrical service in the ORT building. All new electrical services within the NCDOT or NCTA rights of way shall be underground with pedestal-mounted assemblies. Multiple devices may be fed off a common meter as described herein.

## 7.2 MATERIALS

Material, equipment, and hardware furnished under this section must be pre-approved on the Department's QPL by the date of equipment installation.

Provide all materials necessary to form a complete electrical service assembly as shown in NCDOT *Roadway Standard Drawing* No. 1700.01, "Combination Panel".

Provide an external electrical service disconnect at each new ITS device cabinet location. For disconnects for DMS at ORT Toll Zones, place electrical panel on same concrete pad with ORT Toll Zone equipment. Furnish external electrical service disconnects with a minimum of a single 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 200-ampere minimum that meets the requirements of the local utility. Provide meter base with socket's ampere rating based on sockets being wired with minimum of 167 degrees F insulated wire. Furnish four-terminal, 600 volt, single-phase, three-wire meter bases that comply with the following:

- Line, load, and neutral terminals accept #8 to 2/0 AWG copper/aluminum wire
- With or without horn bypass
- Made of galvanized steel
- Listed as meeting UL Standard UL-414
- Underground service entrance

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 (i.e., Telespar, etc.), Unistrut metal framing, or any method other than an underground service pedestal to mount meter bases and disconnects for new underground electrical service.

## 7.3 CONSTRUCTION METHODS

### (A) 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. Obtain all required local permits before beginning work.

Run service conductors separately from all other conductors in a 1-inch rigid galvanized conduit above ground and Schedule 80 conduit underground. Do not allow service conductors to share conduits or junction boxes with any other conductors or cables. Do not route unfused electrical service conductors inside of metal poles.

### (B) New Electrical Service for ITS 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 disconnects at each device cabinet. The cost of running electrical service to all cabinets will include any transformers.

Locate all secondary power service points outside the controlled access right of way. Locate combination panels as shown on the ITS Concept Plans. 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 load center, 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.

# 8. DEVICE CABINETS

## 8.1 GENERAL

Furnish and install ITS device cabinets to house communications hardware, fiber-optic patch panels, power supplies, cable terminations, and other equipment to support the installation of CCTV, MVDS, DMS, and RWIS devices. Install a DMS “shell cabinet” at all gantry locations that do not currently have a DMS for housing future DMS equipment. See ORT Project Specific Drawings for details of all DMS related cabinet, conduit, box, and foundation work at the ORT gantries.

## 8.2 MATERIALS

### (A) General

Provide device cabinets as follows to house equipment specific to the site where it is installed.

| Cabinet Type Designation | Purpose |
|---|---|
| A | All CCTV and MVDS sites requiring fiber-optic communications |
| C | Remote processing unit for RWIS site |
| D | All DMS signs |

Type A cabinets shall be a minimum size of a Type 336 cabinet. Type D cabinets shall be a minimum size of a Type 336S cabinet.

Provide cabinets with a serial number unique to the manufacturer. Engrave the entire identification code on a metallic plate that is epoxied to the cabinet on the upper right hand sidewall.

**(1) Lighting**

Provide 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.

**(2) Convenience Outlets**

Provide 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. Provide at least one surge protected 120V (+/-10%) GFCI duplex receptacle of the 3-wire grounding type in the cabinet.

**(3) Circuit Protection**

Protect the CCTV 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 and service CCTV equipment and cabinet utilities.

**(B) Type A**

Furnish and install pole-mounted cabinets to house CCTV related equipment described herein. Provide the cabinets with 19-inch communications rack for all equipment. It is the Design-Build Team's responsibility to size the cabinet appropriate to fit all the equipment installed within the cabinet at the particular location.

Furnish, at a minimum, Type 336 CCTV cabinets meeting the following minimum requirements as applicable to the specific installation:

- Pole mounting brackets
- Grounding bus bar
- 120 VAC power supply
- 120 VAC GFCI-protected duplex outlets for tools
- 120 VAC SPD-protected duplex outlets for equipment

- SPD lightning and surge protection on incoming and outgoing electrical lines (power and data)
- 19-inch rack system for mounting of all devices in the cabinet
- Pull-out shelf for laptop and maintenance use
- Fluorescent lighting
- Two ventilation fans with independent thermostat controls
- Power strip along vertical rail
- Termination of the composite cable to the camera
- Fiber-optic interconnect center
- Maintenance access points for data and video connections to observe camera images and program/monitor camera status
- Video encoder
- Ethernet edge switch

Provide cabinets complete with a prefabricated cabinet shell, and all internal components and equipment, back and side panels, front and back doors, terminal strips, cabling and harnesses, surge protection for power and communication circuits, power distribution blocks or assemblies, shelves, connectors and all mounting hardware necessary for installation of equipment.

Construct the cabinets using unpainted sheet aluminum with a minimum thickness of 0.125 inch.

Provide the rack assembly with a removable, standard 19-inch EIA compliant rack. 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 the compartment with a ball bearing telescoping drawer guides to allow full extension from the rack assembly. The storage compartment shall open to provide a full-depth storage space for cabinet documentation and other miscellaneous items. The storage compartment shall be of adequate construction to support a weight of 20 pounds when extended without sagging. The top of the storage compartment shall be hinged aluminum. Provide at least one removable metal full-depth shelf with each cabinet.

Doorstops shall be included at 90 and 180-degree positions. Provide both the door and the doorstop mechanism 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. Provide the cabinets without auxiliary police doors.

Ensure that cabinet doors include a gasket to provide a dust and weather-resistant seal when closed. Provide the gasket material with closed-cell neoprene and shall maintain its resiliency after exposure to the outdoor environment. The gasket shall show no sign of rolling or sagging, and shall ensure a uniform dust and weather-resistant seal around the entire door facing.

*Ventilation:* Provide all cabinets with a 100 CFM, minimum, cooling fan capacity. Provide dual fans with thermostats incorporated into the ventilation system.

Provide the cabinets with vent openings in the doors to allow convection cooling of electronic components. Locate the vent opening on the lower portion of the cabinet doors and shall be covered fully on the inside with a commercially available disposable three layer graded type filter.

**Electrical**

Provide AC isolation within the cabinet. Configure all cabinets to accept 120 VAC from the utility company.

Provide UL listed circuit breakers with an interrupt capacity of 5,000 amperes and insulation resistance of 100 MΩ at 500 VDC. Provide power distributions blocks for use as power feed and junction points for two and three wire circuits. The line side of each shall be capable of handling up to 2/0 AWG conductors. Isolate the AC neutral and equipment ground wiring and terminal blocks from the line wiring by an insulation resistance of at least 10 MΩ when measured at the AC neutral.

**(C) Type C**

Furnish and install pole-mounted Type 5052-H32 aluminum NEMA 4 cabinets to house RWIS related equipment described herein. It is the Design-Build Team's responsibility to size the cabinet appropriate to fit all the equipment installed within the cabinet at the particular location.

Furnish cabinets meeting the following minimum requirements:

- RWIS structure mounting brackets,
- Grounding bus bar,
- 120 VAC power supply,
- 120 VAC GFCI-protected duplex outlets for tools,
- 120 VAC SPD-protected duplex outlets for equipment,
- Communications cabling to ITS network,
- Termination of the cables to the weather sensors,
- Maintenance access points for data connections to check data and program/monitor RWIS status.

Provide cabinets complete with a prefabricated cabinet shell, and all internal components and equipment, back and side panels, single door, terminal strips, cabling and harnesses, surge protection for power and communication circuits, power distribution blocks or assemblies, shelf, connectors and all mounting hardware necessary for installation of equipment.

Construct the cabinets using unpainted sheet aluminum with a minimum thickness of 0.125 inches.

Provide all cabinets and door exterior seams with smooth and continuous welds. Provide all cabinets with a single full-size door. Provide the door with three hinges, or a full-length stainless steel piano hinge, with stainless steel pins spot-welded at the top. Mount the hinges so that they cannot be removed from the door or cabinet without first opening the door. Brace the door and hinges to withstand a 100-pound per vertical foot of door height load applied vertically to the outer edge of the door when standing open. There shall be no permanent deformation or impairment of any part of the door or cabinet body when the load is removed. Provide the cabinet door with padlock hasp. Provide two keys for each cabinet. Provide door openings with double flanges on all four sides.

Provide both the door 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. Provide the cabinets without auxiliary police doors.

Ensure that cabinet doors include a gasket to provide a dust and weather-resistant seal when closed. Provide the gasket material with closed-cell neoprene and shall maintain its resiliency after exposure to the outdoor environment. The gasket shall show no sign of rolling or sagging, and shall ensure a uniform dust and weather-resistant seal around the entire door facing.

Provide mounting hardware to mount the cabinet to the tower according to the manufacturer's recommendations.

**Electrical**

Provide AC isolation within the cabinet. Configure all cabinets to accept 120 VAC from the utility company.

Provide UL listed circuit breakers with an interrupt capacity of 5,000 amperes and insulation resistance of 100 MΩ at 500 VDC. Provide power distributions blocks for use as power feed and junction points for two and three wire circuits. The line side of each shall be capable of handling up to 2/0 AWG conductors. Isolate the AC neutral, equipment ground wiring, and terminal blocks from the line wiring by an insulation resistance of at least 10 MΩ when measured at the AC neutral.

**(D) Type D**

**(1) General**

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

- Cabinet anchor bolts
- Base adaptor
- Grounding bus bar
- 120 VAC power supply and distribution assembly
- 120 VAC GFCI-protected duplex outlets for tools
- 120 VAC SPD-protected duplex outlets for equipment
- 19-inch rack system for mounting of all devices in the cabinet
- Pull-out shelf for laptop and maintenance use
- Power line filtering hybrid surge protectors
- Radio interference suppressor
- Fiber-optic interconnect center
- Communications surge protection devices
- Industrial-grade telephone line surge and lightning protector
- Adjustable shelves as required for components
- Interior fluorescent lighting and duplex receptacle
- Ventilation fans
- Temperature control system
- Industrial-grade UPS system and local disconnect
- Local user interface
- Serial interface port for local laptop computer
- Display driver and control system (unless integral to the DMS)

- Microprocessor based controller
- Ethernet edge switch,
- 12” base extender
- All interconnect harnesses, connectors, and terminal blocks
- All necessary installation and mounting hardware

**(2) Cabinet Shell**

Furnish the DMS controller and associated equipment completely housed in a NEMA 3R cabinet made from 5052-H32 sheet aluminum at least .125-inch 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 requirements. 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 near the bottom, and with air filters as described in the paragraph above.

Provide a Plexiglas rack of appropriate size at 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 padlocking.

Provide 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$^{o}$F and 160$^{o}$F with a differential of not more than 10$^{o}$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).

### (3) Electrical System and Wiring

The requirements stated herein shall apply for any DMS controller cabinet. 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.

All conductors shall be individually and uniquely labeled. All conductor labels shall be clearly visible without moving the conductor. All terminal conductors shall connect to the terminal strip in right angles. Excess conductor shall be removed before termination of the conductor. The conductor shall be molded in such a fashion as to retain its relative position to the terminal strip if removed from the strip. No conductor shall run 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. All connectors, devices, and conductors shall be installed in accordance to manufactures guidelines. All wiring shall comply with the latest NEC guideline in effect during installation. No conductor or conductor bundle may hang loose or create a snag hazard. All conductors shall be protected from damage. All solder joints shall be completed using industry accepted practices and shall not fail due to vibration or movement. All welds must be in a manner that will not fail due to vibration. Lamps and control boards shall be protected from damage.

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.

#### a. Power Supply

Provide AC isolation within the cabinet. Configure all cabinets to accept 120 VAC from the utility company.

Provide UL listed circuit breakers with an interrupt capacity of 5,000 amperes and insulation resistance of 100 MΩ at 500 VDC. Provide power distributions blocks for use as power feed and junction points for two and three wire circuits. The line side of each shall be capable of handling up to 2/0 AWG conductors. Isolate the AC neutral, equipment ground wiring, and terminal blocks from the line wiring by an insulation resistance of at least 10 MΩ when measured at the AC neutral.

Provide power supply monitoring circuitry to detect power failure and to automatically report the occurrence to the control software.

Blackout, brownout, hunting, 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.

**b. Surge Suppression**

Install and clearly label filtering hybrid power line surge protectors on the load side of the branch circuit breakers in a manner that permits easy servicing. Ground and electrically bond the surge protector to the cabinet within two inches. The surge suppression shall meet UL 1449.

**Electrical Power**

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 degrees F to +140 degrees 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 ¼" 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 ± 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 degrees F to 150 degrees 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 |

**c. 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 and Ethernet switch. 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 Ration: @50% Load Up to 4.8:1, @75% Load Up to 3.2:1, and @100% Load Up to 2.4:1
- Output THD: 3% Max. (Linear) and 5% Max. (Non-Linear)
- Output Overload: 110% for 10 min; 200% for 0.05 sec.
- Output Dynamic Response: +/- 4% for 100% Step Load Change and 0.5 ms Recovery Time
- Output Efficiency @ 100% Load: 90% (Normal Mode)
- Operating Temperature: -40 degrees F to +165 degrees F
- Humidity: 0% to 95% Non-condensing
- Remote Monitoring Interface: RS-232 or Ethernet
- Protection: Input/output Short Circuit, Input/output Overload and 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.

**(4) Local User Interface**

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

- On / Off Switch: controls power to the controller.
- Control Mode Switch: for setting the controller operation mode to either remote or local mode.
- LCD Display and Keypad: Allow user to navigate through the controller menu for configuration (display, communications parameter, etc) running diagnostics, viewing peripherals status, message creation, message preview, message activation, etc. Furnish a LCD display with a minimum size of 240x64 dots with LED back light.

## 8.3 CONSTRUCTION METHODS

### (A) General

Ground all cabinets in accordance with the requirements of this Scope of Work. 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.

Tag and identify all cabinet wiring by the use of insulated pre-printed sleeves. The wire markers shall identify in plain words with sufficient details without abbreviations or codes.

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. 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 SPD, circuit breakers, accessory and equipment outlets, and DC power supply chassis.

Fasten all other cabinet components with hex-head or Phillips-head machine screws installed with nuts (with locking washer or insert) or into tapped and threaded holes. Fasten stud-mounted components to a mounting bracket providing complete access to the studs and mounting nuts. All fastener heads and nuts (when used) shall be fully accessible within a complete cabinet assembly, and any component shall be removable without requiring removal of other components, panels or mounting rails. Do not use self-tapping or self-threading fasteners.

Provide cabinets with all mounting plates, anchor bolts, and any other necessary mounting hardware in accordance with these Scope of Work and the project plans.

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.

Ground the cabinet per Sections 1098 and 1700 of the *Standard Specifications*, applicable addenda, the ITS Concept Plans and this Scope of Work. Provide grounding circuits that are permanent and electrically continuous with a current carrying capacity high enough and an impedance low enough to limit the potential above ground to a safe level.

Run the power company neutral, conduit grounds, and all equipment grounds directly and independently off the ground bus. Use ground clamps, grounding and bonding bushings, lock nuts, and grounding electrodes that comply with UL Standard Electric Grounding and Bonding Equipment. Use ground rods of 5/8 inch minimum diameter, 10 feet long, and made of copper clad steel.

Make connections between ground electrodes and the ground wire using an exothermic welding process, cadweld, or equivalent.

Ensure completed cabinet grounds have a resistance to ground of not more than 20 Ohms.

Each cabinet shall be ISO 9001 certified at the time of bid letting.

Equip the cabinets with SPD lightning and surge protection described separately in this Scope of Work.

Mount the fiber-optic drop cable assembly patch panel in accordance with the "Fiber-Optic Communications Cable" section of this Scope of Work. Install the Ethernet edge switch inside the cabinet in accordance with the "Communications Hardware" section of this Scope of Work. Connect the appropriate connectors on the drop cable patch panel with those on the Ethernet edge switch using SMFO jumpers.

**(B) Type A**

Mount the CCTV cabinets on the metal pole using stainless steel bands as shown in the ITS Concept Plans. Attach all risers to the base of pole-mounted cabinet as shown in the ITS Concept Plans.

The CCTV camera cabinet will be interconnected to CCTV camera assembly using a composite cable carrying the video, serial data and power. Terminal strips shall be provided to support 4-wire EIA 422 communications and the 24 VAC power as will be required for power and data. The terminal strips shall be accessible such that it shall not be necessary to remove any other components to gain access. The terminal shall secure conductors by means of nickel or cadmium plated brass binder head screws.

Configure the cabinets with an interface panel to allow maintenance access for both video and data channels. This access should provide a means to connect analog video and control data channels to a laptop computer. The connection of the laptop computer to video and data feeds shall not require disassembly or removal of any of the equipment or other components located inside the cabinet with the exception of patch cords for the data and video feeds.

Provide a video splitter to provide to the video encoder and the video monitor port simultaneously. The video cables shall interface with the CCTV camera cabinet test point connection and be fitted for interconnection to a BNC receptacle.

Provide a switch for selecting and local camera PTZ control. Provide a communication cable for connection to a typical laptop and video board or monitor for future maintenance activities. The data cable shall consist of an integral USB to RS-232/422 converter as required to support the CCTV camera protocol and shall be compatible with the CCTV camera assembly. The data cable shall plug into the test point connector as provided in the cabinet and into a typical laptop USB data port. Two sets of cables shall be provided, two for data and two for video

Mount the digital video encoder in the 19" equipment rack inside the cabinet in accordance with the "Central Video Equipment" section of this Scope of Work.

**(C) Type C**

Locate the cabinet at least 100 feet from the roadway to minimize water spray on the cabinet. Mount the cabinet for the RWIS site on the tower supporting the sensors. The cabinet shall be at least as high or higher as the edge of the adjacent roadway. Install the cabinet and all cabling per the manufacturer's recommended procedures.

Install only rigid metal conduit risers into the cabinet.

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 a switch for selecting and local camera RWIS control. Provide a communication cable for connection to a typical laptop for future maintenance activities. The data cable shall consist of an integral USB to RS-232/422 converter as required to support the RWIS protocol and shall be compatible with the RWIS RPU. The data cable shall plug into the test point connector as provided in the cabinet and into a typical laptop USB data port. Two sets of data cables shall be provided.

**(D) Type D**

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 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 3-inch minimum clearance from the bottom of the cabinet to all equipment, terminals, and bus bars.

No cabinet resident equipment shall utilize the GFCI receptacle. There shall be one spare non-GFCI receptacle for future addition of equipment.

## 9. METAL CCTV AND MVDS POLES

### 9.1 GENERAL

Furnish and install new metal CCTV and MVDS poles, grounding systems, and all necessary hardware. The work covered by this special provision includes requirements for the design, fabrication, and installation of custom/site specifically designed CCTV and MVDS poles and associated foundations. The Design-Build Team may use CCTV poles with or without lowering devices but shall not compromise the camera viewing requirements described in this scope of work. The minimum CCTV mounting height shall be 45’ above the adjacent roadway whether it is the mainline, ramp or crossing roadway, whichever is higher. The minimum mounting height and resultant pole length of the MVDS above the roadway edge of pavement shall be established by the manufacturer’s recommended guidelines. For cases where the pole location is well above the grade of the roadway, a shorter pole will be allowed if the Design-Build Team documents there will be no loss of functionality or sight distance.

The Design-Build Team may use NCDOT’s standard strain poles and foundations for the CCTV and MVDS poles or they may custom design the poles and foundations used the design procedures described in this scope of work. Screw, auger, or helix pole foundations shall not be used for CCTV poles.

Provide metal CCTV and MVDS poles that contain no guy assemblies, struts, or stay braces. Provide designs of completed assemblies with hardware that equals or exceeds the requirements of the latest Edition of the 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals”, including the latest interim specifications. Provide assemblies with a round cross-sectional design.

Ensure that materials and construction are in accordance with Section 11 of the "Project Special Provisions for Signals and Intelligent Transportation Systems". Ignore references to mast-arm poles and traffic signal related equipment. Replace references to "Contractor" with "Design-Build Team". Replace references to "signal poles" with "CCTV and MVDS poles". Replace references to "Department" with "NCTA".

## 9.2 MATERIALS

### (A) General

Furnish poles and foundations that meet or exceed the following functional requirements with all CCTV and/or MVDS units, power meter, service disconnect, and all equipment cabinets attached and all risers, condulets, and weather head accessories in place:

- Maximum deflection at top of pole in 30 mph, non-gusting wind: 2 inches
- Ultimate load: 90 mph wind with a 30% gust factor

Furnish poles and foundations that sustain the dead load of all equipment attached to the pole with a safety factor of 1.5.

Furnish MVDS poles that when erected in foundation and completely installed are at a minimum height as recommended by the MVDS manufacturer.

### (B) Metal Pole

Design poles according to the ITS Concept Plans.

Furnish hot-dipped galvanized steel poles to mount CCTV / MVDS units and equipment cabinets that meet or exceed the requirements of the NCDOT *Standard Specifications* unless otherwise noted in the ITS Concept Plans or this Scope of Work.

Furnish CCTV poles with ½ inch diameter air terminal, with #4 AWG wire, routed down pole and attached to cabinet equipment grounding system. Furnish an air terminal that extends high enough to provide a 45 degree cone of protection of the camera, as shown in the ITS Concept Plans.

Provide materials in accordance with Section 11.2 of the "Project Special Provisions for Signals and Intelligent Transportation Systems".

### (C) Foundation

Prepare a design for the pole's concrete foundation and submit to the Engineer for review. The top of the drilled shaft foundation shall be flush with finished grade. Unstable soil may require a deeper foundation. Concrete for the foundation shall be 3000 psi minimum. Foundation design shall meet all NCDOT requirements and be prepared and sealed by a North Carolina registered professional engineer. Prepare design, optional custom design and perform soil tests for each CCTV metal pole foundation location in accordance with Section 11.4.B of the "Project Special Provisions for Signals and Intelligent Transportation Systems".

Conduit elbows in foundation shall have a minimum radius of 15 inches (380 mm).

### (D) Camera Lowering Device

If the Design-Build Team chooses to use a camera lowering device, provide them on a steel pole as shown in the ITS Concept Plans. Consider the lowering device and pole as two

interdependent components of a single unit, and provide them together to ensure compatibility of the pole and lowering device.

**(1) Pole**

Use a pole as shown in the ITS Concept Plans that meets the requirements of this section of this Scope of Work. The lowering mechanism and cabling shall be internal to the pole. Provide the pole with a 1.25" PVC conduit inside to house the composite camera cable. This conduit separates the cable from the winch cable. Use a pole that is equipped with a hand hole of sufficient size to provide access to the pole interior and for temporarily securing and operating the lowering tool. Ensure that the pole-top tenon is rotatable.

**(2) Lowering Device**

Use a lowering device as shown in the ITS Concept Plans. Ensure that the lowering device provides the electrical connections between the control cabinet and the equipment installed on the lowering device without reducing the function or effectiveness of the equipment installed on the lowering device or degrading the overall system in any way. Ensure that the only cable in motion when operating the lowering device is the stainless steel lowering cable contained within the pole. Ensure that the lowering device includes a disconnect unit for electrically connecting the equipment installed on the lowering device's equipment connection box to the power, data, and video cables (as applicable); a divided support arm, a pole adapter for the assembly's attachment to the rotatable pole-top tenon, and a pole-top junction box, as shown in the ITS Concept Plans.

Ensure that all of the lowering device's external components are made of corrosion-resistant materials that are powder-coated, galvanized, or otherwise protected from the environment by industry-accepted coatings that withstand exposure to a corrosive environment.

**(3) Equipment Connection Box**

Provide an equipment connection box for connecting the CCTV camera to the lowering device. Ensure that the equipment connection box is watertight and able to seal the interior from moisture and dust.

**(4) Disconnect Unit**

Ensure that the disconnect unit has a minimum load capacity of 200 pounds with a 4:1 safety factor. Ensure that the fixed and movable components of the disconnect unit have a locking mechanism between them. Provide a minimum of two mechanical latches for the movable assembly and, when latched, ensure that all weight is removed from the lowering cable. Ensure that the fixed unit has a heavy-duty cast tracking guide and a means to allow latching in the same position each time.

Ensure that the disconnect unit is capable of securely holding the lowering device and the equipment installed on the lowering device. Use interface and locking components that are stainless steel or aluminum.

**(5) Disconnect Unit Housing**

Ensure that the disconnect unit housing is watertight with a gasket provided to seal the interior from dust and moisture.

**(6) Connector Block**

Provide a connector block as shown in the ITS Concept Plans and directed by the Engineer. Provide modular, self-aligning, and self-adjusting female and male socket contact halves in the connector block. Provide a minimum of nine, including two spare contacts, and a maximum of 20 contacts. Provide contact connections between the fixed and movable lowering device components that are capable of passing EIA-232, EIA-422, EIA-485, and Ethernet data signals and 1 volt peak to peak (Vp-p) video signals, as well as 120 VAC, 9-24 VAC, and 9-48 VDC power. Ensure that lowering device connections are capable of carrying the signals, voltages, and current required by the device(s) connected to them under full load conditions.

Ensure that the female socket contacts and the male contact halves of the connector block are made of heavy-duty molded synthetic rubber, molded chlorosulfonated polyethylene, or approved equal. Provide connector pins made of brass- or gold-plated nickel, or gold-plated copper.

Ensure that the current-carrying male and female contacts are a minimum of 0.102 inch in diameter. Provide two male contacts that are longer than the other contacts to mate first and break last, providing optimum grounding performance.

Provide cored holes in the rubber to create moisture-tight seals when mated with the male connector. Permanently mold the wire leads from both the male and female contacts in a body of heavy-duty molded synthetic rubber, chlorosulfonated polyethylene, or an approved equal. Provide current-carrying wires and signal wires of American Wire Gauge (AWG) #18/1 jacketed wire.

Ensure that the contacts are self-wiping with a shoulder at the base of each male contact so that it is recessed in the female block, thereby giving each contact a rain-tight seal when mated.

**(7) Lowering Tool**

Provide a metal-frame lowering tool with winch assembly and a cable with a combined weight less than 35 pounds, a quick release cable connector, and an adjustable safety clutch. Ensure that the lowering tool can be powered using a half-inch chuck, variable-speed reversible industrial-duty electric drill to match the manufacturer-recommended revolutions per minute, or supply a drill motor for the lowering tool.

Ensure that the lowering tool supports itself and the load. Ensure that the lowering tool is equipped with a positive braking mechanism to secure the cable reel during raising and lowering operations, and to prevent freewheeling.

Use a lowering tool equipped with gearing that reduces the manual effort required to operate the lifting handle to raise and lower a capacity load. Provide the lowering tool with an adapter for operating the lowering device with the portable half-inch chuck drill using a clutch mechanism.

Ensure that the lowering tool is manufactured of durable, corrosion-resistant materials that are powder-coated, galvanized, or otherwise protected from the environment by industry-accepted coatings that withstand exposure to a corrosive environment.

Provide a minimum of one lowering tool plus any additional tools. Upon a project's final acceptance, deliver the lowering tool to NCTA.

**(8) Lowering Cable**

Provide a lowering cable with a minimum diameter of 0.125 inch. Construct it of stainless steel aircraft cable with a minimum breaking strength of 1,740 pounds, and with seven strands of 19-gauge wire each. Ensure that the prefabricated components for the lift unit support system preclude the lifting cable from contacting the power or video cables.

**(9) Wiring**

Ensure that all wiring meets NEC requirements and follows the equipment manufacturers' recommendations for each device connected on the pole, at the lowering device, and in the field cabinet.

## 9.3 CONSTRUCTION METHODS

### (A) General

Obtain approval from the Engineer for final field locations of the CCTV/MVDS metal poles before developing shop drawings and installing the poles. Obtain shop drawings, signed and sealed by a North Carolina registered engineer, for each pole location (each combination of pole height and equipment mix) and submit to Engineer for approval. When approved, submit to pole manufacturer. Determine and provide to pole manufacturer the effective projected area of all items to be attached to each pole at each pole location. Construct drilled pier foundations, drilled pier wing-wall foundations, and erect pole in accordance with Section 11.4 of the "Project Special Provisions for Signals and Intelligent Transportation Systems".

### (B) Camera Lowering Device

Preassemble all components on the ground and tension the lifting cables. Assemble and install the pole and lowering device according to the manufacturer's recommended procedures.

Make a watertight seal between the lowering device and CCTV dome housing. Test the watertight seal of the lowering device and CCTV dome. Test the seal with a water hose.

Ensure that all other cables remain stable and secure during lowering and raising operations and are not entangled or abraded by movement of the lowering cable.

Ensure that the divided support arm and receiver brackets self-align the contact unit with the pole centerline during installation and that the contact unit cannot twist when subjected to the design wind speeds defined in the Standard Drawings for Metal Poles Drawing M 1. Supply an internal conduit in the pole for the power and video cabling.

Ensure all pulleys installed for the lowering device and portable lowering tool have sealed, self-lubricated bearings, oil-tight bronze bearings, or sintered bronze bushings.

# 10. CCTV FIELD EQUIPMENT

## 10.1 DESCRIPTION

Design CCTV camera locations to provide full viewing coverage of the project corridor. Also, provide camera coverage of the crossing roads (out to approximately ¼ mile) that interchange with above-mentioned facilities. The ITS Concept Plans show possible locations but the final locations and quantity are the responsibility of the Design-Build Team. All cameras must be serviceable either by a) camera lowering device or b) aerial lift truck with a working

height of 50 feet or less, without a lane closure. Locate CCTV and poles to minimize further clearing and grubbing of the right of way. Provide traffic control for the installation of those proposed cameras along existing roadways within the project limits. The video shall be encoded using MPEG-4 video compression for transmission over an Ethernet network on single-mode fiber-optic cable.

Furnish and install CCTV field equipment, cabinets and local camera control software described in this Section and as shown in the ITS Concept Plans.

Provide a system to protect field devices and electronic equipment from lightning and surge protection using transient voltage and surge suppression (SPD) technology and standards.

## 10.2 MATERIALS

### (A) General

Furnish new CCTV camera assemblies and CCTV cabinets.

Each CCTV camera assembly shall consist of the following:

- NEMA environmental dome enclosure
- CCTV day/night color digital signal processing camera unit with zoom lens, filter, control circuit, and accessories
- Control receiver/driver that complies with the NTCIP specifications listed below,
- Motorized pan, tilt, and zoom
- Power supplies
- Pole-mount camera lowering device attachment hardware
- All necessary cable, connectors and incidental hardware to make a complete and operable system
- Furnish a NEMA Type 4, IP 66 enclosure constructed of aluminum with a clear acrylic dome or approved equal camera unit housing
- Composite cable for power supply and video and data transmission
- Surge suppression devices (SPDs)

### (B) Standards

- ANSI
- ASTM
- CE, Class B
- EIA Standards 170, 232, 422, 250C and 485
- FCC Rules Part 15, Sub-part J
- FCC Class A
- FCC, Class B
- IEEE
- ICEA
- IMSA
- ISO 9001
- NEC
- NEMA 4X, IP 66
- NEMA Type 1
- NTSC
- UL Listed

Provide UL listed SPD devices according to the *UL 1449, 2nd edition* standard and shall comply with the NEMA requirements as detailed in the *NEMA LS 1 (1992)* standard.

Provide UL listed air terminal according to the *UL 96A* standard and be suitable for use in a UL master label lightning protection system.

**(C) Camera and Lens**

**(1) Cameras**

Furnish new ¼-inch EXview HAD (Hole-Accumulation Diode) charged-coupled device (CCD) color cameras. Furnish cameras with automatic gain control (AGC) for clear images in varying light levels. The camera must meet the following minimum requirements:

- Video signal format: NTSC composite color video output,
- Image sensor resolution: 540 TV lines,
- Image resolution (NTSC): 768 horizontal pixels by 494 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 1/30,000th of a second,
- 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,
- Sensitivity: 1.5 lux at 90% scene reflectance,
- Signal to noise ratio: Greater than 50 dB,
- Video output connection: 1-volt peak to peak, 75 ohms terminated, BNC connector,
- Primary power: 120 VAC,
- Power: Nominal 24 VAC or 24 VDC, and
- Camera power: 73 VA with heater at 24 VAC or 3 amps at 24 VDC.

**(2) Zoom Lens**

Furnish each camera with a motorized zoom lens with automatic iris control with manual override and neutral density spot filter. Furnish lenses that meet the following optical specifications:

- Automatic focus: Automatic with manual override,
- Horizontal Angle of View: 56 degrees at 3.4 mm wide zoom and 1.7 degrees at 119 mm telephoto zoom,
- Focal length: 0.14” – 4.68”, 35X optical zoom, 12X electronic zoom,
- Zoom Speed: 3.2, 4.6 and 6.6 seconds,
- Lens aperture: Minimum of f/1.4,
- Maximum Sensitivity at 35 IRE: .055 lux at ½ second color, .018 lux at 1/2 second color, .00018 lux at ½ sec black and white, and
- Preset positioning: Minimum of 256 presets.

The lens must be capable of both automatic and remote manual control iris and focus override operation. The lens must be equipped for remote control of zoom and focus, including

automatic movement to any of the preset zoom and focus positions. Mechanical or electrical means must be provided to protect the motors from overrunning in extreme positions. The operating voltages of the lens must be compatible with the outputs of the camera control.

**(D) Camera Housing**

Furnish new dome style enclosure for assemblies with a high performance integrated dome system or approved equal. Equip each housing with a mounting assembly for attachment to the CCTV camera-lowering device, or to the pole if lowering devices are not used. The enclosures must be equipped with a strip heater and a sunshield and be fabricated from corrosion resistant aluminum and finished in a neutral color of weather resistant enamel. The viewing area of the enclosure must be high impact acrylic plastic.

A dome-type environmental housing shall have a sustained ambient operating temperature of -29 degrees F to 165 degrees F, with 100 percent non-condensing relative humidity as defined within the NEMA TS-2 (1998) standard.

The enclosure shall have a NEMA 4X/IP-66 rating.

**(E) Pan and Tilt Unit**

Each new dome style assembly must be equipped with a pan and tilt unit. The pan and tilt unit must be integral to dome system. The pan and tilt unit must be rated for outdoor operation, provide dynamic braking for instantaneous stopping, prevent drift, and have minimum backlash. The dome must have an auto flip dome rotation to rotate and reposition camera for viewing objects passing below camera. Equip the drive unit with electronic image stabilization and image enhancement. The pan and tilt units must meet or exceed the following specifications:

- Pan: Continuous 360 degrees,
- Tilt: +2 degrees to -92 degrees unobstructed minimum,
- Presets: Minimum of 256 presets,
- Pan speed: .1 degrees/second to 80 degrees/second,
- Tilt speed: .1 degrees/second to 40 degrees/second,
- Preset Speeds: 400 degrees/second pan and 400 degrees/second tilt,
- Input voltage: 24 VAC 60 Hz or 24 VDC, and
- Motors: Variable speed, continuous duty, instantaneous reversing.

**(F) Power Supplies**

Provide all power supplies necessary for the camera and its pan tilt unit. Mount power supplies in the camera cabinet and utilize composite cable to supply power the camera and pan tilt unit.

**(G) Control Receiver/Driver**

Each new camera unit must contain control receiver/driver that is integral to the CCTV dome assembly. The control receiver/driver must 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 must provide the following functions:

- Zoom in/out,
- Automatic focus with manual override,

- Tilt up/down,
- Automatic iris with manual override,
- Pan right/left, and
- Minimum of 256 preset positions for pan, tilt, and zoom.

In addition, each control receiver/driver must accept status information from pan/tilt unit and motorized lens for preset positioning of those components. The control receiver/driver must relay pan, tilt, zoom, and focus positions from the field to remote camera control units. The control receiver/driver must 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.

**(H) Video Cabling**

Provide video cabling meeting the following requirements:

- Analog video cable between camera and cabinet: RG-59, 75 ohm, solid copper AWG-20, foam dielectric, copper braided foil shield, polyethylene outer jacket with BNC connectors on both ends, and
- Analog video cable within the camera-lowering device and within camera cabinet: RG-59u, 75 ohm, solid copper AWG-22, foam dielectric, copper braided foil shield, polyethylene outer jacket with BNC connectors on both ends.

**(I) Software**

Furnish vendor-supplied software to program and configure the cameras in the field. This software shall include features to set communications addresses and protocols, define presets, tours, privacy zones, and camera ID. Provide an on-screen compass direction indication. The software shall allow the user to control all functions of the camera locally from the CCTV cabinet at the base of the pole with a serial cable.

**(J) CCTV Camera Attachment to Pole**

Comply with the Section on Metal CCTV and MVDS poles in this Scope of Work.

**(K) Surge Suppression**

Provide a maximum 20 ohm ground impedance measurement, and the placement of transient voltage protection both ahead of and behind the ITS device electronics for CCTV installations. All SPD devices shall have an ambient operating temperature of -29 degrees F to 165 degrees F with 95 percent non-condensing relative humidity.

**(1) Grounding**

Furnish a grounding system as shown in the ITS Concept Plans. Provide all connections to the grounding electrode with an exothermic weld. Bond (i.e., connect) all metal components of the camera and cabinets to the grounding system with a grounding cable that uses a mechanical connection on the equipment side and an exothermic welded connection at the down cable.

**(2) Load Side CCTV Power**

Load side protection is designed to restrict surge current transients from entering the power source from the CCTV device and/or site. The SPD for the CCTV power source shall have an

operating voltage of 120 volts single phase and a maximum continuous operating voltage of 150 volts single phase.

The device's SPD shall be rated at a minimum of 90,000 amps per phase and have maximum clamping voltage ratings of 330 volts at 500 amps, 395 volts at 3,000 amps, and 533 volts at 10,000 amps. The SPD shall also be UL listed for a minimum suppressed voltage of 330 volts per line to the neutral/ground. The suppression device shall be of the metal oxide varistor (MOV) type.

**(3) Line Side CCTV Power**

The SPD for the CCTV power source shall have an operating voltage of 120 volts single phase and a maximum continuous operating voltage of 150 volts single phase. The SPD shall be rated at a minimum of 150,000 amps per phase, and have minimum clamping voltage ratings of 293 volts at 500 amps, 350 volts at 3,000 amps, and 446 volts at 10,000 amps. The SPD for the power source shall also be UL listed for a minimum suppressed voltage of 400 volts per line to the neutral/ground. The suppression device shall be an MOV type.

**(4) CCTV Data/Video Supply and Load Side**

The SPD shall have an operating voltage to match the characteristics of the CCTV, such as 24 volts of direct current (VDC) and less than five VDC for data and video functions. These specialized SPD units shall be UL listed according to the *UL 497A* standard. The minimum surge current rating for the SPD shall be 2,000 amps for data and telecommunications, and 4,000 amps for binary network connectors (BNC).

## 10.3 CONSTRUCTION METHODS

### (A) Electrical and Mechanical Requirements

Ground all equipment as called for in the *Standard Specifications*, this Scope of Work, and the ITS Concept Plans.

Install surge protectors on all ungrounded conductors entering the CCTV enclosure as described below. House the protectors in the CCTV cabinet on the pole in a manner approved by the Engineer. The air terminal ground wire must not pass through this cabinet.

### (B) CCTV Camera

Mount CCTV camera units at the height specified in Section 9.1. Install CCTV assemblies at the locations shown on the ITS Concept Plans unless otherwise approved by the Engineer.

Mount the CCTV camera on the side of pole nearest the intended field of view so that the mounting avoids occluding the view with the pole. Obtain approval of camera orientation from the Engineer.

Use the vendor-supplied software to configure the cameras.

### (C) Power Service

Provide 120 Volt power service. Comply with the "Electrical Service" section of this Scope of Work.

### (D) Surge Suppression

#### (1) Grounding

Connect all grounding points related to the CCTV camera assembly and its subsystems to a single point main grounding electrode as shown in the ITS Concept Plans. A 10-foot grounding electrode shall be installed a minimum of 20 feet away from any additional grounding electrodes and/or ground mounted devices.

This grounding radiant shall consist of one main 10-foot grounding rod located at the structural base of the CCTV camera pole and attached to three additional 10-foot radiant grounding rod placed a minimum of 20 feet away from the main grounding rod. Attach the radiant grounding rod to the main grounding rod with a minimum #4 solid bare copper wire that is exothermically welded at both the main grounding rod and the radiant grounding rod.

#### (2) Load Side CCTV Power

Install a transient voltage suppressor (SPD) at the CCTV power source on the load side. This device shall provide protection between line-to-neutral, line-to-ground, line-to-line, and neutral-to-ground.

#### (3) Line Side CCTV Power

Install a SPD in the power line side ahead of all CCTV electronic equipment. This installation technique is designed to restrict earth current transients induced within the ground, or directly from the power source, from entering the ITS device through the incoming 120-volt power circuit. This device shall provide protection between line to neutral, line to ground, line-to-line and neutral to ground.

#### (4) Device Data/Video Line and Load Side

Install specialized SPD devices at the line and line sides of all low voltage connections to the CCTV device and its operating subsystems. These connections include, but are not limited to, Category 6 data cables, coaxial video cables, twisted pair video cables, and low voltage control cables that comply with EIA requirements as detailed in the EIA-232/422/485 standards.

## 11. MICROWAVE VEHICLE DETECTION SYSTEM

### 11.1 GENERAL

Furnish and install a microwave vehicle detection system (MVDS) as shown in the ITS Concept Plans and directed by the Engineer that is capable of traffic data collection meeting this section's requirements. Ensure that the MVDS can be mounted on new MVDS poles, CCTV poles, or toll gantry structures, for a side-fire configuration. The final locations and quantity to provide the minimum coverage shown in the ITS Concept Plans are the responsibility of the Design-Build Team.

The detection units shall use Ethernet communications for monitoring and control from the STOC and monitoring only from the NCTA Executive Offices.

## 11.2 MATERIALS

### (A) General

Provide an MVDS assembly for the project site that consists of microwave radar sensor(s) in enclosed housing(s) (i.e., the detectors), as shown in the ITS Concept Plans and directed by the Engineer. Provide an installation kit with mounting brackets; home run cable for the transmission and receipt of data and communications between the field detector and the communication system hardware; and all required power and data cables, as detailed in the ITS Concept Plans.

### (B) Detector

Provide a (MVDS) that uses a Federal Communications Commission (FCC)-certified, low-power microwave radar beam to detect vehicle passage and generate volume, occupancy, length-based classification, and speed data. Ensure that the MVDS is a true-presence microwave radar that uses the frequency modulated continuous wave (FMCW) principle. Ensure that any non-background targets reflect the signal back to the microwave radar detector, where the targets are detected and their range measured.

Ensure that the MVDS provides speed-trap emulation and has the ability to detect automatically sensor settings, baud rates, loop spacing, and communication port settings to select an operational mode.

Ensure that the detector has the ability to self-tune and allow manual calibration via supplied vendor software. Ensure that the MVDS is capable of auto-calibration and auto-configuration, and that it does not transmit any signals outside its FCC-approved frequency. Provide a setup program that allows the operator to define detection zones within the detector's field of view. Ensure that the detector automatically configures zones, requiring minimal external tuning. Verify that the unit is not adversely affected by varied weather conditions, such as rain, fog, heat, or wind.

Ensure that the MVDS can compute, store, and provide all required traffic parameter measurements per detection zone in user-selected time intervals from 0 to 60 minutes, including, but not limited to, 10 seconds, 20 seconds, 30 seconds, 60 seconds, 5 minutes, 10 minutes, 15 minutes, 30 minutes, and 60 minutes. The MVDS shall log and store vehicle volume, occupancy, length-based classification and speed data for a minimum of seven days regardless of collection interval. Data storage within the MVDS shall utilize a first in/first out architecture such that the oldest stored data record is overwritten with the newest data record when the storage device is at full capacity.

#### (1) Communications

Ensure that the MVDS generates and transmits traffic data either in serial format using an Electronic Industries Alliance (EIA) standard EIA-232 communication port or an Internet Protocol (IP) interface. If the detector does not have Ethernet communications integral to the detector provide data translators to provide for Ethernet communications. Ensure that the MVDS can generate contact closures emulating the output of a pair of 6-foot by 6-foot loops with leading edges placed 16 feet apart.

Verify that the MVDS is IP addressable. Ensure that all device communication addresses are user programmable.

Ensure that the MVDS supports Ethernet protocols. Ensure that the setup program assigns an IP address to the detection unit. Ensure that the MVDS responds to a polling request from the TMC for traffic data. Verify that the detection unit responds with the accumulated traffic parameter measurements from the period since the last request was issued.

Verify that the MVDS stores all system configuration and traffic parameter data within internal nonvolatile memory. Verify that traffic data can be locally and remotely transferred by issuing requests from a personal computer (PC) across the communication network connecting the detector and the TMC operator workstation or other PC.

**(2) Configuration and Management**

Ensure that the MVDS software application provides PC desktop display of the detection zones and control of any vehicle detector connected to the network. Ensure that the MVDS setup program enables the operator to select whether data is output as contact closures emulating standard loop detector outputs, and/or as accumulated statistical data using detector serial ports.

Verify that the sensor holds a vehicle's presence in the specified detection zone until the vehicle is clear of the zone. Ensure that the sensor does not tune out stationary vehicles within a detection zone and thereby give a false clear status to the lane, even if a vehicle has stopped for a period exceeding 30 minutes. Provide a detector that is capable of resolving closely spaced vehicles.

Provide an assembly manufactured in such a way as to prevent reversed or improper installation. Ensure that the MVDS design provides high-voltage exposure protection to personnel during equipment operation, adjustments, and maintenance.

Provide software licenses.

Ensure that an operator using a locally connected laptop computer can conduct system setup, calibration, diagnosis, and data retrieval operations. Ensure that the MVDS is capable of having its configuration data saved to a laptop computer or TMC server, which can later transfer the data back to the MVDS for reloading.

Ensure that the MVDS operator can use a laptop computer or TMC server to edit previously defined detection configurations to permit adjustments to the detection zone's size, placement, and sensitivity, and to reprogram the detector's parameters.

Ensure that the laptop computer and the MVDS can communicate when connected directly by an EIA-232 cable. Ensure that the laptop computer and MVDS can communicate across the ITS system's communication network using the NTCIP standards described in this Scope of Work. Ensure that the software allows communication between multiple users and multiple field devices concurrently across the same communication network.

Once programmed, ensure that no periodic adjustments are required to the detection zones unless physical roadway conditions change, such as lane shifts or closures.

**(3) Electrical Requirements**

Ensure that the MVDS field hardware meets the requirements in the FCC's 2005 Code of Federal Regulation (CFR), Title 47, Part 15. The detector shall not interfere with any known equipment.

Ensure the MVDS operates using a nominal input voltage at the field cabinet of 120 volts of alternating current ($V_{AC}$). Ensure that the system's power supply will operate with an input voltage ranging from 89 to 135 $V_{AC}$. For any device requiring a source input other than the standard 120 $V_{AC}$, supply the appropriate means of conversion.

Provide an assembly manufactured in such a way as to prevent reversed or improper installation. Ensure that the MVDS design provides high-voltage exposure protection to personnel during equipment operation, adjustments, and maintenance.

Furnish all equipment with the appropriate power and communication cables. Install the power cable and the communication cables according to the manufacturer's recommendation. Ensure that the cables comply with NEC sizing requirements as presented in NEC Article 210-19(a), Fine Print Note (FPN) No. 4, and meet all other applicable standards, specifications and local code requirements.

Ensure that the power cable running between the MVDS and its electrical service is in a separate conduit. Do not install communication cables in the same conduit as power cables carrying voltage greater than 24 $V_{DC}/V_{AC}$ or current in excess of 1.5 amps. Do not install the power and communication cables in the same pull boxes.

Cut all wires to their proper length before assembly. Do not double back any wire to take up slack. Neatly lace wires into cables with nylon lacing or plastic straps. Secure cables with clamps and provide service loops at all connections.

In the event that power to the MVDS or a subcomponent thereof is interrupted, ensure that the equipment automatically recovers after power is restored. Ensure that all programmable system settings return to their previous configurations and the system resumes proper operation.

Ensure that the MVDS operator is able to select and use 12 to 24 volts of direct current ($V_{DC}$) and 115 $V_{AC}$ at 60 Hz.

Ensure that the detector is FCC certified and that the FCC's identification number is displayed on an external label. Ensure that the detector transmits within a frequency band of 10.525 gigahertz, ±25 megahertz, or another FCC approved spectral band.

**(4) Environmental Requirements**

Provide MVDS that meet all specifications during and after being subjected to an ambient operating temperature range of -29 degrees F to 165 degrees F with a maximum non-condensing relative humidity as defined in the environmental requirements section of the NEMA TS 2 standard.

Verify that the MVDS manufacturer certifies that its device has successfully completed environmental testing as defined in the NEMA TS 2 standard. Verify that vibration and shock resistance meet the requirements of Sections 2.1.9 and 2.1.10, respectively, of NEMA TS 2.

Ensure that no item, component, or subassembly emits a noise level exceeding the peak level of 55 decibels adjusted (dBa) when measured at a distance of 3.3 feet away from its surface.

Ensure that MVDS components comply with the environmental requirements detailed in the NEMA TS 2 standard.

**(5) Detector Housing**

Furnish and install an environmentally resistant and tamper-proof sensor enclosure for any detector assembly exposed to the elements. Ensure that the enclosure is environmentally sealed upon installation and that it is light in color.

**(6) Wind Loads**

Design MVDS poles in accordance with the 4th Edition 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.

**(7) Performance**

Provide a MVDS capable of meeting the minimum total roadway segment accuracy levels of 95% for volume, 90% for occupancy, 90% for length based classification and 90% for speed for all lanes, up to the maximum number of lanes that the device can monitor as specified by the manufacturer. This evaluation (by necessity) shall take place during the Observation Period.

To verify conformance with the accuracy requirements in this section, perform evaluations by comparing sample data collected from the vehicle detection system with ground truth data collected during the same time by human observation or by another method approved by the Engineer. Base the vehicle detection system's performance evaluation on sample data taken over several periods under a variety of traffic conditions. Develop and adhere to a methodology to collect data and calibrate and evaluate the performance of each device using speed, volume, and occupancy data.

**(C) Software**

Provide software to perform the following tasks:

- Device configuration and setup,
- Diagnostic testing,
- Device management,
- Data retrieval, analysis, reporting and storage,
- Data importing from NCDOT's MVDS database,
- Data exporting to other systems, including but not limited to:
    - Toll collection system for congestion pricing
    - Dynamic Message Signs for travel time posting
    - NCDOT for posting on a speed map
- Independent travel time calculation from first mainline MVDS to US 601, and from US 601 to last mainline MVDS, in each direction.

Provide software to collect data from each sensor as frequently as 20-second intervals.

The report function shall include user-definable queries in graphical, text and tabular formats.

The software shall perform database translations, data types and file formats to accomplish the above data exporting. The software should utilize the following minimum file formats:

XML, HTML, SQL, Excel, and PDF. Software shall include "on-demand" and scheduled data translation.

The Design-Build Team shall update the NCTA website speed map by depicting:

- Location of each MVDS on Monroe Connector/Bypass,
- Background map suitable in detail and for use on Internet website.

The maps shall be expanded to display all of the Monroe Connector/Bypass and the crossing routes (whether interchange or otherwise). Depict on the map local names, route numbers, and major landmarks. The Design-Build Team shall develop a verification plan to be approved by Engineer to verify that speeds displayed on the map are accurate. This verification shall take place during the Observation Period.

Provide device drivers for detectors provided in this Scope of Work.

## 11.3 CONSTRUCTION METHODS

Install, configure, and demonstrate a fully functional vehicle side-fire detection system. Connect all field hardware to the communication network, and provide all materials specified in this Scope of Work. Install all equipment according to the manufacturer's recommendations or as directed by the Engineer.

### (A) Electrical and Mechanical Requirements

Ground all equipment as called for in the *Standard Specifications*, this Scope of Work, and the ITS Concept Plans.

Install surge protectors on all ungrounded conductors entering the MVDS enclosure as described below. House the surge protectors in the MVDS cabinet on the pole in a manner approved by the Engineer. The air terminal ground wire must not pass through this cabinet.

### (B) MVDS

Ensure that the MVDS can be mounted on new MVDS poles or CCTV poles, in a side-fire configuration. Mount each MVDS at height and setback corresponding to the manufacturer's recommendations for the number of lanes and the detection zone. For CCTV poles with lowering devices, provide a detector-mounting bracket to mount the detector on the side of the pole 90 degrees to traffic so the camera and lowering device do not strike the detector. For locations where the minimum setback cannot be met when mounting on front face of pole, provide a mounting bracket to mount on the side of the pole 90 degrees to traffic so the camera and lowering device do not strike the detector. Use this method only if that provides the minimum setback.

Mount the MVDS detector as detailed in the ITS Concept Plans. In either configuration, mount the detector level with respect to the centerline of the roadway. Tilt the unit downward toward the roadway to ensure detection of all lanes.

Ensure that the MVDS sensor has a 200-foot range, and that the viewing angle is a minimum of 40 degrees vertical and a maximum of 15 degrees horizontal. Verify that all detection zones are contained within the specified elevation angle according to the manufacturer's recommendations and that the MVDS is capable of fully detecting all vehicles in a minimum of eight lanes or zones. Ensure that the configuration also provides accurate collection of all data types as detailed in this specification.

Provide a detector housing that can be pole-mounted, as indicated in the ITS Concept Plans. Supply a universal mounting bracket that is adjustable on two axes for optimum alignment.

Attach the mounting bracket with approved stainless steel bands that are 0.75 inch wide and 0.025 inch thick, or mount to a concrete structure using two stainless steel expansion bolts of sufficient length and diameter to support 100 pounds.

When installing a detector near metal structures, such as buildings, bridges, or sign supports, mount the sensor and aim it so that the detection zone is not under and does not pass through any structure to avoid distortion and reflection.

Ensure that the detector is factory calibrated to comply with all applicable standards, specifications, and requirements.

Provide an interface to external equipment with a single connector. Ensure that the connector provides power to the unit and allows generation of contact closure output pairs. Ensure that the connector includes serial communication lines for programming, testing, and interfacing with the modem/switch at 9,600 to 115,000 bps baud rate and that it has at least 26 pins. Ensure that the serial port's data format is standard binary non-return to zero (NRZ) modulation with 8-bit data, 1-stop bit, and no parity.

Ensure that the homerun cable is a polyurethane-jacketed cable approved by the Engineer, with polyvinyl chloride (PVC) insulated conductors. The homerun cable shall have a 300-volt rating and a temperature rating of 200° F. Ensure that the cable is equipped with #20 or #22 American Wire Gauge (AWG) conductors.

Crimp or solder the detector connector pins to the cable conductors. Assemble and test the cable prior to onsite installation and pulling. Cut all wires to their proper length before installation. Do not double back wire to take up slack. Neatly lace wires into cable with nylon lacing or plastic straps, and secure cables with clamps. Provide service loops at all connections.

Perform continuity tests on the detector's stranded conductors using a meter having a minimum input resistance of 20,000 Ω per volt and show that each conductor has a resistance of not more than 16 Ω per 984.25 feet of conductor.

Measure the insulation resistance between isolated conductors and between each conductor, ground, and shield using a meter designed for measuring insulation resistance. The resistance must be infinity. Perform all resistance testing after final termination and cable installation, but prior to the connection of any electronic or field devices.

**(C) Power Service**

Provide 120VAC power service. Comply with the "Electrical Service" section of this Scope of Work.

**(D) Surge Suppression**

**(1) Grounding**

Connect all grounding points related to the MVDS to a single point main grounding electrode as shown in the ITS Concept Plans. A 10-foot grounding electrode shall be installed a minimum of 20 feet away from any additional grounding electrodes and/or ground mounted devices.

This grounding radiant shall consist of one main 10-foot grounding rod located at the structural base of the MVDS pole and attached to three additional 10-foot radiant grounding rod placed a minimum of 20 feet away from the main grounding rod. Attach the radiant grounding rod to the main grounding rod with a minimum #4 solid bare copper wire that is exothermically welded at both the main grounding rod and the radiant grounding rod.

**(2) Load Side Detector Power**

Install a transient voltage suppressor (SPD) at the MVDS power source on the supply side. This device shall provide protection between line-to-neutral, line-to-ground, line-to-line, and neutral-to-ground.

**(3) Line Side Detector Power**

Install a SPD in the power line side ahead of all MVDS electronic equipment. This installation technique is designed to restrict earth current transients induced within the ground, or directly from the power source, from entering the ITS device through the incoming 120/240-volt power circuit. This device shall provide protection between line to neutral, line to ground, line-to-line and neutral to ground.

**(4) Load Side Detector Data**

Install specialized SPD devices at the supply and line sides of all low voltage connections to the MVDS and its operating subsystems. These connections include, but are not limited to, Category 6 data cables, and low voltage control cables that comply with EIA requirements as detailed in the EIA-232/422/485 standards.

**(E) Software**

If software is required, install the software application(s) on the STOC virtual servers for access by all TMC operators, NCTA CSC workstation, and NCTA Executive Office access. Coordinate with Toll Systems Integrator to define the data variables, database type and file format for congestion pricing. Configure data translation applications for those services described above.

## 12. DYNAMIC MESSAGE SIGN (DMS) SYSTEM

### 12.1 DESCRIPTION

**(A) General**

Furnish and install new NTCIP v2 compliant Dynamic Message Signs (DMS), and DMS power and communications equipment in accordance with this Scope of Work and ITS Concept Plans. Integrate the signs into the STOC software. The DMS signs shall be fully compatible with the Vanguard® DMS control software version currently in use at the STOC to ensure seamless integration of new signs with NCDOT's existing central command and control system.

Furnish and install DMS signs compliant with UL standards 48, 50, 879, and 1433.

Add and configure the new DMS signs in the existing NCDOT *Vanguard* database on the proposed servers. Furnish, install, test, integrate, and make fully operational the new DMSs at locations shown on the project plans. The Design-Build Team shall also be responsible for any

MIB development and configuration if the NCDOT STOC does not already have MIBs for the DMS.

The structures supporting the DMS signs are described elsewhere in this RFP. Furnish, install, test, integrate and make fully operational the new DMSs at locations shown in the ITS Concept Plans.

For DMS A1 and DMS A2, establish Ethernet radio communications from the fiber-optic communications network to these devices.

For each new location, the DMS system shall include:

- Color, full matrix LED technology
- Minimum 27 pixels high by 110 pixels wide display (27 by 90 pixels for A1 and A2)
- DMS controller
- Uninterruptible Power Supply (UPS)
- Cabinet and accessories with interconnect, power cabling and conduit
- Electrical service and related equipment
- All other equipment and incidentals required for furnishing, installing, and testing system and system components
- Use only UL listed and approved electronic and electrical components in the DMS system
- Walk-in housing or front access, as shown on the ITS Concept Plans

## 12.2 MATERIALS

### (A) General

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.

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.

### (B) Environmental Requirements

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

Design the DMS system to comply with the requirements of Section 2.1 (Environmental and Operating Standards) of NEMA TS 4-2005.

Construct the DMS and housing so that it can withstand AASHTO 2002 50-year wind speed for the area where the DMS will be installed.

### (C) DMS Enclosures

The DMS enclosure construction shall comply with the requirements of Section 3 (Sign Mechanical Construction) of NEMA TS 4-2005. The following requirements complement TS 4-2005.

Paint the DMS face matte black. All grind marks and discoloration shall be removed from the surfaces.

All nuts, bolts, washers, and other mounting and bonding parts and components used on the exterior of the DMS enclosure shall be corrosion resistant and 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.

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

**(1) Front Access DMS**

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 enclosures. Construct the enclosure of welded aluminum type 5052-H32, or of an Engineer approved alternate. The sheet aluminum skin shall be a minimum of .090-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).

**(2) Walk-in DMS**

The DMS enclosure construction shall comply with the requirements of Section 3 (Sign Mechanical Construction) of NEMA TS 4-2005 as it applies to Walk-in enclosures. Construct the enclosure of welded aluminum type 6061-T6 (major structural components), 5052-H32 (minor structural components and exterior shell), or of an Engineer approved alternate at least .125-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). All structural attachment hardware (direct tension indicators, nuts, bolts, washers) shall be either stainless or galvanized steel A325 high strength steel.

Construct the DMS with a metal walk-in enclosure excluding the face. Provide an aluminum walking platform with a slip resistant surface inside the enclosure that is at least 28 inches wide. The width of the walking platform shall be free of obstructions to a height of 7 feet.

Provide one key lockable, hinged, gasket-sealed inspection door for service and maintenance along each end of the enclosure. Equip the doors with locks operable from the inside. Install one appropriately sized fire extinguisher within 12 inches of each maintenance door. Equip the door with a door-hold-open device.

**(D) Structural Requirements**

**(1) General**

Mount the DMS enclosure and interconnect system securely to supporting structures as described in this RFP. For Walk-in DMS, design the enclosure supports to allow access to the DMS enclosure inspection door.

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 *Standard Specifications for Structural Supports for Highway Signs, Luminaires*, and the section titled "Dynamic Message Sign Assembly" of this Scope of Work.

**(2) Direct Tension Indicators**

Use direct tension indicators whose material, manufacturing process, performance requirements, workmanship and certification requirements conform to the requirements of ASTM F959.

For Type 3 high strength bolts, use direct tension indicators mechanically galvanized to ASTM B695 Class 50, then with 1 mil of baked epoxy applied.

For plain Type 1 high-strength bolts, use direct tension indicators that are plain or mechanically galvanized to ASTM B695 Class 50.

For galvanized Type 1 high strength bolts, use direct tension indicators that are mechanically galvanized to ASTM B695 Class 50 only.

**(E) DMS Enclosure Structure Mounting**

Provide vertical I-beams or Z-bars bolted through the exterior shell to the structural frame to mount the sign on the structure. Utilize aluminum type 6061-T6 structural members and either stainless or galvanized steel A325 high strength steel mounting hardware. Design and fabricate the vertical supports so hanger attachments can be mounted without affecting or penetrating the outer shell of the sign.

Design the DMS enclosure supports and structure to allow access to the DMS enclosure inspection doors on walk in signs or access panels on front access signs. Design and ensure the penetrations through the exterior shell remain watertight.

**(F) Front Panel**

Protect the DMS face with contiguous, weather-tight, removable panels. Manufacture these panels of sheets of polycarbonate, methacrylate, GE Lexan Type SG300 or equivalent that are ultraviolet protected, have an antireflection coating, and are a minimum of 1/8-inch thick. 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 circular openings for each LED pixel. Front side of the aluminum mask, which faces the viewing motorists, shall be primed and coated with automotive-grade flat black acrylic enamel paint or an approved equivalent. All painted surfaces shall 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 case and the front panel must not cause damage to either 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. Cover the areas of the panels between characters and lines with a flat black, UV-treated, colorfast material to reduce glare.

For front access signs, provide access internal to the sign housing by one of two methods. Method one is provide a hinged front face from the top to allow access to the interior of the sign

and all of its components. Method two is the provision of a means to remove any and all display modules described below to access to the interior of the sign and all of its components.

**(G) Display Modules**

Manufacture each display module with a standard number of pixels, not to exceed an array of 9 x 5 that can be easily removed. Assemble the modules onto the DMS assembly 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. All power and communication cables connected to a display module shall be plug-in types to allow easy removal for maintenance and repair. Provide a positive locking mechanism to hold the boards in place.

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

**(H) LED Pixels**

A pixel is defined as the smallest programmable portion of a display module that consists of a cluster of closely-spaced discrete LEDs. Design each pixel to be a maximum of 1.75 inches center to center.

Pixels shall be constructed with two strings of LEDs. The number of LEDs in each string shall be determined by the manufacturer to produce the candela requirement as stated herein.

Ensure that all pixels in all signs in a project, including operational support supplies, have equal color and on-axis intensity. Ensure that the sign display produces an overall luminous intensity of at least 92 candelas per square meter when operating at 100% intensity. Measure the brightness of each LED in accordance with the International Commission on Illumination's (CIE) requirements detailed in Test Method A of the CIE 127 (1997) standard. Provide the LED brightness and color bins that are used in each pixel to the Engineer for approval. Provide a letter of certification from the LED manufacturer that demonstrates testing and binning according to the CIE 127 (1997) standard. Ensure each pixel contains two interlaced strings of LEDs. Ensure that all LEDs operate within the LED manufacturer's recommendations for typical forward voltage, peak pulsed forward current, and other ratings. Component ratings shall not be exceeded under any operating condition.

Provide a pixel test as a form of status feedback to the TMC from the local sign controller. Ensure that the operational status of each pixel in the sign can be automatically tested once a day. The operational status may also be tested when the STOC or a laptop computer prompt defective pixels as transmitted to the STOC or a laptop computer. Ensure that the log file includes the pixel status, module number, column number, and pixel number. Ensure that the pixel status test determines the functional status of the pixel as stuck-on or stuck-off and does not affect displayed message for more than half a second.

Each pixel shall contain the quantity of discrete LEDs needed to output white colored light at a minimum luminous intensity of 12,400 candelas per square meter when operated within the forward current limits defined in this Scope of Work.

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 catalog cuts.

Protect LEDs from degradation due to sunlight via flat black louvers or a functionally equivalent methodology. Place these louvers or equivalent behind the front panel. Use a method that does not reduce the display viewing-angle below that provided by the LED. Install the louvers or equivalent in such a way as to promote cooling of the LEDs and so that they are easily removable for cleaning or maintenance.

**(I) 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 with a MTBF (Mean Time Between Failure) of at least 100,000 hours of permanent use at an operating point of 140 degrees 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 70% 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. Distribute the batches consistently and evenly across the sign face. Document the procedure to be used to comply with this requirement as part of the catalog cut submittal.

Individually mount the LEDs on circuit boards that are at least 1/16-inch thick FR-4 fiberglass, flat black printed circuit board in a manner that promotes cooling. Ensure the LEDs are mounted parallel and flush to the circuit board. 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 degrees F to +140 degrees F at 95% relative humidity, non-condensing.

Supply the LED manufacturer's technical specification sheet with the catalog cuts.

Provide LEDs that are untinted, non-diffused, high output solid-state lamps manufactured by Toshiba or Hewlett-Packard. The red LEDs shall utilize aluminum indium gallium phosphide (AlInGaP) technology with a peak wavelength of 625 ± 10 nm. The green LEDs shall utilize indium gallium nitride (InGaN) technology with a peak wavelength of 527 ± 7.5 nm. The blue

LEDs shall utilize indium gallium nitride (InGaN) technology with a peak wavelength of 467 ± 3 nm. No substitutions will be allowed. Provide T 1¾, mm size LEDs.

**(J) LED Power Supplies**

Power the LED display by means of multiple regulated switching DC power supplies that operate from 120 volts AC input power and have an output of 24 volts DC or less. Wire the supplies in a redundant parallel configuration that uses multiple independent power supplies per display. Provide the supplies with current sharing capability that allows them to provide 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 (all pixels on at maximum brightness) and at a temperature of 140 degrees F.

Provide power supplies to operate within a minimum input voltage range of +110 to +130 volts AC and within a temperature range of –22 degrees F to 140 degrees F. Power supply output at 140 degrees F must not deteriorate to less than 65% of its specified output at 70 degrees F. Provide power supplies that are overload protected by means of circuit breakers, and 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.

**(K) 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.

**(L) Display Capabilities**

Design the DMS with at least the following message displays:

- Static display,
- Flashing display with dynamic flash rates, and
- At least two alternating static and / or flashing sequences (multi-page messages).

**(M) DMS Interior Environment Monitoring and 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 degrees F of the outdoor ambient temperature. Provide the DMS environmental monitoring and control system with five primary subsystems as follows:

**(1) 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 point down on the bottom of the sign. Place the other two, on the back wall and one on the front wall of the sign enclosure. Alternate design maybe accepted provided the sensor assembly is 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.

**(2) 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 degrees F to +176 degrees 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 degrees F, and to automatically restart the LED display whenever the suspect temperature falls below +130 degrees 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.

**(3) 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 four 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 degrees F and to turn the cooling system off whenever LED board temperature falls below +85 degrees 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 to discourage birds from nesting in them. 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.

**(4) 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 degrees F and to deactivate the system whenever LED board temperature falls to +85 degrees F. Locate cooling fans so as not to hinder removal of LED display modules and driver boards.

**(5) 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 degrees F and to deactivate the defog/defrost system whenever LED board temperature exceeds +106 degrees 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).

**(N) Electrical Requirements**

The requirements stated herein shall 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.

All conductors shall be individually and uniquely labeled. All conductor labels shall be clearly visible without moving the conductor. All terminal conductors shall connect to the terminal strip in right angles. Excess conductor shall be removed before termination of the conductor. The conductor shall be molded in such a fashion as to retain its relative position to the terminal strip if removed from the strip. No conductor shall run 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. All connectors, devices, and conductors shall be installed in accordance to manufactures guidelines. All wiring shall comply with the latest NEC guideline in effect during installation. No conductor or conductor bundle may hang loose or create a snag hazard. All conductors shall be protected from damage. All solder joints shall be completed using industry accepted practices and shall not fail due to vibration or movement. All welds must be in a manner that will not fail due to vibration. Lamps and control boards shall be protected from damage.

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.

Provide one earth grounding lug that is electrically bonded to the sign housing.

Label all equipment and equipment controls clearly.

Supply each sign assembly with one complete set of wiring diagrams that identify the color-coding or wire tagging used in all connections.

Provide power supply monitoring circuitry to detect power failure in the DMS and to report automatically this fault to the control software. This requirement is in addition to reporting power failure at the controller cabinet.

**(1) Lighting**

Equip walk-in DMS enclosures with internal fluorescent lighting controlled with timers installed close to each inspection door. No light emitted from the fluorescent tubes or any other light source inside the enclosure not comprising the display shall leak to the outside of the enclosure.

**(2) Convenience Outlets**

Install GFCI duplex utility receptacles every 6 feet along the width of the DMS in convenient locations for powered service tools.

**(3) 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 Hz. $\pm$ 3 Hz. Under normal operation, do not allow the voltage drop between no load and full load of the DMS and its controller to exceed 3% of the nominal voltage.

Blackout, brownout, hunting, 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.

Protect the DMS sign, 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.

**(4) Surge Suppression**

See the Cabinet Section of the Scope of Work for surge suppression equipment required in the DMS controller cabinet.

Install and clearly label filtering hybrid power line SPDs 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 waveshape | 50,000 amperes |
| Energy absorption | > 500 joules |
| Clamp voltage | 240 volts |
| Response time | <1 nanosecond |
| Minimum current for filtered output | 15 amperes for 120VAC* |
| Temperature range | -40$^{o}$F to +158$^{o}$F |

* Capable of handling the continuous current to the equipment

**(O) 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 project plans for cable and conduit types and sizes. Conduit shall not be mounted on the exterior of the DMS structure. Conduits will be provided within the toll gantries for the DMS cabling and power supply.

**(P) DMS Controller**

Furnish and install one DMS controller with accessories per DMS in a cabinet described in this Scope of Work. Provide the DMS controller as a software oriented microprocessor and with resident software stored in non-volatile memory. The control software, controller, and communications must comply with the NTCIP Standards identified in this Scope of Work. Provide sufficient non-volatile memory to allow storage of at least 500 multi-page messages and a test pattern program.

**(1) 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 and if the addresses match, then the controller processes the accompanying data.

**(2) Controller Modes of Operation**

Provide each controller with two possible modes of operation based on the point of control:

- Remote Mode: The control software controls DMS display. and
- Local Mode: An on-site operator controls DMS display using the LCP or a laptop computer.

The controller will report its operational mode status to the Control Software when polled.

**(3) Controller Functions**

Design the DMS controller to continuously control and monitor the DMS independent of the control software.

Design the controller to display on the sign a message sent by the control software, a message stored in the sign controller memory, or a message input on-site by an operator.

The control software can direct the controller to perform the following major tasks: create, edit, and / or delete messages and their parameters, stop or change the message being displayed, and perform diagnostic and test programs.

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 LCP.

**(4) Controller Memory**

Design each DMS controller with its local 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 Engineer will furnish the initial set of messages. Load these messages into both the control software library and the DMS controller's non-volatile memory. 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. These actions shall be accomplished without removing the non-volatile memory from the controller and installing another non-volatile memory in the controller.

**(Q) 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, obtain access to, and perform all functions of the main controller.

**(R) NTCIP Requirements**

This portion of the specification defines the detailed NTCIP requirements for the DMS signs covered by this Scope of Work.

For compatibility with Vanguard software, implement all objects found on the attached MIB file except for the objects that are exclusively applicable to proprietary hardware features found in Vanguard DMSs.

**(1) 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 | Simple Transportation Management Framework |
| NTCIP 1201 | NTCIP 1201:1997 | Global Object Definitions |
| NTCIP 1203 | NTCIP 1203 v03:2009 | Object Definitions for Dynamic Message Signs |
| NTCIP 2001 | NTCIP 2001:1997 | Class B Profile |
| NTCIP 2101 | NTCIP 2101 | SP-PMPP/232<br>Subnet Profile for PMPP over RS-232 |
| NTCIP 2103 | NTCIP 2103 | SP-PPP/232<br>Subnetwork Profile for PPP over RS232 (Dial Up) |
| NTCIP 2104 | NTCIP 2104 | SP-Ethernet<br>Subnet Profile for Ethernet |
| NTCIP 2201 | NTCIP 2201 | TP-Null<br>Transport Profile |
| NTCIP 2202 | NTCIP 2202 | TP-Internet Transport Profile (TCP/IP and UDP/IP) |
| NTCIP 2301 | NTCIP 2301 | AP-STMF<br>AP for Simple Transportation Management Framework |

Note: this project features color signs with the ability to post graphics. The color DMS signs shall comply with NTCIP Standard 1203 Object Definitions for Dynamic Message Signs version 02, dated 2007. Comply with all mandatory objects pertaining to the displaying and monitoring of graphics and color messages. Comply with all optional objects necessary to support the displaying and monitoring of graphics and color messages.

**(2) General Requirements**

**a. Subnet Level**

Ensure NTCIP components support NTCIP 2104.

NTCIP Components may support additional Subnet Profiles at the manufacturer's option. At any one time, only one Subnet Profile shall be 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.

**b. Transport Level**

Additionally, NTCIP components shall support NTCIP 2104.

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.

### c. Application Level

Ensure each NTCIP Component complies with NTCIP 1103 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.

### d. Information Level

Each NTCIP Component shall provide Full, Standardized Object Range Support of all objects required by these procurement specifications unless otherwise indicated below. The maximum Response shall be 100 milliseconds plus one millisecond per each byte in the response bindings field.

Design the DMS to support all mandatory objects of all mandatory Conformance Groups as defined in NTCIP 1201 and NTCIP 1203 v02: 2007. 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 700,000 bytes 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, central and central override |

* Ensure the Permanent Messages display the content shown in Table 3.

**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.

**e. Test Heading**

**Time Management**

As defined in NTCIP 1201

**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 |

**Report**

As defined in NTCIP 1103v02-10b. 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 1103 Clause A.7.4 | At least 50 |
| eventConfigurationMode | NTCIP 1103 Clause A.7.5.1.3 | The NTCIP Component supports the following Event Configuration Modes: other, onChange, greaterThanValue, smallerThanValue, hysteresisbound, periodic and addedWithValue. |
| MaxEventLogSize | NTCIP 1103 Clause A.7.6 | At least 200 |
| MaxEventClasses | NTCIP 1103 Clause a.7.5.12 | At least 255 |

**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 character set for the first three fonts are defined in NEMA TS-4 section 5.6.1. The second font is a double-stroke 18” font. The third font is a 28” font. The fourth font is empty.

**DMS Configuration**

As defined in NTCIP 1203.

**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 and full |
| defaultJustificationPage | NTCIP 1203 Clause 2.5.1.1.1.7 | The DMS supports the following forms of page justification: top, middle and bottom |
| defaultCharacterSet | NTCIP 1203 Clause 2.5.1.1.1.10 | The DMS supports the following character sets: eightBit |

**Default Message Control:**

As defined in NTCIP 1203.

**MULTI Error Control:**

As defined in NTCIP 1203.

**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 and manual |
| dmsIllumNumBrightLevels | NTCIP 1203 Clause 2.8.1.1.1.4 | At least 16 |

**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 |

**Sign Status**

As defined in NTCIP 1203.

**Status Error**

As defined in NTCIP 1203.

**Pixel Error Status**

As defined in NTCIP 1203.

**Climate Control Status**

As defined in NTCIP 1203.

**Power Status**

As defined in NTCIP 1203.

**Temperature Status**

As defined in NTCIP 1203. Install necessary hardware for the support of items above.

**Table 11: Optional Object Requirements**

| Object | Reference | Project Requirement |
|---|---|---|
| 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. |

## (S) Ethernet Radio

Provide an 802.11 Ethernet radio system with a bi-directional, full duplex communications channel between two or more “line-of-sight” antennas using license-free, spread spectrum technology. Install radios that are fully compatible with the Ethernet switches to be used on the project.

Furnish material and workmanship conforming to the *National Electrical Code* (NEC), the *National Electrical Safety Code* (NESC), Underwriters Laboratories (UL) or a third-party listing

agency accredited by the North Carolina Department of Insurance, and all local safety codes in effect on the date of advertisement.

Furnish license free Ethernet radio transceivers with antennas, coaxial cable, and mounting hardware, and configuration software. Design radio transceivers to work in "point-to-point", "store and forward repeater", "point-to-multipoint" and "peer to peer" configurations. Provide radios that can operate as repeaters. Ensure the Ethernet radio transceivers meet the following minimum requirements:

- 10/100 Base T, IEEE 802.11 Ethernet
- License free (ISM) spread spectrum radio band (900 MHz or 2.4 GHz),
- Frequency hopping spread spectrum technology
- Programmable radio frequency (RF) output levels of 100mW to 1 Watt,
- Minimum 50 hopping channels per automatically generated pattern
- Ethernet interface capable of operating at 1.1 Mbps with a data rate of 345 Kbps,
- DB9-F connector for RS-232/422/485 serial port,
- 32 bit Cyclic Redundancy Check (CRC) error checking with auto re-transmit,
- Data encryption 128 bit WEP, 128 bit WPA, 256 Bit AES,
- Range with clear LOS: 60 miles
- Network Protocols: TCP, UDP, ARP, IMCP, DCHP, HTTP, SNMP, FTP
- System gain: 156 dB with Yagi antenna
- Front panel LED indicators: Power, Transmit, Receive, Data Port and Signal Strength.
- Operating temperature of –30 to +165 degrees F at 5 to 95% Humidity
- Power supply: 9 VDC to 30 VDC
- Typical current draw of no greater than 600 mA when powered with 12 VDC input
- Shelf mounted design not to exceed 5" long x 2" wide x 7" high.

Furnish a radio frequency signal jumper and Ethernet data interface cable in accordance with Section 10.2 of the "Project Special Provisions for Signals and Intelligent Transportation Systems".

Furnish units with a Windows® XP compatible software program that uses a GUI (Graphical User Interface) to provide "remote programming, radio configuration, remote maintenance, diagnostics and spectrum analyzer" features. Provide software approved by the Engineer that is designed to function with the approved radio. Provide configuration software that can be upgraded in the future at no additional charge.

Ensure the radio transceiver is configurable from a single location (i.e. master radio location) via supplied software (no extra cost). Ensure the supplied software contains pre-written drivers for industry standard dynamic message signs.

Ensure that the following materials are in accordance with Section 10.2 of the "Project Special Provisions for Signals and Intelligent Transportation Systems".

- Coaxial Cable
- Directional Antenna (Yagi)
- Signal Splitter
- Standard N-Type Male Connector
- Coaxial Cable Shield Grounding and Weatherproofing Kits
- Surge Protector
- Lightning Arrestor

## 12.3 CONSTRUCTION METHODS

### (A) 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 Scope of Work 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.

### (B) Layout

The Design-Build Team shall be responsible for the proper elevation, offset, level, and orientation of all DMS assemblies on the structures provided by others. Make actual field measurements to place conduit and equipment at the required location. Mark the proposed location of circuits and all other components for the Engineer's approval prior to installation. Submit a drawing showing all underground conduits and cables dimensioned from fixed objects or station marks.

### (C) Structural Requirements

#### (1) General

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.

No welding, cutting, or drilling in any manner will be permitted in the field, unless approved by the Engineer.

Drill boltholes 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 boltholes and slots will not be permitted.

Use two coats of a zinc rich paint to touch up minor scars on all galvanized materials.

**(2) Access Platform for Walk-in DMS**

Provide an access platform, a minimum of three feet wide, as measured parallel with the edge of the roadway, with open skid resistant surface and safety railing, on the DMS assembly 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. The access platform shall attach only to the structure.

Connect the platform sections rigidly where sections join to avoid an uneven walking surface.

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.

**(3) Direct Tension Indicators**

Use direct tension indicators on all ASTM A325 high strength bolt connections in mainline toll gantry, overhead sign structures, and cantilever sign structures.

Provide direct tension indicators that conform to this Scope of Work, the requirements of ASTM F959 and the manufacturer's recommendations.

Install the direct tension indicators in strict compliance with the manufacturer's written instructions.

Install the direct tension indicator under the bolt head normally. If it is necessary to install the direct tension indicator under the nut, or if the bolt head must be turned, install additional hardened washers in accordance with the manufacturer's instructions.

Have a tension-indicating device on the project for determining the tension imposed on a fastener when the protrusions on direct tension indicator have been properly compressed.

Test three samples from each lot of direct tension indicators in the presence of the Engineer. Achieve a minimum bolt tension 5 percent greater than that required by Table 440-1 in Article 440-10 of the *Standard Specifications*. Do not substitute direct tension indicators for the hardened steel washers required with short slotted or oversized holes, but you may use them in conjunction with them.

Initially install the direct tension indicators to a snug tight condition as specified in Section 440-10 Paragraph (C) (3) of the *Standard Specifications*. After the initial tightening, fully tighten the fasteners, as recommended by the manufacturer of the direct tension indicators, beginning at the most rigid part of the joint and continuing toward its free edges.

Use a wrench to tighten fasteners containing direct tension indicators of the type and capacity recommended by the manufacturer and which is clean and lubricated. Use an air supply and hoses that are in good condition and provide air pressure of at least 100 psi at the wrench.

Perform any heating of structural steel required for corrections near fasteners before direct tension indicators are installed.

**(4) Inspection**

The Engineer will inspect for correct tightening of bolts by inserting a 0.005-inch thickness feeler gauge into the openings between adjacent flattened protrusions of the direct tension

indicator. The tension is correct when the number of spaces the gage cannot enter is equal to or greater than the value shown in the table below.

| Number of Spaces in Washer | Number of Spaces Gage is Refused |
|---|---|
| 4 | 2 |
| 5 | 3 |
| 6 | 3 |
| 7 | 4 |

The gage must not be able to enter any spaces when the direct tension indicator is used under the turned element.

Do not tighten bolts to a no visible gap condition. Replace bolts that have a direct tension indicator with no visible gap and tighten the bolts with a direct tension indicator.

The Engineer will inspect at least 10 percent, but no less than 2, of the bolts in each connection, using the metal feeler gages provided by the Design-Build Team.

Ensure that the part of the fastener being restrained from turning does not rotate during the tightening process, thereby abrading away a portion of the direct tension indicator protrusions.

Ensure that none of the direct tension indicator protrusions is accidentally partially flattened before installing in the structural steel joints.

Do not reuse direct tension indicators. If it becomes necessary to loosen a bolt previously tensioned, discard and replace the direct tension indicator.

**(5) Equipment and Cabinet Mounting**

Mount equipment securely at the locations shown in the ITS Concept Plans, in conformance with the dimensions shown, and plumb and level. 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, if required) to structures.

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

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 DMS cabinet on all metal conduits entering the DMS cabinet. Connect these ground bushings to the cabinet ground bus.

**(D) Electrical Requirements**

Provide electrical equipment described herein 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).

**(1) Conduit**

Install the conduit system in accordance with Section 1715 of *Standard Specifications* and NEC requirements for an approved watertight raceway. Mount the conduit on the horizontal truss in such a manner to be hidden from approaching traffic

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 assembly 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 four feet for conduit 1.5 inches and larger, or 6 feet for conduit 1.25 inches and smaller. Place fasteners no more than 3 feet from the center of bends, fittings, boxes, switches, and devices.

Locate underground conduit as shown in the Plans in a manner consistent with these Scope of Work.

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

**(2) 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 (grounded neutral-WHITE, grounding-BARE or GREEN, and phase conductors RED and BLACK). Use approved marking tape, paint, sleeves or continuous colored conductors for No.8 AWG and larger. Do not mark a white conductor in a cable assembly any other color. You may strip white, red, or black conductor at all accessible points and use it as a bare equipment-grounding conductor.

Bury underground circuits at the depth shown in the plans and surround 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 plans.

**(3) Cabinet and System Grounding**

Ground the DMS enclosure and DMS structure per Sections 1098 and 1700 of the *Standard Specifications*, applicable addenda, typical drawings found in Appendix A, the ITS Concept Plans and this Scope of Work. Provide grounding circuits that are permanent and electrically continuous with a current carrying capacity high enough and an impedance low enough to limit the potential above ground to a safe level.

Make connections between ground electrodes and the ground wire using an exothermic welding process, cadweld or equivalent.

Ensure completed cabinet grounds have a resistance to ground of not more than 20 Ohms.

**(E) 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.

**(F) Limits of Manufacturer's Proprietary Information**

NCTA's electronics technicians will use the above documentation (schematics, drawings, software, firmware, manuals, etc.) exclusively for the following purposes: diagnosing and performing repairs on malfunctioning equipment, equipment circuit boards, and malfunctioning systems; operational test of repaired equipment, circuit boards, systems; and performing

authorized upgrades to equipment, circuit boards, and software supplied under this contract. NCTA electronics technicians will not use or copy devices or software for any purpose other than diagnosis, repair, and testing or to perform authorized firmware or software upgrades.

Upon notification by the manufacturer, the Authority agrees not to divulge any proprietary or otherwise confidential information contained in the above-required documentation. NCTA agrees to protect and secure any proprietary documentation identified by the manufacturer as proprietary or confidential. Upon request by the manufacturer, NCTA agrees to sign a binding non-disclosure agreement with the manufacturer or other business that is providing documentation it considers proprietary or otherwise confidential.

**(G) Testing and Integration**

Integrate the DMS signs as described in this Scope of Work. Conduct testing upon completion of all work as described in the Testing and Acceptance Section of this Scope of Work.

**(H) Ethernet Radio**

Perform and/or construct the following items in accordance with Section 10.3 of the "Project Special Provisions for Signals and Intelligent Transportation Systems": Site Survey, Antenna, Cabling, Cabinet and Electrical Power Wiring.

The radios may be installed only on NCTA or NCDOT poles or structures. Do not use joint use poles.

## 13. ROAD WEATHER INFORMATION SYSTEM

### 13.1 GENERAL

Furnish and install a road weather information system (RWIS) for detection of certain weather and visibility conditions that would adversely affect traffic. The RWIS shall be capable of measuring wind speed and direction, temperature and humidity, precipitation presence, atmospheric pressure, and the presence of water, ice, slush, snow, and frost on road surfaces. The final location is the responsibility of the Design-Build Team. A specific location has not been identified. Use the FHWA "Road Weather Information System Environmental Sensor Station Siting Guidelines", dated April 2005 for positioning of the RWIS site. The location of the RWIS shall not encroach in the clear zone. The RWIS shall be sited so the tower or pole can be lowered without requiring a lane or shoulder closure. Locate the RWIS to minimize vandalism.

The RWIS station to be located on the west end of project shall be a full station with all equipment described herein.

The system shall use Ethernet communications for monitoring and control from the STOC and monitoring only from the NCTA Executive Offices.

### 13.2 MATERIALS

**(A) General**

Provide an RWIS consisting of an environmental sensor station (ESS) installed as shown in the ITS Concept Plans and as directed by the Engineer. Provide an ESS that includes environmental sensors mounted on an aluminum tripod tower and a remote processing unit

(RPU) at the tower's base, if required for that location. Ensure that the RPU can collect, store, and process sensor data to describe current weather conditions.

Provide any ancillary equipment or incidental items required, including mounting hardware, power supplies, grounding, surge suppression devices, and communication equipment, at the ESS location to make a complete and fully operational RWIS. Ensure that the system provides real-time, accurate, reliable data on all system parameters to the degree of precision defined in this Scope of Work.

**(B) Sensors**

Provide an ESS that can collect, store, and transmit data from the following sensors:

- A sonic anemometer to measure wind speed and direction,
- A thermoresistor to measure temperature,
- An integrated circuit to measure humidity,
- A capacitance sensor to measure presence of precipitation,
- A pressure transducer (silicon chip) to measure atmospheric pressure, and
- Non-intrusive laser spectroscopy sensors to detect the presence of water, ice, slush, snow, or frost on road surface.

**(C) Sensor Performance**

Each environmental sensor and its associated transducers shall record the following attributes to the listed degree of accuracy:

| **Roadway Data** | | |
|---|---|---|
| Surface Temperature | ±0.36 degrees F between -40 degrees and 150 degrees F | |
| Precipitation | Type: Dry, wet, ice, slush, snow and frost | |
| **Atmospheric Data** | | |
| Temperature | ±1 degrees F between -40 degrees and 176 degrees F; resolution of 0.1 degree | |
| Relative Humidity at 70° F | ±5% between 10 and 100% | |
| Barometric Pressure | Accurate to ±0.02 inch of mercury (in. Hg) between 26 and 32 in. Hg; resolution of 0.005 inches Hg | |
| Precipitation | Presence | |
| Wind | Direction: | ±3 degrees between 0 and 360 degrees |
| | Speed: | ±1 mph between 0 and 100 mph, with gusts up to 180 mph |

**(D) RPU**

Furnish an RPU that supports a minimum of eight pavement sensors. Use an RPU that supports EIA 232/485 serial protocols, as well as TCP/IP output. Ensure that the RPU is programmable and based on an open architecture.

Provide a unit having a minimum of ten EIA-232 serial ports. Ensure that the RPU has a maximum serial data transmission rate of 128 kbps. Ensure that the unit's mean time between failures (MTBF) is 15,000 hours or 625 days.

Ensure that the RPU issues and communicates an alarm whenever a user-defined threshold is exceeded. Ensure that the RPU is also capable of producing an output through contact closure or a digital output that imitates a contact closure.

At minimum, the RPU shall be able to store internally the last 24-hour readings over a user defined time interval of up to 5 minutes.

Ensure that the RPU operates using a nominal input voltage at the cabinet of 110 to 120 $V_{AC}$. The RPU must be capable of operating on 12 $V_{DC}$ of solar battery power. The RPU shall issue an alarm to the TMC if the AC power supply is lower than acceptable operating conditions or if there has been a complete power loss. Ensure that the system sends a message when the unit returns to normal conditions.

All components within the RPU shall operate throughout an ambient operating temperature range of -40 degrees to 160 degrees F, with a maximum relative non-condensing humidity of 90%.

**(E) Communications**

Use an RPU capable of transmitting all collected data to the TMC using the National Transportation Communications for ITS Protocol (NTCIP) over Ethernet communications over single-mode fiber-optic cable that transfers data at a minimum rate of 10 megabits per second (Mbps).

**(F) Configuration and Management**

Ensure that the RWIS software application provides PC desktop display of the RWIS location on a map of the Monroe Connector/Bypass. Ensure that the RWIS software enables the system operator to derive environmental measurements, such as the dew point, wind chill, and heat index, from sensor data received. Ensure that the RWIS software can be used to report minimums, maximums, averages, cumulative values, and standard deviations for all data over a prescribed period.

Ensure that the RWIS software provides English-to-metric unit conversions, when applicable, and lets the operator choose which unit of measure to report if more than one unit is common for a particular measurement.

When the software supplied with the RWIS is installed on a laptop computer or a remote workstation, ensure that the operator is able to access, either remotely through the workstation or at the site with the laptop computer, all user-defined parameters, and stored data within the RPU, including the ability to view, download, and delete stored data.

Ensure that the laptop computer and the RWIS can communicate when connected directly by a cable connected to the laptop's USB port. Ensure that the laptop computer and RWIS can communicate across the ITS system's communication network using the NTCIP standards described in this Scope of Work.

**(G) Electrical Requirements**

Provide RWIS equipment and components installed at the ESS that operate at 110 to 120 $V_{AC}$ from a commercial utility company. Equip the ESS installation with provisions for

emergency backup power in the event of primary power loss. Ensure that backup power is capable of continuing ESS operations for a minimum of 12 hours.

**(H) Foundation and Tower Requirements**

Provide a supporting tower or pole that provides a mounting platform for atmospheric sensors free of influences from topography, buildings, and vehicles. Ensure that the tower also supports any lightning protection devices (e.g., grounding rods) for the site. Mount the atmospheric sensors on a hinged, 33-foot tower. Use a tower having a hinge approximately 10 feet above ground for access to the atmospheric sensors.

Provide a support structure that is self-supporting without guy wires, using a 50-year design life, and in accordance with the 4th Edition 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions (25-year reoccurrence). Ensure that the structure is made of 6061-T6 corrosion-resistant aluminum or an equivalent. Ensure that all hardware and fasteners are stainless steel.

Provide a fence to enclose the ESS.

## 13.3 CONSTRUCTION METHODS

**(A) General**

Install, configure and demonstrate the fully functional RWIS installation as shown in the ITS Concept Plans. Connect all field hardware to the communication network, and provide all materials specified in the Contract Documents. Install all equipment according to the manufacturer's recommendations or as directed by the Engineer.

Ensure that all equipment and materials furnished, assembled, fabricated, or installed are commercial off-the-shelf products.

Unless detailed otherwise in the ITS Concept Plans, mount all atmospheric sensors except anemometers at cabinet-top height, approximately 10 feet above grade. Mount anemometers at the top of the tower. If local restrictions prevent installing the anemometers at the top, install them no less than 20 feet above the ground.

Construct the enclosure fence as shown in the ITS Concept Plans. Locate the gate so the tower assembly can be lowered to the ground without hitting the fence.

Install all wiring so that it is either internal to a pole, in conduit attached to truss members, or contained in underground conduit.

# 14. ETHERNET COMMUNICATIONS CABLE

## 14.1 DESCRIPTION

Furnish and install copper Ethernet cable for interconnecting various hardware in an Ethernet network located in ITS device cabinets, ORT buildings.

## 14.2 MATERIAL

**(A) Ethernet Cable**

Provide Category 6 Ethernet cable, complying with ANSI/TIA-568-B.2-1 standards for four-pair unshielded twisted copper. Size the wire gauge for the installation. 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 within a building.

**(B) Connectors**

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

**(C) Ethernet Patch Cords**

Furnish Fast Ethernet patch cords meeting the following physical requirements:

- Minimum of five (5)-foot length,
- Category 6,
- RJ-45 connectors on both ends,
- Molded anti-snag hoods over connectors, and
- Gold plated connectors.

Patch cords in the STOC shall be of sufficient length to make connection when installed in cable management hardware without straining the cable or connectors.

Furnish Ethernet patch cords meeting TIA/EIA-568-B.2-1, Additional Transmission Performance Specifications for 4-pair 100 Ω Enhanced Category 6 Cabling.

**14.3 CONSTRUCTION METHODS**

**(A) General**

Install Category 6 Ethernet cable for all network cabling in the ORT buildings. Install Category 6 Ethernet patch cords in the ORT buildings.

Provide the Engineer through Constructware with the Ethernet cable manufacturer's recommended and maximum pulling tension for each Ethernet cable size before the installation of Ethernet cable.

Furnish all tools, equipment, materials, supplies, and hardware necessary to install a fully operational Ethernet cable system. 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 equipment. Do not pull the cable over or around obstructions.

Install Ethernet cable in continuous lengths. 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.

**(B) Building Installation**

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

Provide bushings and cable guides to protect the cable. Manually feed the cable by rotating the reel.

## 15. COMMUNICATIONS RACK

### 15.1 DESCRIPTION

Furnish and install one open, non-lockable, 19-inch communications with no side panels in each ORT buildings. Install the racks in locations as directed by the Engineer. Provide enough rack space to house the equipment designated for each location plus 50% spare space.

### 15.2 MATERIALS

Provide all communications rack meeting these minimum performance requirements:

- All equipment shall comply with ANSI/EIA RS-310D,
- Provide frame and external components with zinc coating per ASTM B633,
- Paint interior and exterior components per RAL 7035,
- Provide UL 508 and NEMA Type 12 certifications, and

Provide all communications racks meeting the following minimum material requirements:

- 19-inch EIA single-bay
- Nominal height of 78 inches less base
- Nominal 4-inch high ventilated base
- Depth: 31 inches
- House 44 units of rack space
- All-metal components

Vented top with three integral prewired fans, and fans that provide up to 300 cubic feet per minute (cfm) of exhaust.

*Mechanical:* Construct all rack frames from 12-gauge, cold-formed steel. Construct the vented base from 16-gauge steel. Construct the 19-inch electrical rack angles from 12-gauge steel.

Furnish and install one metal shelf kit per each rack. Provide each shelf the full width and depth of the rack angles and attach directly to the rack angles. Furnish and install one metal keyboard slide out drawer per each rack.

### 15.3 CONSTRUCTION METHODS

*Finish:* Furnish factory-applied paint on the exterior of all components with a color that matches that of the respective room they are located. Submit color samples to the Authority for review and approval.

*Electrical:* Furnish and install an outlet strip and 10-foot power cord along one rear vertical rack frame. Furnish and install strips that use 120 VAC 60 Hz power and shall contain at least 10 outlets over the 70 inches. Furnish and install grounding bus bar system for the ground rack mounted electrical equipment. Equip door with grounding studs.

Furnish and install cable management hardware for attachment vertically along the rack frame and horizontally between 19-inch rack angles. Cable management hardware shall run vertically up one rear rack frame and shall include six horizontal runs per rack. Provide hardware including cable organizers and clamps to provide strain relief and cable mounting.

*Keyboard Shelf*: Install keyboard shelf at a height comfortable for operator use when sitting on a stool. Provide tamper-resistant but removable screws through hinges and exterior panels. Furnish any special tools required to remove tamper resistant screws.

Ground the racks to a building ground.

## 16. COMMUNICATIONS HARDWARE

### 16.1 DESCRIPTION

#### (A) General

All communications between ITS devices and the local hub shall use Ethernet communications. The communications network along the corridor shall consist of local Ethernet edge switches at devices, and Gigabit Ethernet routing switches as shown in the Plans. The field Gigabit Ethernet routing switches will act as data aggregation and data distribution nodes for Ethernet edge switches located at all ITS device sites. Gigabit Ethernet routing switches located in the ORT mainline buildings at each end of the corridor will communicate with the CSC and then to the STOC via two leased circuits (provided by the Toll System Integrator) operating from each end of the corridor. See Sheet 1 of 26 of the ITS Concept Plans for further details.

Provide a minimum of a Fast Ethernet (100 Mbps) optical communications network between all proposed ITS field devices and Gigabit Ethernet routing switches located in the Open Road Tolling (ORT) buildings located at the toll plazas.

Provide an optical Gigabit Ethernet (minimum of 1 Gbps) communications network between the Gigabit Ethernet routing switches using proposed single-mode fiber-optic cable along the project corridor.

Between the project corridor and the CSC and STOC provide the capability of an optical Gigabit Ethernet (minimum of 1 Gbps) communications network, using media by others.

#### (B) Gigabit Ethernet Routing Switches

Furnish and install a Layer 3 Gigabit Ethernet routing switch in at least three of the mainline ORT Buildings. The Design-Build Team shall determine the layout of the network and choose which ORT buildings will house the routing switches.

Ensure that the routing switches provide Gigabit Ethernet connectivity at minimum transmission rates of 1 Gbps between the Gigabit Ethernet routing switches.

#### (C) Ethernet Edge Switches

Furnish and install a hardened, device-level managed field Ethernet edge switch in each ITS field cabinet location. Ensure that the Ethernet edge switches provide fast Ethernet connectivity at minimum transmission rate of 100 Mbps from each ITS cabinet location to its respective Gigabit Ethernet routing switch.

#### (D) Network Management Software

For the communications network, utilize the existing network management software (NMS) for configuration, troubleshooting, security, and system monitoring. The Design-Build Team shall perform the initial system integration of all Gigabit Ethernet routing, and Ethernet edge switches installed on the project.

## 16.2 MATERIAL

### (A) General

Ensure that the Ethernet switches are fully compatible and interoperable with the trunk Ethernet network interface and that the Ethernet switches support half and full duplex Ethernet communications.

Furnish Ethernet switches that provide 99.999% error-free operation and that comply with the Electronic Industries Alliance (EIA) Ethernet data communication requirements using single-mode fiber-optic transmission medium and copper transmission medium. Ensure that the Ethernet switches have a minimum mean time between failures (MTBF) of 10 years, or 87,600 hours, as calculated using the Bellcore/Telcordia SR-332 standard for reliability prediction.

### (B) Gigabit Ethernet Routing Switches

To ensure maximum interoperability within the Gigabit network, provide Gigabit Ethernet routing switches from the same manufacturer. Ensure compatibility with existing core switch make and model in STOC. Provide one of the following make/models of switch, or approved equal:

Cisco Catalyst 4506-E, Brocade (Foundry) FastIron SuperX, Juniper EX8208, Extreme Networks Black Diamond 8806.

The Gigabit Ethernet Network, which includes all Gigabit Ethernet Routing Switches, shall be a routed network. The Contractor shall configure each Layer 3 routing switch with industry standard, non-proprietary routing protocols identified in the Contractor-provided network documentation as outlined in Section 16.3A. The protocols to be configured by the Contractor shall include at a minimum:

- OSPF (Open Shortest Path First)
- PIM-SM / PIM-DM (Protocol Independent Multicast – Sparse Mode / Dense Mode)
- VRRP (Virtual Router Redundancy Protocol)

The Contractor shall submit all configurations to the Engineer for review and approval prior to implementation

### (C) Ethernet Edge Switches

Provide one of the following make/models of switch or approved equal:

RuggedCom RS900, GarrettCom Magnum 6KL or 6K8, Etherwan EX71000, EX72000, or EX73000, Cisco Catalyst 2955S-12, and ITS Express 8040.

The Contractor shall configure each Layer 2 edge switch with industry standard, non-proprietary protocols identified in the Contractor-provided network documentation as outlined in Section 16.3A. The protocols to be configured by the Contractor shall include at a minimum:

- RSTP (Rapid Spanning Tree Protocol)
- SNMPv3 (Simple Network Management Protocol version 3)
- IGMP Snooping (Internet Group Management Protocol)
- SNTP (Simple Network Time Protocol)

## 16.3 CONSTRUCTION METHODS

### (A) General

Ensure that all Ethernet switches are UL listed.

Verify that network/field/data patch cords meet all ANSI/EIA/TIA requirements for Category 6 4-pair unshielded twisted pair cabling with stranded conductors and RJ45 connectors.

Ensure that all project IP addresses are assigned. Ensure as-built plans include the identification of all IP addresses and VLANs, and associated hardware devices and device locations. Configure the Ethernet network so the CCTV cameras are in separate VLAN(s) from other devices. Configure the Ethernet network so the DMS signs are in a separate VLAN from other devices.

After consulting with vendors of communication hardware, submit the following for review and approval by the Engineer:

- Drawings and supporting documentation of the physical network topology as established and installed including physical connectivity at the device and port level
- Drawings and supporting documentation for a coherent and complete overall logical layers 2-3 network architecture and detailed design to include the following:
  - VLAN
  - EAPS/STP domains
  - EAPS/STP mode
  - EAPS/STP ports
  - IP addressing/subnets
  - IP routing/trunking
  - Routing and routed protocols
  - Multicast addressing
- Drawings and supporting documentation identifying SNMP and RMON strategy and configurations including, probe information as applicable, management IP addressing, community strings, MIBS, traps, and respective active/passive alert thresholds.

### (B) Gigabit Ethernet Routing Switches

Install Gigabit Ethernet routing switches that provide data aggregation and data distribution to and from Ethernet edge switches located at each ITS device cabinet. Ensure that the Gigabit Ethernet routing switches communicate with one another at Gigabit Ethernet data transmission rates (1000 Mbps).

Ensure that the network administrator will be able to remotely manage each Gigabit Ethernet routing switch for switch configuration, performance monitoring, and troubleshooting. Locate the Gigabit Ethernet routing switches in the ORT Buildings, as shown in the ITS Concept Plans and provide full Layer 3 functionality.

Install and configure the Gigabit Ethernet routing switches to be fully compatible with the Ethernet edge switches as defined in this Scope of Work.

Ensure all fiber connections of the Gigabit Ethernet routing switches are connected to two pairs of single-mode fiber strands of the ITS cable plant via fiber-optic interconnect center for redundant communications.

Connect the Gigabit ports with other Gigabit Ethernet routing switches as described in the ITS Concept Plans.

### (C) Ethernet Edge Switches

Ensure that the ITS network administrator will be able to manage each Ethernet edge switch individually or as a group/cluster for switch configuration, performance monitoring, and troubleshooting. Note that these requirements stipulate additional minimum management intelligence (i.e., Layer 2+) typical of most current industrial Ethernet deployments. Ensure that the Ethernet edge switches include 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.

Ensure that all project IP addresses and VLAN IDs are assigned. Ensure as-built plans include the identification of all IP addresses, VLANs, and associated hardware devices and device locations.

Mount the Ethernet edge switches securely inside each ITS device cabinet in the communications rack or on a vertical rail. Ensure that the Ethernet edge switches are resistant to all electromagnetic interference (EMI). Ensure that the Ethernet edge switches are 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 6 4-pair unshielded twisted pair cabling with stranded conductors and RJ45 connectors.

## 17. CENTRAL VIDEO EQUIPMENT

### 17.1 DESCRIPTION

Furnish and install modifications to the existing STOC analog video matrix switch to facilitate video sharing between the project corridor and NCTA and NCDOT as described in this Scope of Work.

### 17.2 MATERIALS

Furnish and install digital video encoder and decoder hardware to create a video-over-IP network system. Furnish digital video encoder and decoder components that utilize the Moving Picture Experts Group's MPEG-4 Part 10 video compression technology as described in this Scope of Work.

### (A) Digital Video Encoders and Decoders

Provide Moving Picture Experts Group's MPEG-4 Part 10 digital video encoders and decoders in accordance with the International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) requirements detailed in the ISO/IEC 14496-14 standard for video sharing between the NCTA Executive Offices and the STOC. Ensure that the digital video encoders and decoders are capable of unicast and multicast operation, and that they support the Session Announcement Protocol (SAP) as recommended by the Internet Engineering Task Force (IETF) RFC 2974, and Differentiated Services/Quality of Service (DiffServ/QoS) software components.

Provide the Internet Engineering Task Force (IETF) Session Description Protocol (SDP) in RFC 4566 and Real Time Streaming Protocol (RTSP) in RFC 2326. Ensure that the DVE provides 99.999% error-free operation.

**(1) Digital Video Encoder**

Provide digital video encoders that are hardware-based network devices able to accept a minimum of one analog National Television System Committee (NTSC) video input and digitize it for transport across IP networks. Use digital video encoders that provides a minimum of two serial data interfaces for transmission of command and control data to other devices (typically camera PTZ commands), as well as console and configuration functions.

**(2) Digital Video Decoder**

Provide digital video decoders that are hardware-based network devices able to accept a minimum of one digital video output from an IP network and convert it to an analog National Television System Committee (NTSC) video signal. Use digital video decoders that provide a minimum of two serial data interfaces for transmission of command and control data to other devices (typically camera PTZ commands), as well as console and configuration functions. Provide hardware-based decoders that have a minimum of one analog NTSC video output and decode digital video and data streams present on an IP network into analog formats for interconnection with other devices.

**(3) Interoperability**

Within each type of video compression technology, provide digital video encoders and decoders that are interoperable and interchangeable with similar devices and from other manufacturers. Ensure that the digital video encoder is compatible and fully interoperable with software and hardware digital video decoders from the digital video encoder manufacturer, as well as a minimum of two hardware digital video decoders from other manufacturers. Ensure that the digital video decoder is compatible and fully interoperable with digital video encoders from the digital video decoder manufacturer, as well as a minimum of two other digital video encoders from other manufacturers.

**(4) Video Requirements**

Ensure that any video input utilizes a BNC connector and delivers one-volt peak-to-peak (Vp-p) NTSC composite video signals for encoding. Ensure that the digital video encoder and digital video decoder operate with both color and monochrome video, and that they allow the user to select and adjust video resolution. Ensure that the digital video encoder and digital video decoder support resolutions that include, but are not limited to those in table below. Ensure that the MPEG 4 Part 10 digital video encoder and digital video decoder are capable of delivering color and monochrome video at 30 fps regardless of resolution, and that they can do so using variable, programmable bit rates from 128 Kbps to 12 Mbps. Ensure that the MPEG 4 digital video encoder and digital video decoder are capable of delivering color and monochrome video at 30 fps regardless of resolution, and that they can do so using variable, programmable bit rates from 32 Kbps to 8 Mbps. Ensure that the digital video encoders provides fixed and variable bit rate modes.

**Resolution Specifications**

| Compression Technology | Resolution | NTSC Requirements |
|---|---|---|
| MPEG 4 | QCIF | 176 horizontal x 120 vertical |
| MPEG 4 | CIF | 352 horizontal x 240 vertical |
| MPEG 4 | 2CIF | 704 horizontal x 288 vertical |

Note: The resolutions attained depend on the data transmission rate.

**(5) Electrical Requirements**

Ensure that all wiring meets NEC requirements and standards. Provide equipment that operates on a nominal voltage of 120 volts alternating current ($V_{AC}$). The equipment shall operate within a voltage range of 89 $V_{AC}$ to 135 $V_{AC}$. The operating frequency range for power shall be 60 Hz. ±3 Hz. If the device requires operating voltages of less than 120 $V_{AC}$, supply the appropriate voltage converter.

**(6) Serial Interface**

Use hardware-based digital video encoders and decoders having a minimum of two serial data interfaces and connectors that conform to EIA-232/422/485 standards. Ensure that the serial interfaces support EIA-232 as well as 2-wire and 4-wire EIA-422/485 connections. Ensure that the serial port(s) support data rates up to 115.2 Kbps. Serial interface parameters, such as data format, number of bits, handshaking, and parity, shall be software programmable through local connection to the digital video encoders and decoders and through connections over the network. Serial interface ports may utilize registered jack (RJ-45) connectors, D-sub connectors, or screw terminals.

**(7) Network Interface**

Ensure that the digital video encoders and decoders local area network (LAN) connection supports the requirements detailed in the IEEE 802.3 standard for 10/100 Ethernet connections. Provide a digital video encoder having a minimum of one Ethernet port, which shall be a 10/100 Base-TX connection or 100 Base-FX ST interface connection. Ensure that the connector complies with the EIA and Telecommunications Industry Association (TIA) requirements as detailed in the EIA/TIA-568-A standard. Provide copper-based network interface ports that utilize RJ-45 connectors.

Ensure that all Category 6, unshielded twisted pair/shielded twisted pair network cables are compliant with the EIA/TIA-568-A standard. Ensure that the network communication conforms to User Datagram Protocol (UDP), Version 4 of the Internet Protocol (IP) and Version 2 of the Internet Group Multicast Protocol (IGMP).

**(8) Front Panel Status Indicators**

Provide digital video encoders and decoders that have light-emitting diode (LED) displays, liquid crystal displays (LCDs), or similar illuminated displays to indicate status for power, data activity, link status and video transmission.

**(9) Configuration and Management**

Provide digital video encoders and decoders that support local and remote configuration and management. Configuration and management functions shall include access to all user-programmable features, including but not limited to addressing, serial port configuration, video

settings, device monitoring, diagnostic utilities, and security functions. Ensure that the digital video encoders and decoders support configuration and management via serial login, telnet login, and Simple Network Management Protocol (SNMP).

**(10) Environmental Requirements**

Ensure that encoders and decoders comply with the environmental requirements detailed in the NEMA TS 2 standard. House the digital video encoder in a field cabinet with protection from moisture and airborne contaminants, blowing rain, wind, blowing sand, blowing dust, humidity, roadside pollutants, vandalism, and theft. Ensure that the digital video encoder is resistant to vibration and shock, and conforms to Sections 2.1.9 and 2.1.10, respectively, of the NEMA TS 2 standard.

Provide digital video encoders that meet the following environmental conditions from the NEMA TS 2 standards:

- Ambient temperature: -30 degrees F to 165 degrees F; and
- Humidity: 5% to 95% relative humidity, non-condensing.

Ensure that all digital video decoders meet all specifications during and after being subjected to an ambient operating temperature range of 32 degrees to 113 degrees F.

**(B) Video Matrix Switch Modifications**

**(1) Video Matrix Bay**

Furnish video matrix bays as needed with connector panels designed for high-density input cards to input CCTV images along the NCTA facilities.

Provide matrix bays meeting the following requirements:

- Dual power supplies,
- Convection cooling system not requiring electrical fans,
- Modular design providing sixteen high-density slots for input modules and two high-density slots for an output modules,
- “Heartbeat” LED indicator that the CPU on the module is running,
- Power LED indicators that the module power circuitry is operational,
- Video loss LED indicator if any of the video inputs on the module are not present,
- Monitoring all video inputs for video loss without the need for any additional hardware or software,
- servicing without the need to disconnect any external cabling,
- Automatically report malfunctions to remote alarm monitoring equipment via an internal alarm output port,

**(2) Analog Input Cards**

Furnish 32-channel video input cards to provide an additional 32 inputs. Provide cards compatible with the existing STOC Pelco video switch.

Provide the video input/output cards meeting the following requirements:

- Video Input/output Level: .1.0 V p-p, +/- 3 dB
- Impedance: 75 ohms
- Input Signal Return Loss: 40 dB over a frequency range of 0 to 5.0 MHz
- Output Signal Return Loss: 40 dB over a frequency range of 20 Hz to 5.0 MHz
- Connectors: BNC

**(3) Code Distribution Units**

Provide code distribution units compatible with the Pelco SpectraDome III and IV cameras. Provide units with EIA-422 serial data interface ports, and two RS-422 RJ-45 female ports for communication with the video switch CPU and other daisy-chained code distribution units.

Provide code distribution units with sixteen three-position screw terminals and mating plugs sized for wire 14-28 AWG sizes.

Provide units that operate on 110-130 VAC. If the supplied unit operates on any other voltage or DC voltage, provide appropriate power supply.

Provide code distribution units that meet the following environmental conditions:

- Ambient temperature: 32 degrees F to 122 degrees F
- Humidity: 5% to 95% relative humidity, non-condensing

Provide a design that inherently temperature compensated to prevent abnormal operation. The circuit design shall include such compensation as is necessary to overcome adverse effects due to temperatures in the specified environmental range.

## 17.3 CONSTRUCTION METHODS

### (A) Digital Video Encoders and Digital Video Decoders

**(1) Digital Video Decoder**

Furnish, install and integrate the digital video decoders in the STOC as shown in the ITS Concept Plans. Connect the Ethernet port of the digital video decoder to the Gigabit Ethernet routing switch as shown in the ITS Concept Plans.

Connect the video output port of the digital video decoder to an input of the video distribution amplifier as shown in the ITS Concept Plans. Use standard coax cable with BNC (gold-plated center pin) connectors. Configure ports and IP addresses.

**(2) Digital Video Encoder**

Furnish, install and integrate the digital video encoders in each CCTV cabinet and the STOC as shown in the ITS Concept Plans. At CCTV sites, connect the analog input of the MPEG 4 the digital video encoder to the CCTV camera as defined above. Connect the RS-422 PTZ serial communications from the camera to the serial port of the video encoder. Connect the Ethernet port of the digital video encoder to the Ethernet edge switch as shown in the ITS Concept Plans.

Configure ports and IP addresses for multicast broadcast and VLANs.

Connect the Ethernet output of the digital video encoder to edge switch. Use standard coax cable with BNC (gold-plated center pin) connectors.

### (B) Video Matrix Switch Modifications

#### (1) General

Assemble the video switch components in the ITS server room of the STOC. Migrate the existing database, configuration, and devices to the new system. Ensure all existing users maintain their access.

#### (2) Video Matrix Bay

Install the video matrix bays in 19-inch communications racks. Terminate and install the video input cards in the switch bays. Connect the analog outputs from the video distribution amplifiers to individual inputs of the video matrix switch.

Connect the MPEG 4 video encoders as shown in the ITS Concept Plans.

Connect the RS-422 PTZ data lines from each camera to individual communications ports of the code distribution units.

Neatly secure cabling using cable management hardware.

#### (3) Analog Input and Output Cards

Terminate and install the video input and output cards and connector panels in the video matrix switch bays. Neatly secure cabling using cable management hardware.

#### (4) Code Distribution Units

Terminate and install the code distribution units. For the existing NCDOT cameras, connect the RS-422 PTZ data lines from each camera through the existing video/data transceivers or video multiplexers and demultiplexers to the data ports of the code distribution units to provide PTZ control. For the existing NCDOT cameras, connect the RS-422 PTZ data lines from each camera to the data ports of the respective video decoders to the data ports of the code distribution units to provide PTZ control. Interconnect the proposed CDUs together in a daisy chain configuration using the RJ-45 ports. Neatly secure cabling using cable management hardware.

## 18. CCTV INTEGRATION AND SOFTWARE MODIFICATION

## 18.1 DESCRIPTION

Modify the software configuration of the Regional ITS Graphical Interface and Protronix Central CCTV software at the STOC to permit viewing and control of the proposed cameras from the STOC.

Edit the database of the existing Regional ITS Graphical Interface and Protronix Central CCTV software controlling the existing Pelco Model 9770 video matrix switch at STOC to add the additional CCTV devices and update the map coverage.

Edit the video switch database in the STOC and then download the database to the other video switches on the video network to add the additional cameras on the network.

## 18.2 FUNCTIONAL REQUIREMENTS

### (A) Regional ITS Graphical User Interface Software (GUI)

The Regional ITS Graphical User Interface Software includes a zoomable static display map that includes a location of each ITS device. This map can be dynamically sized. Each ITS device is associated with an icon that loads an executable application. All ITS elements, icons and their

respective locations are stored in the 1983 North American Datum North Carolina state plane coordinates in English units (feet). Text notes are stored for each device, which includes the dates of the last modification.

Edit the existing unified device database to add the new CCTV devices with icons. The unified device database contains the coordinates of each device in individual records and contains a maximum of fifty fields. Collect the location data for all CCTV field devices required to add the new CCTV devices to the existing database. Ensure the map extents have adequate coverage to show the new CCTV devices. Ensure the existing capability to import data from other file formats is maintained.

All additions to the database must be viewable by all users at the STOC, Emergency Management Division, MRTMC in Charlotte, and the EIC in the NCDOT Transportation Building including local agencies who share their access to the STOC video switch.

**(B) Central CCTV Software**

The existing CCTV central software that controls the existing video matrix switches at the STOC is Protronix's VideoPro. It also interfaces with the existing multiplexers, demultiplexers and videocassette recorders. This software includes on-screen pan-tilt-zoom controls of each camera in the system.

Modify the Protronix CCTV central software configuration at the STOC to display and map the new CCTV devices so the CCTV video can be displayed on the existing monitors and display devices at the STOC.

**(C) Central CCTV Software:**

Edit the configuration setup of the Pelco 9770 video matrix switch in the STOC to incorporate the new CCTV analog and serial data ports and communications hardware. Extend the same priorities and lockout privileges to the STOC users.

## 19. CSC CONNECTION

### 19.1 DESCRIPTION

Two leased commercial connections (transmission rate to be determined) from the corridor to the CSC for the sharing of just the ITS data from the corridor will be provided by others. The CSC network extends to the STOC via NCDOT and NCTA fiber-optic cable.

Once the circuits are tested and accepted (by others), verify communications, and test communications between devices on the corridor and the STOC according to the provisions in the Testing Section of this Scope of Work. NCTA will be responsible for all monthly/reoccurring costs associated with this connection.

## 20. SUBMITTAL DATA AND DOCUMENTATION

### 20.1 DESCRIPTION

Provide project submittal data and documentation as described below. All submittals described in this section will utilize the NCTA Constructware site.

## 20.2 SUBMITTALS

### (A) General

Comply with NCTA Design-Build Submittal Guidelines. All written documentation will be either 11” x 17” or 8½” x 11” format. No documentation may be smaller or larger than these formats. Unless otherwise noted all submittals for this project will be in Constructware. Except for standard bound manuals, bind all 8 1/2" x 11" documentation, including 11" x 17" drawings folded to 8 1/2" x 11", in logical groupings in either 3-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 Standard Specifications, Standard Roadway Drawings, ITS Concept Plans and this Scope of Work. All submittals will be reviewed and approved the Authority. Absence of comment will not grant approval.

### (B) 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 not pre-approved when required will not be allowed for use on the project. Consult the QPL Website to obtain pre-approval procedures.

### (C) Submittal Requirements

Provide certification through the Constructware site to NCTA that all Design-Build Team-furnished material is in accordance with the contract. When requested by NCTA, provide additional certifications from independent testing laboratories and sufficient data to verify item meets applicable specifications. Ensure additional certification states 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 completely the materials meet the requirements of the ITS Concept Plans 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 shall meet or exceed the requirements of the ITS Concept Plans and this Scope of Work. Each submittal shall be sufficiently complete and detailed for the Authority to review and approve the submittal. If NCTA deems the submittal insufficient in detail or completeness for review or approval, the submittal will be returned as rejected. Additional time will not be granted for re-submittal.

Before material submittal data begins, provide to NCTA for approval a list of all submittals with approximate dates of submission that the Design-Build Team intends to make. It is incumbent upon the Design-Build Team to schedule reviews in a timely manner that will not delay his 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 as packages as follows:

| Submittal Package | Description |
|---|---|
| CCTV Field Equipment | CCTV camera, encoders, decoders, camera lowering device, camera pole |
| Testing Plans | Unique submittal time |
| CCTV Central Video Equipment | Video switch replacement components, code distribution unit, video wall components |
| Communications Hardware | Ethernet Routing and edge switches, port servers, communications racks |
| Computer Hardware | Servers and workstations |
| Electrical | UPS, meter bases, disconnects |
| Dynamic Message Signs | DMS sign, sign controller and sign controller cabling between sign and controller, DMS controller cabinet |
| Field Equipment Cabinets | Cabinet layout and wiring diagrams |
| Fiber-optic Cable | Fiber-optic cable, drop cable assemblies, interconnect centers, splice enclosures |
| Field Infrastructure | Conduit, risers, junction boxes, heavy-duty junction boxes/cabinets, misc. hardware |
| RWIS | Environmental sensors, remote processing unit, supporting tower |
| MVDS Detection | Detector unit, vendor software, cabling |

Submit cabinet layout and wiring diagrams for all cabinets.

Identify all proprietary parts in furnished material. The Authority reserves the right to reject material that uses proprietary components not commercially available through electronic supply houses.

For furnished material listed on the QPL, furnish submittals in the format defined by the QPL.

For furnished material not on the QPL, furnish the equipment list including catalog cuts. Identify proposed material on catalog cuts by a reproducible means. 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, clearly identify by circles, marking or other means the specific materials for which approval is requested.

Allocate 40 days for the NCTA to review and respond to a submittal. Submittal approval will be granted only to specific materials; do not deviate from what is approved without approval by the NCTA. Do not fabricate or order material until receipt of the Authority's approval. All submittals will be returned as either "Approved (as submitted)", "Approved as Noted" or "Rejected". The Design-Build Team may proceed with fabrication or ordering for items marked "Approved". If an item is marked "Approved as Noted" without any stipulation for re-submittal, then the Design-Build Team may proceed with fabrication or ordering. For any other notations, the Design-Build Team shall revise the submittal, address comments and resubmit for approval.

## (D) Documentation

In addition to the requirements in Section 109 of the *Standard Specifications*, furnish to NCTA 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. Provide all configuration data for each device in electronic and printed form.

## (E) Dynamic Message Signs

### (1) Shop Drawing

Submit to NCTA for approval the brackets for supporting the DMS and the access platform. The Design-Build Team must ensure that the DMS signs are totally compatible with the existing support structures provided by the others. Show in the shop drawings provisions for attaching DMS and access platform to supporting structures, applicable material specifications, and any other information necessary for procuring and replacing any part of the complete DMS.

### (2) Test Documents

Furnish the Engineer with the manufacturer's test report for each lot of direct tension indicators used in the project. The manufacturer must perform these tests according to the requirements of ASTM F959. Include in each test report the lot number of the indicators, manufacturer's name, tension load when indicators were tested, gap clearance, nominal size, coating thickness, date tested, and name and location of the company that performed the tests.

Furnish the Engineer with the manufacturer's instructions for installing the direct tension indicators before installation begins along with at least one metal feeler gauge for each 50 direct tension indicators shipped. Use only direct tension indicators whose container lot numbers match the lot numbers on the test documents.

### (3) Required Test Samples

Furnish the Engineer with three samples of load indicating washers from each lot number, size, and type for departmental tests along with two of the metal feeler gages required for performing the tests.

### (4) Character Set Submittal

Submit through Constructware an engineering drawing of the DMS character set including 26 upper 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.

### (5) Drawings and Documents' Certification

Provide the following drawings, documents, plans, and calculations approved by a Professional Engineer registered in the state of North Carolina that bears his/her signature, seal, and date of acceptance:

- Plans for the DMS enclosure, mounting description, and shop drawings
- Plans for overhead sign assembly, footings, design computations and shop drawings
- Electrical power distribution drawings and power consumption calculations

**a. Mechanical**

This set of submittals includes, but is not limited to, material specifications, catalog cut sheets, parts list, and fabrication drawings for DMS controller cabinet(s), DMS enclosure, character assemblies, DMS overhead assembly, DMS to DMS overhead assembly mounting, etc. Engineering calculations must accompany drawings as needed and applicable.

**b. Electrical**

This set of submittals includes, but is not limited to, material specifications, catalog cut sheets, parts list, and wiring diagrams within the DMS controller cabinet, DMS enclosure, DMS controller cabinet/enclosure, service entrance cabinet/panels, and etc. This set of submittals also includes power consumption calculations, wire and conduit size calculations, voltage drop calculation, etc. The DMS electrical system: wires, conduits, breakers, panel-boards, etc. must meet the latest edition of NEC requirements and must be sealed and signed by a Professional Engineer registered in the state of North Carolina.

**c. Electronics**

This set of submittals includes, but is not limited to, material specifications, catalog cut sheets, parts list, and schematic diagrams for all electronics assemblies and sub-assemblies used in the system.

**d. Block Diagrams**

A block diagram shall be provided for the following:

- DMS System,
- DMS Controller Cabinet,
- DMS Enclosure
- DMS Controller
- DMS Display Boards
- DMS Driver Board(s)
- DMS Lighting Control Board(s),
- Interface Board(s)
- Other system's boards/assemblies that help in understanding, troubleshooting, and repairing the system and/or system's components

**e. LEDs**

This set of submittals includes LED data/specification sheets and the LED selection procedure as required by section 3.2.B.5.

**f. Software 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 shall be provided. 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 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 all of this documentation by any party authorized by the Authority for systems integration purposes at any time initially or in the future, regardless of what parties are involved in the systems integration effort.

**(6) DMS Bench Test Unit and Bench Repair Documentation**

**a. DMS Bench Test Unit**

Provide a fully operational DMS comprised of three (3) character modules of the size and type specified elsewhere in this Scope of Work. If the Authority owns one such unit from a previous contract, this item will be deleted.

Provide the Test Unit with controller, drivers, power supplies, and all other devices and equipment needed to furnish a fully operational Test Unit.

Provide access to all the electronics and electrical devices and equipment within the Test Unit enclosure from the back. Provide access to character modules from the front of the Test Unit.

Ensure all materials and electrical/electronic devices, components, and equipment used to build the Test Unit conform to the applicable specifications and requirements outlined elsewhere in this Scope of Work and other documents and standards referred to by this Scope of Work.

Furnish the Test Unit with an electrical cord (hot, neutral, and ground) for power connection to a standard receptacle. In addition to this cord, provide an on/off switch mounted in a convenient location on the outside of the Test Unit enclosure.

Install an appropriate ventilation system in the Test Unit.

Submit a drawing outlining the layout of parts and components, location of switches and other devices for review and approval.

**b. Bench Repair Documentation**

After approval of any equipment or equipment component parts and prior to installation of the equipment, supply all schematics drawings, board layout information, equipment manuals, software, and firmware required to perform bench repair to the component level and testing of electronic equipment and equipment circuit boards. Provide above documentation to the NCDOT Traffic Electronics Center at the address below. Failure to supply the documentation required by this Section of the Scope of Work shall be grounds for rejection of the submitted item due to incomplete information. Provide schematic drawings as well as the board layout drawings that identify all components in the equipment or circuit board including but not limited to all digital and analog integrated circuits devices (ICs), all discrete electronic components, transformers, relays, and other electronic devices and components used in the circuits. Provide schematic drawings that show pin-to-pin interconnection between components. Provide a complete parts list for each circuit board’s components to the Traffic Electronics Center.

Provide a copy of all software required to operate any equipment or circuit boards for the purposes of test or system software to test operation of equipment used as a system component.

**c. 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 backlit conditions).

## 21. TRAINING

### 21.1 DESCRIPTION

Provide training for the installation, operation, and maintenance of:

- CCTV field equipment
- Communications hardware
- Fiber-optic communications
- RWIS
- MVDS detection
- DMS

NCTA will consider waiving certain sections of training if the equipment provided as a part of the project is identical or similar to equipment provided as a part of the Triangle Expressway project.

### 21.2 MATERIALS

#### (A) General

Provide training in the installation, operation, maintenance, troubleshooting, and repair of all equipment and software. Prepare training outline, agenda, training manuals, training exercises, instructor resumes and any other teaching aids for approval by NCTA. For exercises requiring computers, furnish enough computers to have one computer per two students.

Provide draft training material to NCTA 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. 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. Provide two additional copies of these documents to NCTA.

Utilize training personnel well versed in the subject matter and with extensive field experience dealing with real world problems. Utilize training personnel that have been certified by the respective manufacturers.

Video record the entire training on digital video disc (DVD) and provide the DVD(s) to NCTA for later use.

The training shall be conducted locally after the completion of all system integration tests. NCTA shall provide the training facility. Provide NCTA with a 30-day notification to carry out the training so that arrangements can be made for attendance. Coordinate a mutually agreeable

date, time, and location with the Authority. The Engineer shall approve the training schedule time and location.

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

Provide course lengths and specific training described below:

**(B) 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, Demonstration | |
| Local camera programming | Lecture, Demonstration and Hands-on | |
| Camera addresses, presets, privacy zones, tours, other features | | |
| Maintenance | Lecture | |
| Routine maintenance, testing, troubleshooting | Lecture, Demonstration and Hands-on | |

**(C) Communications Hardware**

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 | |

| Course | Type of Training | Length (Days) |
|---|---|---|
| Maintenance | Lecture, Demonstration and Hands-on | |
| Routine, troubleshooting procedures, testing, system restart and recovery | | |
| Question and answer session | | |

**(D) Fiber-Optic Communications**

Provide training using the test and repair equipment furnished for the project. 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** | | 1 |
| Safety | Lecture | |
| Introduction to fiber-optics, theory, and principals | Lecture | |
| Fiber and cable types | Lecture and Hands-on | |
| National Electrical Code considerations | Lecture and Hands-on | |
| Plenum and riser type cable | | |
| Outdoor cable, etc. | | |
| Introduction to terminating hardware, end equipment, and applications | Lecture, Demonstration and Hands-on | |
| Connectors (ST, SC, etc.) | | |
| Splice enclosure, splice trays, and connector panels | | |
| Cable placement techniques | | |
| Question and answer session | | |
| **Fiber-Optic Cable System (cont.)** | | 1 |
| 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 | | |
| Fusion splicing | | |
| Field termination of connector types | | |
| Introduction to cable plant testing procedures | Lecture, Demonstration and Hands-on | |
| Proper usage of optical light generator and power meter | | |
| Class project (build working system using | Lecture, Demonstration | |

| Course | Type of Training | Length (Days) |
|---|---|---|
| cables/connectors made by attendees) | and Hands-on | |
| Question and answer session. | | |
| **Fiber-Optic Cable System (cont.)** | | .5 |
| Class project -- Testing and troubleshooting | Lecture, Demonstration and Hands-on | |
| Cable system maintenance and restoration | Lecture | |
| Question and answer session. | | |

**(E) RWIS**

Provide training in the basic theory and operation of the RWIS system. Include in this training lecture and hands-on exercise in the use of the RWIS software.

The training shall include the following sessions specific to the RWIS system:

| Course | Type of Training | Length (Days) |
|---|---|---|
| Operations | Lecture | 1 |
| System overview/theory of operation | Lecture, Demonstration | |
| System software | Lecture, Demonstration | |
| Maintenance | Lecture | 1 |
| Routine maintenance, troubleshooting, testing and calibrating | Lecture, Demonstration and Hands-on | |

**(F) MVDS**

Provide two sessions in the basic theory and operation of the MVDS detectors, cabinets, and other related equipment. Include in this training lecture and hands-on exercise in the use of the MVDS software.

The training shall include the following sessions <u>specific to the MVDS detectors:</u>

| Course | Type of Training | Length (Days) |
|---|---|---|
| Operations | Lecture | 1 |
| System overview/theory of operation | Lecture, Demonstration | |
| System software | Lecture, Demonstration | |
| Maintenance | Lecture | 1 |
| Routine maintenance, troubleshooting, testing and calibrating | Lecture, Demonstration and Hands-on | |

### (G) DMS Signs

Provide one session in the basic theory and operation of the DMS equipment, cabinets, and other related equipment. Include in this training lecture and hands-on exercise 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 | 1 |
| System overview | Lecture, Demonstration | |
| System software | Lecture, Demonstration | |
| Maintenance | Lecture | 1 |
| Routine maintenance, UPS, troubleshooting, testing | Lecture, Demonstration and Hands-on | |

## 22. TESTING AND ACCEPTANCE

### 22.1 GENERAL

Identify the test organization including the roles and responsibilities of the quality assurance organization. For each piece of equipment that requires testing, a test plan must delineate the following:

- Test procedures with test values and desired outcomes,
- Submittal schedule of test procedures,
- Start time of each level of testing,
- Test duration including any re-tests that are required or anticipated, and
- Submittal of the completed and signed off test report.
- Revisions to the test plan must be provided to NCTA at the Monthly Progress Meeting.

All testing must be performed by the Design-Build Team and will be observed by the Engineer. The Engineer may perform additional testing at any time during the project.

Conduct and complete successfully the following progressive series of tests before acceptance: factory acceptance testing, field demonstration test prior to installation, installed standalone device tests, system test of the network hardware, management software and an observation period. Develop a comprehensive series of test plans for each device to determine the equipment was correctly installed and meets the requirements of materials, workmanship, performance, and functionality required in the Plans and this Scope of Work. The test plans shall describe the functions to be tested, purpose of test, setup requirements, procedures to be followed, any inputs and expected outputs for each test, criteria for pass/fail and any required tools or test equipment. Any software testers shall be pre-approved by NCTA.

Develop as part of the test plan a traceability matrix of all the individual subsystem functional requirements to be used to cross-reference each planned test to a specific contract requirement to be verified. This Test Evaluation/Traceability Matrix shall be used by the Engineer to crosscheck the functional requirements and the results.

A key element of test plans, where appropriate, is the introduction of forced errors into the functional test. The test plan shall check the actual result of the forced error against the anticipated result. Test will be performed by the Design-Build Team and witnessed by NCTA. No deviation from the approved test procedure shall be permitted without approval from the Engineer. Any changes to the approved test procedure to accommodate unforeseen events during the time of testing shall be documented in the master test procedure. Immediately following the conclusion of each test, NCTA and the Design-Build Team shall meet to agree on the results observed and recorded during the testing. This will form the basis for the conclusions reported in the test plan. All test results, notes, and observations shall be maintained in electronic form. Maintain complete records of all test results during all stages of testing.

## 22.2 FACTORY ACCEPTANCE TESTING (FAT)

Conduct a factory acceptance test in the presence of the Engineer to verify to NCTA that all design, materials, and performance requirements for this project are satisfactorily met. Perform the factory acceptance tests at the equipment manufacturer's facility or at an independent testing laboratory.

### (A) Ethernet Switches and Video Encoders

Subject the video encoders, Gigabit Ethernet core and routing, Ethernet edge switches, switch blades, GBICs, and switch supporting equipment to factory acceptance tests (FATs). Develop and submit a test plan for FATs to the Engineer for consideration and approval. The Engineer may accept certification by an independent testing laboratory in lieu of the FATs to satisfy the requirement that certain features and functions have been witnessed and documented as performing satisfactorily. Arrange for and conduct the tests and be responsible for satisfying all inspection requirements prior to submission for the Engineer's inspection and acceptance. The Engineer reserves the right to witness all FATs. Complete the tests within five calendar days.

Transient, Temperature, Voltage, and Humidity Testing: Test and evaluate the units as indicated below. Ensure all testing of the Gigabit Ethernet core and routing switches, Ethernet edge switches, switch blades, GBICs and switch supporting equipment adheres to procedures defined in Section 2.2.7 of the NEMA TS 2-1998 standard and include the following tests:

- Test A: (FAT) Placement in Environmental Chamber and Check - Out of Hook-Up,
- Test B: (FAT) Temperature Cycling and Applied Transient Tests (Power Service),
- Test C: (FAT) Low - Temperature Low - Voltage Tests,
- Test D: (FAT) Low - Temperature High - Voltage Tests,
- Test E: (FAT) High - Temperature High - Voltage Tests,
- Test F: (FAT) High - Temperature Low - Voltage Tests,
- Test G: Test Termination (All Tests), and
- Test H: Appraisal of Equipment under Test.

### (B) RWIS

Subject the RWIS to factory acceptance tests. Utilize a testing procedure that includes a remote field sensor and RPU test and a remote-to-central communication test. Conduct the following tests and submit the results to the Engineer:

- Perform and document laboratory tests verifying proper sensor calibration,
- Calibrate instrument alignment with true north,
- Furnish sensor calibration protocols and adjustment procedures,
- Verify that the grounding component is installed as required and produces a voltage standing wave ratio (VSWR) of 1.5 or less, and
- Certify anemometers by wind tunnel tests.

Submit test results to the Engineer for review and approval. Upon request, furnish independent laboratory testing documentation certifying adherence to the stated wind force criteria using a minimum effective projected area (EPA), the actual EPA, or an EPA greater than that of the device to be attached.

**(C) Dynamic Message Sign**

The factory acceptance 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.

Manufacture a prototype DMS and controller of the type and size described in the Scope of Work. Test the prototype according to the factory acceptance and operational test requirements. When all corrections and changes (if any) have been made, the Authority 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 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 factory acceptance test, successfully perform the Functional Tests described below. Apply the extreme conditions to all associated equipment unless stated otherwise in this Scope of Work.

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 should 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 NCTA, to incorporate all design changes necessary to pass the required tests.

Demonstrate in the FAT that the proposed sign communicates with the version of the *Vanguard* software currently used by NCDOT at the STOC. Demonstrate the sign has all of the functionally provided by the *Vanguard* software.

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 the 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 is the Design-Build Team's responsibility to ensure the DMS system functions properly even after the Engineer accepts the DMS 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.

## 22.3 PRE-INSTALLATION FIELD DEMONSTRATION TESTING (FDT)

### (A) General

Conduct pre-installation tests on all devices at a Design-Build Team-provided facility within Mecklenburg or Union Counties. Perform the tests on all components supplied to verify that no damage was done to any unit during the shipment and delivery process. Notify the Engineer a minimum of 15 calendar days before the start of any tests. Conduct all tests according to the approved test procedures detailed in this section. Each device shall pass the individual tests detailed below prior to installation.

#### (1) Product Examination Test

Examine each device carefully to verify that the materials, design, construction, markings, and workmanship comply with all applicable standards, specifications, and requirements. 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 Test Specifications

Check the wiring to determine conformance with the applicable standards, specifications, and requirements.

#### (3) Operational Test Specifications

Operate each device long enough to permit equipment temperature stabilization, and to check and record an adequate number of performance characteristics to ensure compliance with applicable standards, specifications, and requirements.

**(4) Pre-installation Test Failure Consequence**

If any unit fails to pass a FDT, the unit shall be corrected or another unit substituted in its place, and the test successfully repeated.

If a unit has been modified because of an FDT failure, prepare a report and deliver that report to the Engineer prior to the unit's shipment. The report shall describe the nature of the failure and the corrective action taken.

If a failure pattern develops (more than two failures), the Engineer will make a determination of the disposition of the failed equipment without additional cost to NCTA or an extension of the contract period.

**(B) Ethernet Switches and Video Encoders**

Subject the video encoders, Gigabit Ethernet core and routing, and Ethernet edge switches, switch blades, GBICs, and switch supporting equipment to field demonstration tests (DATs). Develop and submit a test plan for FDTs to the Engineer for consideration and approval. Arrange for, conduct the tests, and be responsible for satisfying all inspection requirements prior to submission for the Engineer's inspection and acceptance. The Engineer reserves the right to witness all FDTs. Complete the tests within five calendar days.

**(C) Dynamic Message Signs**

Subject the DMS to design approval and factory acceptance tests as described in the section Dynamic Message Signs in this Scope of Work.

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 this Scope of Work. The field demonstration test will use the NTCIP Exerciser, and/or other authorized testing tools and will follow the guidelines established in the ENTERPRISE Test Procedures. Conduct the test in North Carolina on the installed system in the presence of the Engineer. Document and certify the results of the test by the firm conducting the test and submit 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. NCTA reserves the right to enhance these tests as deemed appropriate to ensure device compliance.

The Test Unit shall be pre-configured to the system requirement. The Design-Build Team shall submit a list of the additional components for approval by the Engineer.

The Test Unit, all associated manuals, equipment, and repair documentation listed above shall be delivered to:

North Carolina Department of Transportation
Traffic Electronics Center
750 North Greenfield Parkway
Garner, NC 27529
ATTN: John A. Stephenson
Phone #: (919) 661-4697

### (D) Microwave Vehicle Detectors

Subject the MVDS to field demonstration tests as follows:

- Use a laptop computer provided as part of the support equipment to configure the installation
- Install the MVDS sensor at the site for test setup
- Verify that configuration data is stored in nonvolatile memory
- Download previously stored configuration data
- Verify that vehicles traveling at the test site can be detected across multiple travel lanes to the accuracy specified herein
- Drive a test car of known length and speed through the detection zone. Compare the output from the vehicle detector to this known value to verify the accuracy of detection. Repeat this measurement at least 10 times
- Verify the volume counts and speed measurements for each MVDS using the test software running on the laptop computer connected locally to the detector's EIA-232/485 communication port. Verify the accuracy of traffic parameters specified herein by using permanent or temporary traffic detection devices of known accuracy

## 22.4 INSTALLED SITE TESTS

### (A) General

Conduct an approved, installed standalone device installation test at the field site. Test all standalone functions of the field devices using equipment installed as detailed in the Plans, or as directed by the Engineer.

Complete approved test plan forms and turn them over to the Engineer for review as a basis for rejection or acceptance. Provide a minimum notice of 30 calendar days prior to all tests to permit the Engineer or his representative to observe each test.

If any unit fails to pass its stand-alone test, correct the unit or substitute another unit in its place, then repeat the test.

If a unit has been modified because of a standalone test failure, prepare a report describing the nature of the failure and the corrective action taken and deliver it to the Engineer prior to re-testing the unit. If a failure pattern develops, the Engineer may direct that design and construction modifications be made to all units without additional cost to NCTA or an extension of the contract period.

Utilize vendor supplied device software to perform diagnostic tests of each device. The vendor supplied diagnostic software shall be provided to NCTA before final acceptance. Test the following features of each competent as described below.

### (B) Conduit

Prepare and submit written test procedures for conduit system tests to be performed. Provide test procedures for review and approval by the Engineer before any tests are conducted. The test procedures shall follow industry standards. The testing shall demonstrate the following:

- All conduit runs are open,
- Run a mandrel through each conduit to demonstrate a fully functional and clear conduit

- Junction boxes and splice boxes are installed correctly with working lids and are free of debris

The conduit system must be tested in accordance with the testing plan and procedures developed by the Design-Build Team and approved by the Engineer. Notify the Engineer of the proposed date, time and location of all testing 10 calendar days in advance of the test being performed. All testing must be performed by the Design-Build Team and shall be observed by the Engineer. The Engineer or assignee may perform additional testing at any time during the project.

**(C) Fiber-Optic Cable**

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 1000-foot pre-tested launch cable between the OTDR and fiber-optic cable to be tested. Test the fiber-optic trunk and drop cables at 1310 and 1550 nm. Also, test bidirectionally.

If exceeded, remake splices until the loss falls below 0.05 dB. NCTA will record each attempt for purposes of acceptance.

Clearly label each OTDR trace identifying a starting and ending point for all fibers being tested. Record the attenuation level of each fiber and clearly indicate OTDR trace results in report format. Provide a summary section or spreadsheet detailing the loss budget calculation for each section and a summary or spreadsheet for the actual loss measured for each fiber compared with the allowable loss for the segment. Furnish electronic copies of all OTDR trace results on a CD or DVD. Furnish the manufacturer's make, model number, and software version of the OTDR used for testing.

Provide engineering calculations and tests for fiber-optic cable that demonstrate the loss budget where the fiber originates and where the fiber meets an electronic device. The calculations shall summarize the optical losses versus the allowable losses for the communications equipment between each pair of communications hardware. Provide a tabular summary section or spreadsheet detailing the loss budget calculation for each section. Provide a tabular summary section or spreadsheet for the actual loss measured for each fiber compared with the allowable loss for the segment.

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 NCTA.

**(D) CCTV Field Equipment**

Develop an operational test plan that demonstrates all requirements of the equipment and software. Submit for approval before conducting tests.

Notify NCTA at least 14 calendar days prior to the proposed date for the tests. NCTA shall have the right to witness such tests, or to designate an individual or entity to witness such tests.

Perform the following installed site tests at the camera assembly field site in accordance with the test plans. A laptop computer shall provide camera control and positioning. After completing the installation of the camera assembly, including the camera hardware, 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, camera control receiver, and control cabinet
- Perform the CCTV assembly manufacturer's initial power-on test in accordance with the manufacturer's recommendation
- Set the camera control address
- 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.

Repair or replace defective or failed equipment and retest.

**(E) Dynamic Message Signs**

An authorized representative of the manufacturer must sign the test results and data forms. Conduct an installed site test of each DMS system installed on the project to exercise the normal operational functions of the installed operational field equipment. The installed site test will consist of the following tests as a minimum:

**1. Physical Examination**

Test per section "Physical Examination" of the DMS section of this Scope of Work

**2. Continuity Tests**

Test per section "Continuity Tests" above of the DMS section of this Scope of Work.

**3. Functional Tests**

Perform the following functional tests:

- Start-up and operation of 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
- Automatic polling of the DMS by the control software at various intervals and verification of data received by control software from DMS
- Downloading and editing messages using control software
- Execute status request on the DMS controller
- Normal operations during uploading and downloading
- Selection of messages from the sign controller’s local user interface
- Test sequence activation at chosen intervals
- Display and verification of all stored messages
- Resumption of standard operation upon interruption of electrical power
- Demonstration of the failure detection and response functions
- Demonstrate proper operation of the Failure Log
- Set controller clock using the control software
- Execute system shutdown using first the control software and local user interface
- Detection of power failure in the DMS enclosure and reporting of such failure to the control software

**(F) MVDS Detectors**

Inspect the MVDS field components to ensure proper installation and cable termination.

Adjust and verify the detector settings by comparing each sensor’s recorded traffic volumes and speed with those actually observed. Remotely repeat this test from the TMC. Verify the accuracy of traffic parameters using permanent or temporary traffic detection methods or devices of known accuracy.

Conduct the installed field tests detailed below. The Design-Build Team shall:

Furnish all equipment, appliances, and labor necessary to test the installed MVDS and the network communication device, and to perform the following tests before any connections are made:

- Perform a continuity test on the detector cables to ensure that anomalies, such as openings, shorts, crimps or defects, are not present,
- Perform continuity tests on the detector’s stranded conductors using a meter having a minimum input resistance of 20,000 Ω per volt and show that each conductor has a resistance of not more than that specified by the wire/cable manufacturer,
- Measure the insulation resistance between isolated conductors and between each conductor, ground, and shield using a meter designed for measuring insulation resistance. The resistance must be greater than 100 MΩ. Perform all resistance

testing after final termination and cable installation, but prior to the connection of any electronic or field devices, and

- Replace any cable that fails to meet these parameters, or if any testing reveals defects in the cable, and retest new cable as specified in this section.

Furnish and calibrate all test equipment. Demonstrate the following after installation of the MVDS, other hardware, power supplies, and connecting cables:

- Verify that physical construction has been completed as specified in the Plans,
- Inspect the quality and tightness of ground and surge protector connections,
- Check power supply voltages and outputs,
- Verify that device connections to power sources are as specified in the Plans,
- Verify that the installation of specified cables and connections between all detectors and the field cabinet are as specified in the Plans,
- Demonstrate that the remote system is fully operational and performing all specified types of detection, including data storage functions, with a laptop computer, and
- Verify detector accuracy by conducting sample ground counts using test intervals of 10 minutes and 100 vehicles as described in the field demonstration test.

**(G) RWIS System**

Perform installed site tests at the RWIS field site according to the test plans detailed in this section. After the environmental sensors and RPU, and other RWIS hardware, power supplies, and connecting cables have been installed, perform the following:

- Verify that physical construction has been completed as specified in the Plans,
- Inspect the quality and tightness of ground and surge protector connections,
- Check power supply voltages and outputs,
- Connect devices to the power sources,
- Verify installation of specified cables and connections between the environmental sensors and RPUs, and the control cabinet,
- Verify proper orientation of wiring and cabling,
- Ensure that the conduit is straight, neat, and properly secured,
- Verify that the grounding component is installed as required and produces a voltage standing wave ratio (VSWR) of 1.5 or less,
- Test local operation of all environmental sensors and RPU components,
- Calibrate instrument alignment with true north,
- Furnish sensor calibration protocols and adjustment procedures,
- Verify and ensure that sensors are reporting proper field data, and
- Detail regular site maintenance procedures and calibration training.

Provide block diagrams, schematics, catalogs, and line drawings. Program source codes in both printed and digital form.

**(H) Ethernet Communications System**

Once the routing and edge switches have been installed, conduct installed site tests at the Ethernet routing and edge switch field sites according to the submitted test plan. Perform the following:

- Verify that physical construction has been completed as detailed in the Plans
- Inspect the quality and tightness of ground and surge protector connections
- Verify proper voltages for all power supplies and related power circuits
- Connect devices to the power sources
- Verify all connections, including correct installation of communication and power cables
- Verify configuration of the Gigabit Ethernet routing switches Internet Protocol (IP) addresses and subnetwork mask
- Verify the network connection to the Gigabit Ethernet core switch at the STOC through ping and telnet sessions from a remote personal computer (PC)
- Perform testing on multicast routing functionality

Repair or replace defective or failed equipment and retest.

**(I) Video Encoders and Decoders**

The following items, not otherwise required to be tested elsewhere, shall be tested**:** cable continuity, grounding, and power-up self test. Perform the following:

- Verify configuration of each encoder and decoder Internet Protocol (IP) addresses and subnetwork mask,
- Program encoders and decoders for different framing rates and resolutions to verify full functionality,
- View the camera image at cabinet through the Ethernet port of encoder on a laptop, and
- View the camera image through the Ethernet port of decoder on a laptop
- Perform testing on multicast routing functionality.

**(J) CCTV Central Equipment**

Test the components of the CCTV central equipment as follows:

- Check all ground, power, data, Ethernet and analog video connections,
- Run power up self test on each piece of equipment,
- Test the connections between each pair of devices, and
- Run all available vendor-supplied self-diagnostics.

**22.5 SYSTEM TESTING:**

**(A) General**

Conduct tests as described below of the DMS, MVDS, CCTV, RWIS, and communications, subsystems. Conduct approved device subsystem tests on the field equipment with the TMC equipment including, at a minimum, all remote communications hardware monitoring and control functions. These tests shall be a demonstration of overall system stability. During this test period, limit downtime due to mechanical, electrical, or other malfunctions to a maximum of eight hours. The Engineer has the right to suspend the test to correct deficiencies and restart the test or to extend the test period by time equal to the downtime in excess of eight hours.

Conduct device and subsystem tests of any repaired or replaced equipment.

Display the event log from the DMS, MVDS, CCTV, RWIS, network management software for a minimum of seven days. Complete approved data forms and turn them over to the Engineer for review, and as a basis for rejection or acceptance.

The Engineer has the right to suspend the test to correct deficiencies and restart the test or to extend the test period by time equal to the downtime in excess of eight hours. If a component has been modified because of a test failure, prepare a report and deliver it to the Engineer prior to retesting.

**(B) Video Encoders/Decoders**

Perform the following:

- Verify the network connection to each encoder and decoder through ping and telnet sessions from each workstation,
- View the camera image from each workstation and from each workstation, and
- Perform testing on multicast routing functionality.

**(C) Communications Hardware**

For the communications hardware, test the following items**:**

- Verify the network connection to each encoder and decoder through ping and telnet sessions from each workstation,
- Ability for remote configuration of devices,
- Failover switching (Rapid Spanning Tree),
- Verify VLAN configuration of CCTV and other ITS devices' data transmissions,
- IGMP protocol and optical connections and configuration of network management software including SNMP and RMON functions.

Simulate the loss of communications and conduct failover tests to determine the communications system's ability to reroute communications and then reconnect upon the loss of primary communications path. Conduct the test on each Gigabit Ethernet routing switch to Gigabit Ethernet routing switch circuit and for each local circuit on each Gigabit Ethernet routing switch.

**(D) CCTV Subsystem**

After completing the integration of the CCTV equipment, conduct a minimum of a seven-day test of the CCTV subsystem hardware and software. This will include that portion of the communications network serving the CCTV subsystem. The Engineer has the right to suspend the test to correct deficiencies and restart the test or to extend the test period by time equal to the downtime in excess of eight hours. If during that time it is determined by the Authority there are hardware or software failures that are the responsibility of the Design-Build Team, the Design-Build Team shall make repairs or replacements to the satisfaction of the Authority.

Test the following features of each component as described below.

**1. CCTV Field Equipment:**

The following items, not otherwise required to be tested elsewhere, shall be tested for each CCTV site from the TMC**:**

- Verify new CCTV device database allows connection to each CCTV in the new database
- NTCIP objects
- Power-up self-tests
- Iris control,
- Preset functions
- Presence and quality of the video image with a portable NTSC-approved monitor
- Preset positioning, and power on/off functions
- Camera and controller access and security from all workstations
- Disconnect camera and take local control and reconnect camera at local cabinet to the communications and verify TMC control is regained
- Confirm ability to change camera ID
- Verify unique camera identifier and icons on GUI
- Viewing of camera image on each monitor

In addition, test the system's ability to transport multiple video streams at 30 frames per second at a data rate of 6 Mbs with a latency of less than 250 ms without errors by simultaneously displaying the maximum number of video images on the monitors and workstations.

**2. CCTV Central Equipment/Software**

Test as follows:

- Use the GUI interface to select and view each camera,
- Verify the ability to command and control each camera,
- Set presets and command each camera to go to different presets and then return to previous presets, and
- Use each joystick, keyboard, touch screen control pad and keypad, and test the ability to control the pan-tilt-zoom and iris settings of each camera.

**(E) DMS Signs**

After the integration of the DMS subsystem, conduct a minimum of a seven-day test of the DMS subsystem hardware. The Engineer has the right to suspend the test to correct deficiencies and restart the test or to extend the test period by time equal to the downtime in excess of eight hours. If during that time it is determined by NCTA there are failures that are the responsibility of the Design-Build Team, the Design-Build Team shall make repairs or replacements to the satisfaction of NCTA.

- Verify new DMS device database allows connection to each DMS signs in the new database,
- Verify communications port addressing from the DMS,
- Test the NTCIP protocols and commands from the TMC,
- Verify the ability to upload and download configuration data. and

- Verify the ability to download and post sign messages.

**(F) MVDS Detectors**

After the integration of the MVDS subsystem, conduct a minimum of a seven-day test of the MVDS subsystem hardware and software. During the seven-day test, the Design-Build Team shall accomplish the following:

- Verify new MVDS device database allows connection to each MVDS in the new database,
- Verify communications port addressing from the MVDS,
- Verify the ability to upload and download configuration data, and
- Verify the ability to upload traffic data.

The Engineer has the right to suspend the test to correct deficiencies and restart the test or to extend the test period by time equal to the downtime in excess of eight hours. If during that time it is determined by NCTA there are failures that are the responsibility of the Design-Build Team, the Design-Build Team shall make repairs or replacements to the satisfaction of NCTA.

**(G) RWIS**

After the integration of the RWIS subsystem, conduct a minimum of a seven-day test of the RWIS subsystem hardware and software. During the seven-day test, the Design-Build Team shall accomplish the following:

- Verify communications port addressing from the RWIS,
- Verify the ability to upload and download configuration data, and
- Verify the ability to upload weather data.

The Engineer has the right to suspend the test to correct deficiencies and restart the test or to extend the test period by time equal to the downtime in excess of eight hours. If during that time it is determined by NCTA there are failures that are the responsibility of the Design-Build Team, the Design-Build Team shall make repairs or replacements to the satisfaction of NCTA.

## 22.6 OBSERVATION PERIOD

**(A) General**

NCTA shall observe all equipment and software operation according to the requirements of this Scope of Work for a single 60-day system observation period for all subsystems simultaneously. The observation period shall not begin until all subsystems are ready.

The observation period shall begin at final acceptance. A successful 60-day observation period shall consist of continuous operation with no more than a total of two calendar days of non-operation due to mechanical, electrical, or other malfunctions of the CCTV DMS, MVDS, RWIS or communications subsystems.

During the observation period, respond to failures of the Design-Build Team's equipment within two hours and make repairs within eight hours. For items that pose a traffic safety hazard, complete repairs within four hours. If any failures affect major components for more than 48 hours, NCTA shall suspend the observation period beginning when the failure occurred. Resume the observation period with the approval of the Engineer after successful repair or replacement. If three or more major component failures of a like nature occur, NCTA shall terminate the

observation period. Begin a new 60-day observation period with the approval of the Engineer after the faulty equipment has been repaired or replaced.

**(B) CCTV Subsystem**

During this period, NCTA shall observe equipment and software operation according to the requirements of this Scope of Work.

Major subsystem components include the video matrix switch and its peripherals, CCTV cameras, CCTV monitors, fiber-optic video/data transceivers, fiber-optic cable, and CCTV cabinets.

**(C) DMS Subsystem**

During this period, NCTA shall observe equipment and software operation according to the requirements of this Scope of Work.

Major subsystem components include the DMS field controller, DMS display module, DMS workstation software, Ethernet edge switches, fiber-optic cable, and cabinets.

**(D) MVDS Subsystem**

During this period, NCTA shall observe equipment and software operation according to the requirements of this Scope of Work.

Major subsystem components include the Ethernet edge switches, fiber-optic cable, and cabinets.

**(E) RWIS Subsystem**

During this period, NCTA shall observe equipment and software operation according to the requirements of this Scope of Work.

Major subsystem components include the Ethernet edge switches, fiber-optic cable, and cabinets.

## LIGHTING SCOPE OF WORK (07-07-2010)

### I. General

Obtain the services of a firm prequalified for lighting design by the NCDOT. Furnish, install, connect and place into satisfactory operating condition, lighting equipment and materials in accordance with the *2006 NCDOT Standard Specifications for Roads and Structures*, and the *2006 NCDOT Roadway Standard Drawings* unless otherwise detailed herein. Provide electronic CADD files in MicroStation format, using Geopak Software (current version used by NCDOT), and showing proposed design. There is no aviation, navigation, sign, or tunnel lighting included on this project.

### II. Roadway Lighting

Complete interchange lighting is required for the interchange of US 74 Toll and US 74 Business near Stallings. Roadway lighting is required, including service roads and underpasses, from the beginning of the project through the interchange of US 74 Toll and US 74 Business near Stallings.

Lighting for future lanes and continuous freeway lighting is not required. The Design-Build Team, in like kind, shall replace existing lighting impacted by construction but not replaced by the lighting required above.

### III. Lighting Design

The Design-Build Team shall design the lighting in accordance with the current AASHTO Roadway Lighting Design Guide.

Design and install a new lighting system that will provide 0.7 footcandles (fc) average maintained illuminance, with a uniformity ration of 3.5:1 (Average fc : Minimum fc). Provide lighting plans on separate “For Lighting Construction Only” plan sheets. Use materials and construction methods as required by the Standard Specifications and Standard Drawings. Use breakaway couplings or bases meeting current AASHTO requirements. Design circuitry for a maximum of 3% voltage drop per feeder circuit. Provide voltage drop calculations for each circuit. Provide Project Special Provisions and installation details for non-standard equipment or construction methods that are required.

Submit catalog cuts for proposed material. Submit preliminary lighting layout and supporting photometric calculations along with other interim plan review documents. Photometric calculations consist of computer generated spacing charts, or footcandle and uniformity graphs that demonstrate how the proposed lighting system will illuminate the proposed roadway to the required standard. Templates may be used to design lighting provided by high mast light standards.

## IV. Final Inspection

Contact Lighting / Electrical Engineers from NCTA or their representatives to inspect the completed lighting system and perform insulation resistance testing for all conductors prior to contract acceptance.

**OPEN ROAD TOLLING (ORT) TOLL ZONE SCOPE OF WORK** (08-10-2010)

This ORT Infrastructure scope of work includes design, engineering, fabrication, delivery and erection of gantries, ORT Toll Zone Buildings, pavements, concrete pads, sidewalks, electrical work, heat ventilation, air conditioning (HVAC) work, conduit duct banks and associated junction boxes necessary for the infrastructure of the open road tolling system.

The NCTA has an agreement with the Toll Systems Integrator, Affiliated Computer Services Inc. (ACS) to design, develop, install and implement a fully automated toll collection system for the Triangle Expressway. The design, fabrication and installation of toll equipment for the Triangle Expressway will be by ACS (Project Manager is Steve Hamilton). It is expected that NCTA will enter into a similar agreement with ACS to provide the fully automated toll collection system for the Project.

The NCTA has an agreement with the Electronic Toll Collection System (ETCS) Integrator, TransCore to design, develop, install and implement a Radio Frequency Identification (RFID) system for the Triangle Expressway. The design, fabrication and installation of the RFID equipment for the Triangle Expressway will be by TransCore (Project Manager is Dan Papiernik). It is expected that NCTA will enter into a similar agreement with TransCore to provide the ETCS for the Monroe Parkway.

The Design-Build Team shall coordinate with Toll System Integrator in the final design and construction of the ORT Toll Zone to readily accommodate the Toll System Integrator components without the need for modifications and to achieve the NCTA tolling performance requirements. Some information contained within this ORT Toll Zone scope of work is typical and may not be applicable for the specific tolling system provided by the Toll System Integrator. However, based upon coordination with the Toll System Integrator in the final design there may be a reduction, deletion or addition of items indicated within this scope of work, which if allowed and necessary, shall result in compensation adjustments in accordance with the 2006 NCDOT *Standard Specifications for Roads and Structures*. Accurate As-Built drawings shall be provided to NCTA at the completion of work indicating all infrastructures installed with locations indicated on the record set of drawings.

Design and construct ORT Facilities in accordance with the following:

- ORT Project Specific Drawings
- Aesthetic Design Scope of Work

Design, construction drawings, as-built drawings, details, and specifications detailed within this scope are the responsibility of the Design-Build Team, unless noted otherwise. Provide all details and plans consistent with industry standards and professional requirements.

**ORT Toll Zone Location**

Locate each ORT Toll Zone in accordance with the ORT Toll Zone Geometry Design Criteria below and generally at the locations indicated on the ORT Project Specific Drawings. Coordinate the site selection for the ORT Toll Zone with the Toll System Integrator and the NCTA.

ORT Toll Zone locations shall be free from electromagnetic conditions such as proximity to large power sources or communication towers. Following preliminary design of the ORT Toll Zones, a Radio Frequency (RF) Spectrum Analysis will be performed by NCTA's ETCS contractor in order to determine whether or not the proposed ORT Toll Zone is free from electromagnetic conditions that may cause interference with the Radio Frequency Identification (RFID) technology.

Locate all ORT Toll Zones in roadway areas where lane changing and weaving would not be expected.

Accommodate the shoulder acceleration and deceleration lengths for access to the ORT Toll Zones detailed in the ORT Project Specific Drawings.

Gantry mounted toll equipment will be accessed via a bucket truck. Place ORT Toll Zones to allow for ease of maintenance access under operating conditions.

Protect access drive and gantry columns with guardrail and concrete barrier as shown in the ORT Project Specific Drawings.

**ORT Site Geometry Design Criteria**

The following requirements shall apply for all mainline and ramp ORT Toll Zone roadways:

For all Mainline and Ramp ORT Toll Zones:

- For geometric design purposes, the ORT Toll Zone shall consist as a tangent section of 250' with limits from at least 100 feet prior to the first ORT gantry structure centerline to at least 100 feet beyond the second ORT gantry structure centerline.
- Locate all ORT Toll Zones either on horizontal tangent sections, or horizontal curve sections with a radius of 2,000 feet or greater.
- Locate ORT Toll Zones on vertical tangents if possible.
- Do not locate ORT Toll Zones in sag vertical curves,
- Do not locate ORT Toll Zones under structures or on structure,
- Do not place drainage pipes under the area between the first and second gantries or within 25 feet of any conduit or junction box. Ensure no drainage swales lead toward toll or ITS junction boxes.

For Mainline ORT Toll Zones:

- Locate ORT Toll Zones in roadway areas where uniform vehicle speeds above 45 mph are expected.
- Provide a minimum of 1000 feet clear line of sight for drivers approaching Toll Zones.
- Provide ORT Toll Zone pavement cross-slopes which are uniform through the ORT Toll Zone, at 2% cross-slope if possible, and at 4% cross-slope maximum

For Ramp ORT Toll Zones:

- Locate Toll Zones a minimum of 250 feet from the center of a ramp terminal intersection.
- Locate ORT Toll Zones a minimum of 350 feet from pavement gore point at exit and entry ramps if possible. Pavement gore point is the intersection of the right outside edge of mainline shoulder and the left outside edge of ramp shoulder.
- Locate ORT Toll Zones Gantries between one-third and one-half of the ramp length as measured from the mainline end of ramp, if possible.
- Locate ORT Toll Zones with a minimum 100 feet between the end of side road intersections and the nearest gantry.
- Locate ORT Toll Zones in roadway areas where uniform vehicle speeds above 35 mph are expected.
- Provide a minimum 1000 feet clear line of sight for drivers approaching exit ORT Toll Zones.
- Provide ORT Toll Zone pavement cross-slopes that are uniform through the ORT Toll Zone, at 2% cross-slope if possible, and at the maximum for the design of the curve.

**Deleted section on ORT Toll Zone Pavement Design**

**ORT Toll Zone Gantry**

Design, engineer, fabricate, transport and erect watertight gantry structures to which the Toll System Integrator will attach the tolling equipment. Design Gantries in compliance with the *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 5th Edition*, as published by AASHTO using a minimum wind speed of 90 miles per hour.

Provide two structural gantries at each ORT Toll Zone site, to be similar in appearance and scale. Design each gantry to span the facility width as indicated on the ORT Project Specific Drawings. Design gantries to ensure that the line of sight for cameras, camera lights, and overhead profilers/separators are not obstructed by the structure.

Design and construct gantry structure including scale, materials, color and finish aesthetically consistent with the Monroe Aesthetic Design Guidelines. The front façade or paneling of the gantry shall conceal all ORT Toll Zone tolling equipment (to the extent possible without impairing the tolling accuracy) and cabling from on-coming traffic and should present a straight and clean visual appearance, which is not detracted from by tolling equipment.

The upstream mainline gantry shall be designed to easily accommodate a DMS (DMS may not be installed initially). The requirements for the DMS are contained in the ITS Scope of Work.

Coordinate with the Toll System Integrator for final toll gantry loading and design. Include effect of proposed future roadway widening in load analysis.

Provide vertical clearance in accordance with the ORT Project Specific Drawings in order to maintain proper clearances for the toll collection equipment.

Design and construct an equipment-mounting frame and cantilevered overhead scanner frame as detailed in the ORT Project Specific Drawings to be used for the installation of the toll collection equipment. Design the gantry structure, equipment mounting frame, and overhead scanner frame to support the equipment specified in the ORT Project Specific Drawings without vibration from wind forces or drafts from vehicles passing under the gantry.

An 8” X 8” divided cable tray shall be located on the top of the truss, concealed by the cladding face, extending the length of the gantry.

Refer to the ORT Project Specific Drawings for conduit, risers and cabling requirements.

Provide conduits or watertight cable trays terminating in the bottom of the divided overhead cable tray and at the at-grade control/ junction boxes at the base of the gantry as shown in the ORT Project Specific Drawings.

Conceal all conduit or cable trays from view within the proposed aesthetic treatment.

Locate hand-holes, stub-outs, junction boxes, or control boxes, for access to equipment cabling and electrical wiring, on the non-traffic side of the gantry structural members.

**ORT Toll Zone Facility Conduit and Junction Boxes**

Design and construct required conduits and cabling infrastructure necessary to establish the communications path between fiber-optic trunk line, ORT Toll Zone buildings, gantries, cabinets, and junction boxes. Install the number and size of conduits specified in the ORT Project Specific Drawings.

Coordinate with the Toll System Integrator in the conduit design and installation.

Provide separation between power and communications conduit as specified in the ORT Project Specific Drawings.

Provide underground concrete encased conduit duct bank when crossing new roadways. Install conduit duct banks such that there is a minimum of 18 inches of cover from pavement subgrade to the top of the duct bank. Trenched conduit, directional bores or jack and bore shall be in accordance with *2006 NCDOT Standard Specifications for Roads and Structures*.

Terminate conduit through the floor slab of ORT Toll Zone Buildings above finished floor elevation. Conduit may enter the building thru the side wall if behind the screen wall.

Furnish conduits stubbed out at all concrete pads with plastic bushings (or comparable material) to prevent cables from being damaged when being pulled through conduits or shifting during use. Clearly label each end of the conduits and include conduit plugs, pull line in each conduit, and tracer wire per Article 1098-4 of the 2006 NCDOT *Standard Specifications for Roads and Structures.*

The Toll System Integrator will provide and install conduit from the loop splice boxes to the shoulder. Installation of the conduit is required during the paving of the roadway shoulders and must be coordinated closely with the Toll System Integrator.

Provide rigid metallic conduit in above ground installations.

In accordance with the ORT Project Specific Drawings, an additional auxiliary communications box (just outside the building) and related conduit infrastructure for exiting the building, shall be provided for the westernmost and easternmost mainline ORT Toll Zone Buildings.

**ORT Toll Zone Buildings**

Design, engineer, fabricate, and erect an ORT Toll Zone Building for each ORT Toll Zone as shown in the ORT Project Specific Drawings. The ORT Toll Zone Building will house ITS equipment and roadside toll collection equipment (provided by the Toll Systems Integrator). The Design-Build Team may propose consolidating the number of required buildings if two or more are located in the same general area. Any such proposed consolidation must be approved by NCTA.

Provide the following ORT Toll Zone Buildings:

| Toll 74 Toll Zone ID | Toll Zone or Interchange Name | Location/ Direction | Mainline ORT Bldg (11x14) | Gantry Cabinet Only | Ramp ORT Bldg (11x11) |
|---|---|---|---|---|---|
| 74-1-1<br>74-1-2 | US 74 Business | EB Off<br>WB On | | | 1<br>1 |
| 74-2-1<br>74-2-2 | Indian Trail ML | EB ML<br>WB ML | 1 | <br>1 | |
| | Indian Trail - Fairview Road | no toll | | | -<br>- |
| 74-3-1<br>74-3-2 | Lake Park ML | EB ML<br>WB ML | 1 | <br>1 | |
| 74-4-1<br>74-4-2 | Unionville - Indian Trail Road | EB On<br>WB Off | | | 1<br>1 |
| | Rocky River Road | no toll | | | -<br>- |
| 74-5-1<br>74-5-2 | Unionville ML | EB ML<br>WB ML | 1 | <br>1 | |
| 74-6-1<br>74-6-2 | Concord Hwy - US 601 | EB On<br>WB Off | | | 1<br>1 |
| | Morgan Mill Rd NC 200 | no toll | | | -<br>- |
| 74-7-1<br>74-7-2 | Lake Twitty ML | EB ML<br>WB ML | 1 | <br>1 | |
| | Austin Chaney Road | no toll | | | -<br>- |
| 74-8-1<br>74-8-2 | Wingate ML | EB ML<br>WB ML | 1 | <br>1 | |
| | Forest Hills School Road | no toll | | | -<br>- |
| | US 74 Business | no toll | | | -<br>- |

Design ORT Toll Zone Buildings to be typical in functionality and appearance throughout the project limits.

ORT Toll Zone Building Site

Design each ORT Toll Zone Building Site following the ORT Project Specific Drawings.

Do not locate the ORT Toll Zone Buildings adjacent to areas that may be subject to the infiltration of water, steam, humidity, heat or other adverse atmospheric or environmental conditions. Avoid site locations that are below water level or near ponding water because of rainfall events. Grade the ORT Toll Zone Site such that water flows away from the buildings.

Locate ORT Toll Zone Buildings away from sources of Electro Magnetic Interference (EMI) including 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.

Do not locate ORT Toll Zone Buildings adjacent to sources of constant, excessive, low or high frequency noise, such as air-handling equipment, pumps, and the like.

Do not install equipment and utilities not specifically required for the equipment building, including utility pipes, wiring, cabling, ductwork or other electrical equipment within, through, or under the ORT Toll Zone Building.

Coordinate final positioning of the ORT Toll Zone Building at each site with the Toll System Integrator.

General Configuration

Reference the layout of the ORT Toll Zone Building in the ORT Project Specific Drawings. All mainline ORT Toll Zone Buildings shall be 11-feet x 14-feet and all ramp ORT Toll Zone Buildings shall be 11 feet x 11 feet. Design finish ceiling height to be not less than 9 feet as measured from the finished floor elevation.

Buildings

Provide ORT Toll Zone Buildings of steel, lightweight concrete, or masonry construction that is aesthetically consistent with the Monroe Aesthetic Design Guidelines and does not require painting and/or routine maintenance. Provide prefabricated, pre-cast or conventional masonry brick/block on-site construction. Do not provide timber structures. Provide durable, watertight, secure, facility requiring minimal maintenance. Provide a roofing system with a minimal 20-year warranty, which does not utilize housing shingles.

Design ORT Toll Zone Buildings for a 2 hour fire rating, unless superseded by the North Carolina Fire Code standards.

All conduit and utility penetrations shall be sealed watertight.

Architectural Plans

Prepare an architectural plans package for the ORT Toll Zone Buildings, to include the Architectural, Structural, Electrical, HVAC, and Mechanical Plans, and other documents necessary for a complete turnkey construction of the ORT Toll Zone Buildings. Submit Design calculations including structural, foundations, HVAC and electrical calculations for all components of the ORT Toll Zone Building with plans submitted. A professional engineer registered in the state of North Carolina shall seal all designs, plans and calculations. Design ORT Toll Zone Building to meet all zoning and building code requirements. Prepare the ORT Toll Zone Building plans and designs in accordance with the North Carolina Building Code, latest edition. Provide facility plans that are accurate, legible, and complete in design, drawn to appropriate scales and furnished in reproducible form. Obtain all required permits to construct and occupy ORT Toll Zone Buildings.

**Foundation/Sidewalk/ Concrete Maintenance Pad**

As shown in the ORT Project Specific Drawings, construct concrete pads that will serve as the building foundation (will serve as maintenance pad, sidewalk, etc.) and equipment cabinet foundations. The building and equipment cabinet foundations shall be 8-inches thick minimum.

The HVAC unit and generator will be located on the building foundation concrete pad as detailed in the ORT Project Specific Drawings.

The ORT Toll Zone Building shall include a 6-inch curb that separates the foundation from the adjacent parking surface. Refer to the ORT Project Specific Drawings for requirements. Provide a ramp from the adjacent parking surface in the vicinity of the door for loading/unloading.

**HVAC**

The Design-Build Team shall design the HVAC system in coordination with the Toll Collection System Integrator. Current heat load requirements provided by the Toll Collection System Integrator require a minimum of a 2-ton HVAC unit for the mainline buildings and a 1-ton HVAC unit for the ramp plazas. These load requirements are based upon estimated toll collection and ITS equipment that will be provided for the Monroe Parkway.

Provide a 10-year life-cycle cost analysis comparing possible mechanical systems using electric, natural gas and propane alternatives for final selection of HVAC System. Provide the most cost effective system, to include the cost of obtaining the initial services.

Furnish ORT Toll Zone Buildings with one heating-ventilation-air-conditioning (HVAC) unit.

Provide a thermostat and install heating and cooling ducts to minimize interference with wall surface area and conflicts with electrical and communication conduits, cable trays, and cabling.

**Exterior Doors**

Provide exterior access doors that swing outward following the ORT Project Specific Drawings. Provide exterior doors constructed of steel with steel frames. Design and install exterior door to accommodate future access-control keypads and proximity card readers, which shall be installed by the Toll System Integrator. Provide keyed door locks for interim/back-up security. Provide door construction to suitably protect, and seal, and prevent the ingress of water, moisture, dust, gases and wind driven rain into facility.

Doors, frames and hardware shall be extra heavy duty, full flush as defined in SDI A250.8 and shall have a minimum 2-hour fire rating in accordance with ANSI/UL 10C, "Positive Pressure Fire Tests of Door Assemblies", unless superseded by the North Carolina Fire Code Standards.

Additionally, the doors to the ORT Toll Zone Building shall be unobstructed such that a vehicle or portable lift could access these locations.

**Interior Finishes**

Fully insulate ceiling/roof, exterior walls and any interior partitions. Wall slabs have 2-inch insulation and ceiling shall have 1-inch insulation embedded in the concrete.

Provide exterior walls and ceiling fully finished with moisture resistant, paper-less, high impact gypsum board.

Provide industrial non-slip tile flooring material.

Paint the ORT Toll Zone Building interior with a durable paint material. The interior finish color should be high, bright white semi-gloss.

**Lighting**

Provide interior lighting consisting of T8 industrial fluorescent lighting fixtures with wall mounted occupancy sensor and manual on/off. Provide a minimum 50 foot-candles of illumination at a 30-inch work plane. Provide battery operated backup emergency packs with integral halogen heads at entrance/ exit. Provide lighting point-by-point calculations for interior lighting as part of Architectural Plan submittal.

Provide motion sensor control, with manual on/off switch, exterior lighting to fully illuminate the access to the ORT Toll Zone Building and the maintenance parking area. Provide full cut-off exterior lighting fixtures as defined by IESNA and shall be International Dark-Sky Association (IDA) compliant. Provide lighting point-by-point calculations for exterior lighting as part of Architectural Plan submittal. Exterior lighting shall not illuminate the roadway in such a way that it would distract drivers.

**Electrical**

Provide electrical service to the ORT Toll Zone Buildings.

Mainline ORT Toll Zones:

- Electrical service to the Mainline ORT Toll Zones shall be 120/240V three-phase service.
- Provide an operating voltage of 120/240V at minimum 200 amps.
- Provide electrical power panel in a conventional NEMA 1 surface mount panel board enclosure, which supplies power to the electronic toll and ITS equipment.
- Provide at a minimum a 200 amp Main Breaker with a minimum of 42 circuits.
- Provide at a minimum two (2) two pole breakers coordinated with the Toll System Integrator (typically 50 or 80 amps) and the remaining breakers at 20 amps rated at minimum 18K AIC.

Ramp ORT Toll Zones:

- Electrical service to the Ramp ORT Toll Zones shall be single-phase service.
- Provide an operating voltage of 120/240V at minimum 100 amps.
- Provide electrical power panel in a conventional NEMA 1 surface mount panel board enclosure, which supplies power to the electronic toll equipment.
- Provide at a minimum a 100 amp Main Breaker with a minimum of 24 circuits.
- Provide at a minimum two (2) two-pole breakers coordinated with the Toll System Integrator (typically 50 or 80 amps) and the remaining breakers at 20 amps rated at minimum 18K AIC.

Coordinate with the Toll System Integrator in the design of the electrical loading, ampere capacity rating, circuit poles, etc. for the final power panel design.

Coordinate with the Toll System Integrator to establish electrical power and communication/data service requirements for each toll gantry.

Provide building electrical power to lights, switches, receptacles, HVAC system and other infrastructure items for operating and managing the ORT Toll Zone Building.

Provide the ORT Toll Zone Buildings with 125 volt rated duplex receptacles 10-foot centers at 18 inches above finished floor.

Coordinate with the local utility company(ies), make application(s) in the name of NC Turnpike Authority, and pay all deposit fees to provide necessary electrical and communication services for the ORT Facility(ies). The Design-Build Team shall be responsible for any application and connection fees. The Design Build Team shall be responsible for any utility service installation from the service tap to the ORT Toll Zone Buildings. The Design-Build Team will not be responsible for paying the monthly power bills.

**Grounding**

Provide a grounding system at all new and revised ORT Toll Zone Building electrical service points unless otherwise specified. In addition to NEC requirements, test grounding electrode resistance at connection point to electrical service ground bus for a maximum of 20 ohms. Furnish and install additional ground rods to grounding electrode system as necessary to meet test requirements. Submit a completed Grounding Test Results form. Provide a length of marker tape 12-inches below finished grade directly over grounding electrodes and conductors.

**Lightning Protection**

Design and install Lightning Protection System for the ORT Toll Zone Building and Gantry 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 and L.P.I. system certification upon completion of the Work.

**Standby Generator**

Furnish and install a permanent mounted standby generator for uninterrupted electrical service in the case of electrical service failures. The table below shows sizes of generator anticipated for the ORT Toll Zones. Coordinate with the Toll System Integrator in confirming the size of the standby generators.

**Anticipated Standby Generator to Power ORT Facility**

Mainline Toll Zone - 60 kW
Ramp Toll Zone - 45 kW

Provide standby generator to power each complete ORT Toll Zone to include toll equipment, video tolling cameras and lights, sensors, DMS on gantries, lighting, electrical system, security system, monitoring and HVAC services. Size the propane standby generator to provide 100 percent ORT Toll Zone backup power plus 25% additional capacity for a minimum of 72 hours. Provide standby generator with an automatic transfer switch designed to run after 5 seconds of power outage. Evaluate and include a method for reducing the noise impact caused by the power generators to residences near proposed ORT Toll Zone Building locations. Provide fuel tank with a level sensing device that will interface with future building automation system provided by others. Install a transfer switch to interact and directly communicate with building automation system for critical status indications. Provide Tolls Systems Integrator with Interface Control Documents (ICDs) for generator and transfer switch to facilitate communications. Design propane fuel tank system compliant with all local, State, and Federal requirements and comply with NFPA 54, National Fuel Gas Code.

Provide a generator in an outdoor-rated housing, with generator mounted on concrete pad by ORT building with clearances required by code. Include a muffled exhaust system for the generator.

**Screen Wall**

Design decorative screening/wall to visually shield the motorist from viewing the ORT Toll Zone Buildings, including the maintenance parking area and generator pad. Provide decorative screening/wall around two sides of the ORT Toll Zone Building, as shown in the ORT Project Specific Drawings. When roadways are located on two sides of the ORT Toll Zone Building, provide a decorative screening/wall around three sides of the ORT Toll Zone Building, screening the traffic facing sides and the rear side of the building. Design decorative screening/wall consistent with the aesthetic design of the noise wall and retaining wall designs as shown in the Monroe Aesthetic Design Guidelines. Between the wall and the building, provide a washed stone (or similar) surface to facilitate maintenance on conduit entering the building.

**Drilling, Foundations, and Supports**

Coordinate drilling activities and installation of any foundations or supports with the Toll System Integrator to avoid damage to underground conduit installation.

## UTILITIES COORDINATION SCOPE OF WORK (05-19-2010)

### General

This scope of work only governs those utilities that are not specifically mentioned in the Utility Construction Scope of Work. Should any utilities not described in the Utility Construction Scope of Work be encountered during design or construction of this project, the Design-Build Team shall coordinate the relocation or adjustment of these utilities in accordance with this scope of work.

### Overview

The Design-Build Team shall obtain the services of a Private Engineering Firm (PEF) 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. Coordination shall include any necessary utility agreements when applicable. The NCTA will be responsible for non-betterment utility relocation cost when the utility company has prior right of way / compensable interest. The utility company shall be responsible for the relocation costs if they can not furnish evidence of prior right of way or a compensable interest in their facilities. The Design-Build Team shall be responsible for determining the cost responsibility 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. NCTA will be the approving authority for all utility agreements and approval of plans. The NCTA will provide a preliminary set of Utility by Others plans.

### Preparation for relocating utilities within the existing or proposed highway Right of way

**I.** 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 Right of way*

*(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) NCDENR Public Water Supply - Rules governing public water supply*

*(G) NCDENR Division of Water Quality - Title 15A - Environment and Natural Resources*

**II.** The Design-Build Team shall be responsible for confirming the utility locations, confirming the type of facilities, identifying the utility owners and determining the cost responsibilities in order to coordinate the relocation of any utilities in conflict with the project.

**Arrangements for Protection or Adjustments to Existing Utilities**

**I.** The Design-Build Team shall arrange with the utility owners for required new installations, adjustments, relocations or removals where the Design-Build Team and utility company, with concurrence from the NCDOT, determine that such work is essential for highway safety and performance of the required construction.

The Design-Build Team shall not commence work at locations where the highway construction is adjacent to utility facilities until making arrangements with the utility company 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 his operations. In the event of interruption of any utilities by the project construction, the Design-Build Team shall promptly notify and cooperate with the owner in the prompt restoration of service.

The Design-Build Team shall accommodate utility adjustments, reconstruction, new installation and routine maintenance work by utility owners.

**II.** In the event of 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 shows existing utilities and proposed utility relocations for approval by the NCDOT.

The Design-Build Team shall be required to submit five (5) copies of the Utility Relocation Plans to the NCDOT for review and approval prior to relocation work beginning. If the Design-Build Team determines the cost to be borne by NCTA, the Design-Build Team shall be required to submit five (5) copies of a detailed utility relocation estimate and copies of verification of compensable interest. The Design-Build Team shall also be responsible for submitting the appropriate agreements to be used with the relocation plans (See Agreements under line items V and VI). After the review process is complete, one (1) copy of the Utility Relocation Plans, executed agreements and any necessary comments will be returned to the Design-Build Team. 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 company.

**III.** The cost for non-betterment utility relocation due to the highway construction will be the responsibility of NCTA when the utility company has prior right of way / compensable interest. As stated in the overview, the Design-Build Team shall be responsible for determining cost responsibility / compensable interest. A compensable interest is defined as follows:

(A) Existing or prior easement rights, either by recorded right of way or adverse possession (Utility located outside the existing highway right of way that has been occupying the same location for 20 years).

(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) Entities that have a joint-use agreement that constitutes a compensable interest with entities that have existing or prior easement rights.

The cost in relocating CATV due to the highway construction shall be the responsibility of the CATV Company; however, under the following conditions the NCTA will bear the relocation expense:

(A) If the CATV Company can validate a recorded easement for facilities outside the NCDOT right of way.

(B) The adjustment is needed on existing utility poles to accommodate for a proposed NCDOT Traffic Management System Fiber Optic Communication Cable Project.

The CATV will not be permitted to place poles within the highway right of way but will be allowed 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 proposed CATV relocation places buried facilities within the highway right of way, plans and encroachment agreements shall be required by NCDOT.

**IV.** If the Design-Build Team elects to arrange with a utility company to incorporate a new utility installation or relocation as part of the highway construction, the utility work done by the Design-Build Team and the associated costs for the work shall be negotiated and agreed upon between the Design-Build Team and the utility company.

If the Design-Build Team is requested, in writing, by an entity to relocate, upgrade or incorporate new water and sewer facilities as part of the highway construction, designs shall be coordinated with the Utility Owner and NCDOT. The associated design and construction costs shall be negotiated and agreed upon between the Design-Build Team and the utility company. 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.

If the Design-Build Team elects to make arrangements with a Governmental Agency or any other utility owner for proposed utility construction, in which the Agency / 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 Agency / Utility Owner agree on a plan and a lump sum estimated cost for the utility construction, the Design-Build Team shall be responsible for submitting five (5) sets of 11 x 17 utility construction drawings to the NCDOT for further handling. Each set shall include a title sheet, plan sheets, profiles and special provisions if available. Also, a letter from the Agency / Utility Owner agreeing to the plans and lump sum cost must accompany this package. The NCTA will reimburse the Design-Build Team the estimated lump sum cost under a Supplemental Agreement. The necessary Utility Agreement to the Agency / Utility Owner for reimbursement shall be a two party agreement between the NCTA and the Agency / Utility Owner; and will be developed and executed by the NCDOT.

**V.** The Design-Build Team shall be required to utilize the NCDOT 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 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*.

**VI.** The Utility Relocation Agreements and encroachment agreements are available from the NCDOT. See Pages 59 and 60 of the *NCDOT Utility Manual on Policies & Procedures for Accommodating Utilities on Highway Right of way* for the different types of encroachment agreements available for use.

**Preparation for Communication Cables / Electrical Services for Lighting, Toll Gantries, & ORT Facilities:**

**I.** 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.

**II.** 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 highway controlled access (C/A).

Parallel service installations within C/A shall be buried and located as close to the R/W line as practical. Only due to unusual circumstances will parallel aerial service installations within C/A be allowed. The Design-Build Team shall justify the allowance of parallel aerial service installation and obtain NCDOT approval prior to installation.

**III.** The Design-Build Team shall be responsible for all coordination activities and costs required for the utility company to provide service taps. Prior to the Design-Build Team developing the associated designs and / or instructing the utility company to proceed with providing the service taps, the Design-Build Team shall obtain approval of the service tap locations from the NCDOT.

**Preparation for Adjusting Existing Utilities due to Proposed Traffic Management Systems Fiber Optic Communication Cables:**

**I.** See Signals Scope of Work.

**II.** The Design-Build Team shall be responsible for the coordination activities required for the utility company to adjust or relocate existing facilities to accommodate the proposed ITS Communication Cable. The NCTA shall approve adjustments and relocations of existing facilities prior to the Design-Build Team developing the associated designs. The NCTA

will be responsible for utility adjustment or relocation costs associated with the proposed ITS Communication Cable installation.

**RIGHT-OF-WAY SCOPE OF WORK** (8-10-10)

Due to its impact on the overall financial viability of the project, reducing the amount of right of way and easements needed and the number of parcels impacted by the project is critical. Based upon the Functional Design Map dated March 30, 2010, it is anticipated that approximately 500 parcels will need to be acquired with 47 business relocations and 95 residential relocatees. t The Design-Build Team is expected to design the project to minimize the amount of right of way, temporary easements, permanent drainage easements and permanent utility easements needed for constructing the project, reduce the number of parcels (claims) impacted by the project and reduce the number of residential and/or business relocations. In reducing right of way and easements, the Design-Build team shall consider future project maintenance. The right of way width does not have to be symmetrical or of uniform width throughout the project limits. In addition, control of access along the Y-lines should be evaluated and adjusted, in accordance with the NCDOT Roadway Design Manual, to limit the properties impacted and minimize right of way costs.

From the Station 162+00 -L- to the western project terminus, the NCTA will acquire the right of way and/or easement to the extent shown on the Functional Design Map dated March 2010. Additional right of way or easements needed in the aforementioned region of the project shall be at the Design-Build Team's expense, to include relocations created by extending the right of way or easements beyond that shown on the Functional Design Map dated March 2010, unless the Design-Build Team can prove that no other viable options exist for constructing the project and locating utilities within the limits above. The Design Build Team shall provide in their Technical Proposal, an area data sheet, which is specific to the design, for all parcels that will require acquisition of right of way or easement(s) from Station 162+00 to the western terminus and shall also designate any parcels which will require either business or residential relocation. The area data sheet shall clearly identify any areas outside the right of way shown on the Functional Design Map dated March 2010. Revisions to the right of way and easements detailed in the aforementioned area data sheet provided in the Technical Proposal (Station 162+00 to western project terminus), which result in additional costs and are not directed by the NCDOT or NCTA, shall be the full financial responsibility of the Design-Build Team, to include costs incurred by the NCTA during acquisition, unless the Design-Build Team can prove that no other viable options exist for constructing the project and locating utilities within the limits above.

In addition, the Design-Build Team shall submit with their Technical Proposal, a listing of parcels impacted by the project design and the number of business and/or residential relocations for the remainder of the project, Station 162+00 to the eastern terminus.

Portions of the right-of-way were acquired for the former NCDOT bypass project (R-2559). The previously acquired right-of-way is shown on the preliminary plans for R-3329 / R2559.

**NCTA Responsibility**

The NCTA will acquire all right of way needed to construct this project within the parameters outlined in this provision. As part of the acquisition process, the NCTA will perform appraisals or value findings, appraisal reviews, negotiations, condemnation maps, condemnation, deed

work, asbestos assessment and abatement, and relocation services and all other services required for acquisition of right of way and easements based upon the parcel priority provided by the Design-Build Team. Approximately $75 M of STIP funding is currently available for early right of way acquisition activities prior to financial close and contract award. NCTA is moving forward with acquisition of parcels that are clearly impacted by the project to the extent that the entire parcels will be required regardless of completion of final design. Proposers are encouraged to review this list and provide, at their earliest opportunity, input into these acquisitions.

All right of way acquisition will be performed 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 (49 CFR Part 24 and 23 CFR 710)*, and *Chapter 133 of the General Statutes of North Carolina from Section 133-5 through 133-18*, including the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended.

The NCTA has retained three right of way firms to assist with right of way acquisition and relocation services and has divided the project into segments, as described below, for right of way acquisition purposes. However, the NCTA may adjust these below limits based upon many factors that may arise during right of way acquisition:

PBS&J – Western project terminus to Stinson Hartis Road, to include areas along existing US74

Carolina Land Acquisition – East of Stinson Hartis Road to Rocky River Road

O. R. Colan – East of Rocky River Road to Eastern project terminus

These firms will work directly for and be compensated by the NCTA. The NCTA will prioritize the firm's work based upon the priorities furnished by the Design-Build Team and other needs identified by NCTA.

Prior to contract award, the Design-Build Team shall have no direct contact with the aforementioned right of way firms, in any manner, except as identified herein. After contract award, the NCTA's right of way manager will attend project meetings, update acquisition status and coordinate/adjust NCTA's acquisition activities to the CPM priorities. Weekly status reports will be provided to the Design-Build Team throughout the right of way acquisition process and all right of way files will be maintained within Constructware.

Revisions to property lines within the NCTA provided PRL file shall be performed by a Professional Land Surveyor, licensed in North Carolina. The NCTA will be responsible for any updates to this file, which occurs during the right of way acquisition process.

**Design-Build Team Responsibilities**

For the purpose of prioritizing right of way parcels, the Design-Build Team shall divide the project into the aforementioned segments to coincide with the right of way firms. Within each of the three segments, the Design-Build Team shall provide their parcel priority for right-of-way acquisition and relocations within 14 days after execution of the contract. This parcel priority shall be inserted within the project CPM Schedule as separate activities, which shall include at minimum the durations from right of way plan acceptance, as detailed in Table 1 below. Unless otherwise noted herein, the NCTA will acquire, or otherwise gain right of entry to these parcels in the respective timeframes contained within the table.

| **Table 1** | | |
|---|---|---|
| **Parcel Priority Category** | **Number of Allocated Parcels** | **Calendar Days for Access from Acceptance of Right of Way Plans** |
| A | 40 | 120 |
| B | 50 | 150 |
| C | 50 | 180 |
| D | Remainder of Parcels | 240 |

In addition to the above acquisition or right of entry timeframes, the Design-Build Team shall account for the following time intervals, which run consecutively, within their project CPM Schedule: (e.g. an “A” priority residential parcel, with relocation and asbestos abatement, will require 255 days).

| | |
|---|---|
| Residential Relocation | 90 days |
| Business Relocation | 120 days |
| Asbestos abatement | 45 days |

In the event that unknown archaeological sites or unknown hazardous materials are revealed during the contract, the NCTA may require additional calendar days beyond that shown in the table to gain access to that parcel; however, in such case, the contract time will be extended in accordance with Article 108-10 of the Standard Special Provision entitled Division One.

When the Design-Build Team revises previously submitted right of way plans, the Design-Build Team shall provide the Engineer and the Agent a listing of the plan changes, a listing of the affected parcels and, when right of way and/or easements beyond that previously acquired is required, the priority for acquiring the additional right of way and/or easements. If revisions occur during the right of way acquisition process, which are not directed by NCTA, the aforementioned time intervals will commence from the date of the revised plans. The Design-Build Team shall revise the CPM schedule to reflect the revised acquisition timeline for the parcels affected.

The Design-Build Team shall provide to the NCTA area data sheets based upon the accepted right-of-way plans. The Design-Build Team shall generate deed descriptions, directly from Microstation, and provide these to NCTA for use during right of way acquisition. If the property

lines are revised, the Design-Build Team shall provide revised deed descriptions for properties affected by the revision. The Design-Build Team shall perform the initial right of way staking for the purpose of initial contact with owners, as well as final staking of right of way and placement of rebar, metal caps and carsonite witness posts. The Design-Build Team shall establish, relocate, and/or replace rebar and metal caps as necessary to reflect the accepted right-of-way plans developed by the Design-Build Team. The NCTA will provide the carsonite witness posts and metal caps.

There is a cemetery located left of approximate Station 682+00 Line-L-. The NCTA will be responsible for the right of way activities, including cost, associated with the relocation of this cemetery. If avoidance of the cemetery is not feasible and once this property is acquired, prior to any construction activities within close proximity of the cemetery, the NCTA will fully delineate the cemetery limits by machine-assisted, controlled removal of the topsoil. Details of the aforementioned delineation will be provided to and approved by the North Carolina Cemetery Program at the Office of State Archaeology (OSA) before grave relocation efforts may begin. Once the full extent of the cemetery is established and approved, the procedures for documentation, public notice, disinterment, and reinterment of a marked/known cemetery will be initiated following the guidance of North Carolina cemetery laws. The Design-Build Team shall include 7 months into their CPM schedule, from acquisition (closing) of the property, for the relocation of this cemetery.

Structures or appurtenances shall not remain partially located within an easement or right of way. The Design Build Team shall encompass all structures and appurtenances in temporary construction easements to facilitate their removal during construction.

The Design Build Team shall be responsible for obtaining any special conditions/restrictions associated with utility easements being purchased as part of this project.

The NCTA will be responsible for preparing all maps associated with condemnation. The Design-Build Team shall provide the latest Microstation files such that the condemnation mapping can occur promptly.

**Contract Time**

The calendar days in Table 1 will be considered binding in regard to contract time.

In the event that a parcel is not obtained, or otherwise granted right-of-entry, within the timeframe shown in Table 1, the NCTA will entertain requests for additional contract time. If the Design-Build Team demonstrates, in accordance with Article 108-2 of the Standard Special Provision entitled Division One contained elsewhere in this RFP, to the satisfaction of the NCTA that the delay in right-of-way or easement availability affects their controlling operation, the contract time will be extended one calendar day for each calendar day delay beyond the timeframe shown in the table or otherwise adjusted in the NCTA's final response. In no case shall further contract time extensions be granted due to further indirect delays (such as weather, seasonal construction limitations, or borrow availability) that may result from the delay in parcel availability.

Any change to the priority list after project award that accelerates the Design-Build Team's expectation for a parcel's availability will nullify this consideration for contract time extension for that parcel. Furthermore, any change to the accepted Right-of-Way plans that require second takings or revised limits will nullify this consideration for contract time extension for such parcels.

# CONSTRUCTION ENGINEERING & INSPECTION SCOPE OF WORK (08-10-2010)

This Scope of Work describes and defines requirements for the construction inspection, materials sampling and testing, and Construction Administration required for this project also hereinafter referred to as "Construction Engineering & Inspection" (CEI). The Design-Build Team shall employ a private engineering firm to perform Construction Engineering & Inspection for all work required under this contract. This private engineering firm is to be a separate entity, unaffiliated with the Design-Build Team in any way. Private engineering firms must be prequalified under the NCDOT CEI prequalification procedures prior to bid submission. The term "pay application" as used herein is synonymous with "payment request" elsewhere in the contract documents.

## I. General

The CEI firm shall be responsible for the Construction Administration, which is defined as all activities, duties, or responsibilities required to ensure the project is constructed in accordance with the RFC plans, Contract, Specifications, and procedures set forth herein.

Contract Administration will be performed by the NCTA and will include duties such as submittal tracking and RFI response, development and execution of change orders, public inquiry response, media interaction, payroll, subcontract agreement requests, and utility agreement execution. Quality Assurance (QA), verification and Independent Assurance (IA) testing will be performed by the NCDOT, unless noted otherwise herein.

The CEI firm shall administer the construction in accordance with the latest NCDOT Construction Manual and any other referenced manuals.

The CEI firm shall utilize effective control procedures such that the construction of the project is performed in reasonably close conformity with the Plans, Specifications, and Contract provisions.

The CEI firm shall be responsible for providing qualified technical personnel in appropriate numbers at the proper times such that all Construction Administration responsibilities are effectively carried out. Qualified technicians shall have all certifications necessary to perform the work required under this contract. A table detailing number of project managers, engineers and technicians, per yearly quarter, shall be provided within the Technical Proposal. This table shall establish the minimum staffing level which shall be provided during project construction, unless otherwise approved by the NCTA.

Work shall be performed in accordance with the established NCDOT standard procedures and practices, unless otherwise stated herein. The CEI firm shall be familiar with NCDOT standard procedures and practices as set forth in the latest *NCDOT Construction Manual* and associated manuals and also with informal procedures and practices for Construction Administration used by NCDOT. The private engineering firm shall be familiar with and adhere to all policies and procedures established by the Monroe Parkway Project Management Plan. Failure on the part of

the CEI firm to perform this scope of work as expected will result in suspension of all work on the project until adequate inspection processes are in place.

All documents produced or obtained in the performance of this work shall be either directly entered or uploaded into Constructware per NCTA procedures. Documents should be updated weekly, unless otherwise stated herein. The CEI staff's use of portable computers with wireless internet access for retrieving and documenting project information is a requirement of this contract.

The CEI firm shall be responsible for administering the DBE provisions contained within the RFP to ensure the Design-Build Team is compliant. Documentation shall be provided with the pay application to collaborate the Contractor's payment tracking reports.

## I. Work Standards

The CEI firm shall document any observed omissions, substitutions, defects, and deficiencies noted in the work, advise the Engineer accordingly, and then recommend and direct corrective action necessary, including suspending the work if necessary. The CEI Firm shall develop and submit to the Engineer a non-conformance report for any defects or deficiencies noted in the work. This report shall contain a detailed description of the defect or deficiency, digital photos, original and subsequent testing, recommended corrective action, corrective work performed, follow-up testing to ensure compliance and acceptability, and daily diaries of events associated with the defect or discrepancy.

The CEI firm shall make normal and routine project decisions in a timely manner and consistent with NCDOT policies and procedures with general guidance by the Engineer.

The CEI firm shall perform Quality Control (QC) sampling and testing, that may be used in the acceptance decision, at the frequencies described in the NCDOT Minimum Sampling Guide. Laboratory testing performed by the Design-Build Team shall be performed by a facility that is approved by the NCDOT and is an AASHTO Accredited facility that participates in the AASHTO Materials Reference Laboratory / Cement and Concrete Reference Laboratory (AMRL/CCRL) proficiency testing program for the tests being performed. Technicians performing sampling and testing shall be qualified in accordance with NCDOT training and certification requirements for the specific materials, in accordance with AMRL/CCRL accreditation requirements.

The CEI firm shall supply, calibrate, and maintain the flexure strength test equipment required to perform the AASHTO T97 test in accordance with the Standard Special Provision for Concrete Pavement and Shoulders.

In processing partial payment requests, the CEI firm shall adhere to the requirements identified in the "NCTA Payment Application Procedures for Design-Build Projects". The CEI firm shall make and record such measurements as are necessary to assure that minimum sampling and testing requirements are being met and to calculate and document quantities for payment as required. These quantities shall be categorized to correspond with the Design-Build Team's

CPM activities and pay applications. The CEI firm shall submit the certified statement below (sealed by the project manager), to be included with each pay application, stating that the appropriate amount of sampling and testing has been performed.

> *This is to certify that sufficient materials have been received and that the results of the tests on Acceptance and the QC/QA samples for Pay Application Number ___ indicate that the materials incorporated in the construction work and the construction operations controlled by sampling and testing are in conformity with the approved plans and specifications. Such results compare favorably with the results of the Independent Assurance sampling and testing. Exceptions to the plans and specifications are noted below.*

The CEI firm shall monitor on-site and off-site construction operations and inspect all materials entering into the work such that the quality of workmanship and materials are completed in reasonably close conformity with the plans, specifications, and other contract provisions. The CEI firm shall keep detailed, accurate daily records of construction operations and significant events that affect the work.

The CEI firm shall utilize a computer application, acceptable to the Engineer, that integrates coordinately correct electronic plans (three dimensional models optional) with physical GPS location, construction oversight processes, and asset inventory / quantity management. Such computer application shall be Trimble SCS900 Data Manager or an approved equal. Such application and equipment shall be used in conjunction with GPS machine guidance systems in providing process controls (e.g. verifying clearing and permit limits; checking slope grades and rough grade elevations; measuring earthwork and other quantities). Otherwise, inspection operations will need to be verified using traditional surveying methods detailed in Article 801.

The CEI firm shall be responsible for verifying the Design-Build Team's layout of critical project elements and shall provide the NCTA a comprehensive list of these elements for approval.

The CEI firm shall maintain a complete and accurate record of all activities and events relating to the project and a record of all construction work completed, including quantities of materials used and work accomplished. The CEI firm shall enter this information, on a daily basis, directly into the Daily Reports Module within Constructware. Uploading of the reports into this module will not be acceptable.

The CEI firm shall enter each work item and the estimated quantity as detailed in the Table of Quantities, in the NCDOT Highway Construction and Material Systems (HiCAMS) computer application. The work items and estimated quantities will be revised to reflect updates to the Table of Quantities. The CEI firm shall record the actual quantity of each work item satisfactorily completed into HiCAMS with each pay application. Quantities shall be based on daily records or calculations.

The CEI firm shall establish and set up the Contract Bill of Materials within HiCAMS.

The CEI firm shall maintain records of all sampling and testing accomplished and analyze such records required such that acceptability of materials and completed work items is determined. The CEI firm shall record sampling and testing data along with material receipts, etc. in HiCAMS. These documents shall be retained within Constructware.

The CEI firm shall maintain records in accordance with the procedures outlined in the latest NCDOT Construction Manual for "Weight Tickets as a Basis of Payment" for price adjustments for asphalt binders for plant mix. The CEI firm shall summarize and submit these records for review and approval by the Engineer with each pay application that includes price adjustments for asphalt binders for plant mix.

The CEI firm shall submit a summary of work items and ticket books for each pay application that includes a fuel price adjustment.

The CEI firm shall provide timely interpretations of the plans, specifications, and contract provisions. The CEI firm shall consult with the Engineer when an interpretation involves complex issues or may have an impact on the cost or time to perform the work or is known to be an area of dispute with the Design-Build Team. The CEI firm shall stop the work when necessary to ensure contract compliance.

The CEI firm shall monitor each construction operation to ensure that no construction activities violate the requirements of any permits. The CEI firm shall notify the Design-Build Team immediately of any observed violations or potential violations that require immediate resolution. Permit violations shall be immediately reported to the Engineer.

The CEI firm shall inspect all traffic control devices and other safety related items each working day to ensure that all measures are properly installed and maintained. Traffic Control inspections shall be documented in traffic control review logs or daily diaries. Checks shall be made after significant storms and/or high winds. Traffic control shall match the released for construction plans, appropriate work and/or conditions at all times and shall be monitored and enforced by the CEI firm.

The CEI firm shall perform erosion control inspections on a routine frequency and after every significant rainfall event in accordance with the NCDOT, NPDES Permit. The NPDES erosion report shall be uploaded to Constructware directly upon completion. The CEI firm shall inspect all erosion and sediment control measures at the end of each working day to ensure all measures have been properly installed or reinstalled if the measures were removed to perform the work. Deficiencies shall be provided to the Design-Build Team's Project Manager and the Engineer concurrently. The CEI firm shall maintain an updated set of Erosion Control Plans in accordance with NCDOT policy. Copies of the 401 and 404 permits and the updated Erosion Control Plans shall be retained on site.

The CEI firm shall have a dedicated erosion control Certified Supervisor as defined in the Project Special Provision for Erosion & Sediment Control/Stormwater Certification who is knowledgeable of current North Carolina Sediment and Erosion Control Laws and vegetation establishment and maintenance techniques.

FHWA reserves the right to inspect any and all processes and procedures at any time and municipalities have the right to inspect their work which has been included within the project, such as utilities.

NCDOT reserves the right to inspect any and all sampling and testing processes and procedures at any time.

## III. Certifications:

The CEI firm shall maintain all material certifications in accordance with Article 106-3 of the Standard Special Provision entitled "Division One". These records shall be included with the materials received reports and retained in Constructware. .

The Design-Build Team shall, upon completion of the project, certify that all material certifications have been received and the materials used in the work were found in compliance with the specification requirements. Any exceptions to the plans and specifications shall have been clearly brought to the attention of the Engineer and properly addressed. All documents used in the certification of materials shall be retained for a period of three years after payment is made by FHWA of the final voucher. These records shall be made available for inspection by Materials and Tests Unit personnel upon request.

The final certification of the project shall be in the following format:

> *"This is to certify that the results of the tests on Acceptance and QC/QA samples indicate that the materials incorporated in the construction work and the construction operations controlled by sampling and testing, were in conformity with the approved plans and specifications. Such results compare favorably with the results of the independent assurance sampling and testing. Exceptions to the plans and specifications are noted below:"*

## IV. Miscellaneous Provisions

The CEI firm shall prepare all documentation necessary to meet all certification requirements in the permits.

The contract between the Design-Build Team and the private engineering firm performing the Construction Engineering and Inspection shall in no way preclude the private engineering firm from suspending work on the project if and when necessary.

The control and supervision of all phases of the Scope of Work performed by the CEI firm shall be under the direction of a project manager who is a Professional Engineer, licensed in North Carolina. The CEI firm shall provide a staff of competent, qualified engineers and technicians, adequate in number and experience to perform the described this Scope of Work.

The CEI firm shall maintain all books, documents, papers, accounting records, and other information pertaining to costs incurred on this project and make such materials available for inspection at its offices at all reasonable times during the contract period and for three years from the date of final payment, by any authorized representative of NCDOT, and the Federal Highway Administration. Copies thereof shall be furnished to the NCTA, NCDOT, and Federal Highway Administration if requested.

Employees of the CEI firm or employees of any subconsultant for the CEI firm to provide inspection or lab services for this project shall comply with the NCTA and NCDOT ethics policies. Failure to comply with the ethics policies will result in the employee's removal from the project and may result in the firm being removed from the NCDOT's list of prequalified Engineering Firms for Construction Engineering and Inspection.

The Engineer shall have the right to approve or reject any personnel assigned to a project by the CEI firm.

## V. Compensation

No direct compensation will be made for the work of "Construction Engineering and Inspection". Compensation is included in the lump sum price bid for the entire project. No separate payment will be made for vehicles, office space, inspection or testing equipment, materials, training requirements, surveying equipment, or any other incidentals as may be necessary to accomplish this work. The Design-Build Team shall compensate the CEI firm for services provided by the CEI firm on a lump sum basis. Compensation shall not be made on any type of unit price basis. The CEI firm is not allowed to provide an hourly quote for services to the Design-Build Team. The CEI quote for services to the Design-Build Team must be in the form of a lump sum quote.

## VI. Other

Quality Management System (QMS) for Asphalt Pavements: The Design-Build Team or Asphalt Producer shall perform all quality control sampling and testing for the asphalt mixtures and asphalt pavement density in accordance with Section 609 of the *2006 NCDOT Standard Specifications for Roads and Structures*. The NCDOT and NCTA will perform all quality assurance, verification and independent assurance sampling and testing for the asphalt mixtures and asphalt pavement density necessary for this project in accordance with NCDOT specifications, policies and procedures.

Materials sampling, testing, or approval required for in state or out of state precast concrete, steel manufacturing, high mast light poles, overhead sign assemblies, toll gantries and other fabricating facilities where the NCDOT Materials and Tests Unit routinely performs these functions will continue to be performed by NCDOT.

The CEI firm is responsible for maintaining coordinately correct as-built plans during the construction and delivering both hard copy and electronic final set of coordinately correct as-

built plans to the Engineer upon completion of the project. These as-built plans will be used to review the final acceptance of the project.

The CEI firm shall provide as built drawings per the Utility Construction Scope of Work prior to acceptance of the utility work. In order to accurately reflect municipal reimbursements for utility work, the CEI firm shall provide NCTA final quantities for all water and sewer relocation work, in accordance with pay items located within Division 15 of the NCDOT Standard Specifications for Roadways and Structures. The CEI firm shall certify utility relocation as-constructed plans as required by the municipalities.

The CEI firm shall also prepare the final estimate in accordance with NCDOT policy for submittal to the Engineer at the conclusion of the project.

## VII. Verification of Pay Application

The CEI Firm shall complete a payment certification for each pay application submission to the Engineer. As a component of this payment certification, the CEI firm will certify that all the materials incorporated into the project and proposed for payment, for the payment period, have been tested in accordance with all contract requirements and have met the respective contract requirements. Any materials and/or products not meeting the requirements of the contract will be noted in the pay application and the CEI firm shall propose a price adjustments in accordance with the contract. The CEI firm shall also reference the cost loaded CPM to certify that the pay application amount requested (invoice) is consistent with the work performed for the period covered by the pay application.

# UTILITY CONSTRUCTION SCOPE OF WORK (8-2-10)

## ACRONYMS

| | |
|---|---|
| NCAC | North Carolina Administrative Code |
| NCDENR | North Carolina Department of Environment & Natural Resources |
| NCDWQ | North Carolina Department of Water Quality |
| DEH | Division of Environmental Health |
| PWSS | Public Water Supply Section |
| NSF | National Sanitation Foundation |

## GENERAL

The design and construction of any utilities not specifically mentioned in this Scope of Work shall be handled and paid for in accordance with the Utilities Coordination Scope of Work.

The NCTA is entering into agreements with the utility owners of water and sewer utility facilities described below and the preparation of these agreements is not the responsibility of the Design-Build Team. Upon final design approval, the Design-Build Team shall provide five (5) sets of 11” x 17” plans for each of the utility owner’s facilities to the NCTA for addendum to the NCTA / Utility Owner agreement. Concurrently with this submittal, the Design-Build Team shall submit one (1) set of 11” x 17” plans for each of the utility owner’s facilities to the Transportation Program Management Unit, and one (1) set of 11” x 17” plans to the NCDOT State Utility Agent.

Unless noted otherwise elsewhere in this RFP, the Design-Build Team is not responsible for acquiring public utility easements nor the cost of same.

The utility owners and their facilities in conflict with this project are as follows:

**Union County** - Water Line, Sanitary Gravity Sewer, and Sanitary Force Main Sewer

**City of Monroe** - Water Line, Sanitary Gravity Sewer, and Sanitary Force Main Sewer

**Town of Wingate** - Sanitary Gravity Sewer

**Town of Marshville** - Water Line

**Charlotte - Mecklenburg Utilities** - Water Line

## AS-BUILTS

The Design-Build Team shall develop and provide As-Built Drawings in accordance with NCDOT Microstation guidelines, which are coordinately correct, horizontal and vertical, and tied to the state coordinate system. As-Built Drawings shall be provided for all utility facilities designed and constructed as part of this Scope of Work. In addition, the following As-Built information shall be provided to the NCTA and the municipalities:

**Union County** – Submit one (1) hard copy set on 0.3mm Mylar sheets - size D (24" x 36") - that are dated, signed & sealed, and clearly marked AS-BUILT. Submit three (3) sets on blue-line sheets, size D (24" x 36"). Submit one (1) digital copy of the As-Builts in AutoCAD 2004 or 2007 version.

**City of Monroe** –Submit one (1) hard copy set on 0.3mm Mylar sheets - size D (24" x 36") - that are dated, signed & sealed, and clearly marked AS-BUILT. Submit Engineer's Certification that is dated and signed & sealed along with the Mylar As-Built drawings. Submit one (1) digital copy of the As-Builts in AutoCAD 2004 version, or newer.

**Town of Wingate** - Submit one (1) hard copy set on 0.3mm Mylar sheets - size D (24" x 36") - that are dated, signed & sealed, and clearly marked AS-BUILT. Submit one (1) digital copy of the As-Builts in AutoCAD 2004 version, or newer.

**Town of Marshville** - Submit one (1) hard copy set on 0.3mm Mylar sheets - size D (24" x 36") - that are dated, signed & sealed, and clearly marked AS-BUILT. Submit one (1) digital copy of the As-Builts in AutoCAD 2004 version, or newer.

**Charlotte - Mecklenburg Utilities** - Submit one (1) hard copy set on 0.3mm Mylar sheets - size D (24" x 36") - that are dated, signed & sealed, and clearly marked AS-BUILT. Submit one (1) digital copy of the As-Builts in AutoCAD 2004 version, or newer.

**DESIGN PROCESS**

The Design-Build Team shall design, permit, furnish, install, inspect and coordinate the certification of Water Line, Sanitary Gravity Sewer, and Sanitary Force Main Sewer utility facilities in accordance with the more stringent requirement of the following project documents: Division 15 of the 2006 NCDOT Standard Specifications for Roads and Structures; 2006 NCDOT Roadway Standard Drawings; NCDOT Policy And Procedures For Accommodating Utilities on Highway Rights Of Way; Utility Construction Criteria for the Monroe Connector/ Bypass, dated May 21, 2010; ; Administrative Code Section 15A NCAC 2T – Waste Not Discharged To Surface Waters; NCDENR – "Minimum Design Criteria For The Permitting of Gravity Sewers"; and the appropriate sections of NCDENR-DEH-PWSS – "Rules Governing Public Water Supplies". It shall be the responsibility of the Design-Build Team to identify all conflicts, obtain all municipality and environmental agency approval, and develop final construction documents accordingly.

Relocation and construction of all water and sewer, including but not limited to: valves; fire hydrants; vaults; fire department connections; manholes; meters; and service lines, that are impacted by the Design-Build Team's design and construction shall be the responsibility of the Design-Build Team, regardless of whether or not the conflict is specifically mentioned in this Scope of Work or shown in the Preliminary Routing plans provided. All costs for design, materials, permits and fees, installation, testing and relocation shall be the responsibility of the Design-Build Team and shall be included in their lump sum bid for the project.

The Utility Construction Preliminary Routing Plans dated May 21, 2010, are provided for general information only and are considered PRELIMINARY as the relocation designs are based on Preliminary (30%) Roadway Design Plans, cross sections, and profiles. These Preliminary Routing Plans should NOT be construed as final engineered design plans or as representing all possible conflicts.

The Town of Marshville does not have its own Standard Specifications or Standard Drawings for their utility facilities.

The Design-Build Team shall coordinate all installations, connections and interruption of service with the appropriate utility owner.

The Design-Build Team shall coordinate and obtain approvals of the Utility Construction design and construction with the utility owner, the NCTA and the NCDOT. The Design-Build Team shall submit two (2) full size (22”x34”) copies of the Utility Construction design to the NCDOT Director of Transportation Program Management for review and acceptance. The Design-Build Team shall provide the utility companies the appropriate number of copies for their review and approval. The Design-Build Team shall allow 20 business days for review of each plan submittal, which shall also be reflected in the project CPM Schedule.

The Design-Build Team shall be responsible for making application and permitting both water and sewer utilities with the utility owner and NCDENR to include any application or permitting fees. The Design Build Team shall adhere to all NCDENR requirements and shall be responsible for all NCDENR coordination and approvals associated with the facilities. Upon permit approval of the Utility Construction design plans, the Design-Build Team shall provide each utility owner with two (2) sets of full size (22” x 34”) plans and a copy of the approved permit.

**DESIGN NOTES**

**General**

The existing utility facilities are to remain in place and fully functioning until new or temporary facilities are certified and accepted as complete by the appropriate utility owner. There shall not be interruption of utility service, unless specifically stated for that conflict herein. Maintain service to all fire hydrants until relocated. Immediately repair and re-establish service line damage resulting from construction activities.

All utilities shall be designed to facilitate future maintenance with equipment readily available to the municipality. At locations where utilities are installed under bridges, a minimum clearance of 20 feet shall be maintained or the Design-Build Team shall include a mechanism or measures to facilitate future maintenance, such as encasing the pipe throughout the limits of the overhead obstruction.

Existing facilities to be placed out of service shall be removed or grouted in accordance with Article 1000-7 of the 2006 *NCDOT Standard Specifications for Roadways and Structures*.

The Design-Build Team shall properly removal and disposal of any matter within the utility, in accordance with local, State and Federal requirements.

Removal of asbestos cement pipe shall be in full pipe sections or broken into pieces. Under no circumstances shall the asbestos cement pipe be saw cut or grinded into friable pieces. All broken materials shall be placed in a plastic bag and transported to the Anson County Landfill for proper disposal. Sections of asbestos cement pipe can be abandoned in place where located in non-traffic bearing areas and areas not to be disturbed by construction.

When connecting to asbestos cement pipe, the Contractor shall remove the entire 13 foot joint, from bell to spigot (plain end). The bell on the adjoining asbestos cement pipe shall be removed to create a spigot end, thus making a spigot connection on each end of the pipe removed. Connection to the asbestos cement pipe will be accomplished using a One Bolt HyMax, or similar, coupling, which shall require removal of the inner gasket of the new pipe to match the outside diameter of the asbestos cement pipe.

The Design Plans and As-Built Plans shall depict all Tax Parcel ID Numbers and Property Owners for all surrounding properties.

The Design-Build Teams shall locate and verify the exact location, material, size, and condition of all water and sewer facilities.

Unless noted otherwise, the Design-Build Team shall locate the new utility facilities as far from the roadway as possible while remaining within the NCTA or NCDOT right-of-way. Except for crossings and transitions from existing lines, utility lines shall be beyond a 1V: 1H distance and a minimum of five feet from edge of pavement. The location of new utilities shall allow for access and future maintenance.

Maintain adequate separation between storm sewers, sanitary sewers, duct banks and potable water mains as per utility owner standards.

All materials shall be new, including fire hydrants. Water mains and appurtenances shall be NSF approved.

All fire hydrants removed during construction shall be provided to the appropriate municipality in like condition to that it was found.

Prior to placing any fire hydrants out of service, notify the municipality Fire Department with jurisdiction within such area.

All steel encasement pipes shall be sealed on each end, delineated and be located such that the utility owner may install the future utility pipe at a later date (which may be prior to completion of the project) by means of open cut without hindrances such as pavement, guardrail, utilities, landscaping, drainage structures, signage, lighting, etc.

For all steel encasement pipes installed for future utilities, obtain and use elevations and inverts from the utility owner requesting the betterment.

All pipe joints that require restraint per the Utility Construction Criteria dated May 21, 2010, or the *2006 NCDOT Standard Specifications*, shall be mechanically restrained.

**Union County Requirements**

All utility pipes that cross under the Monroe Bypass shall be placed within a steel encasement pipe.

All water line 12 inches in diameter and larger to be ductile iron Pipe. Water line less than 12 inches in diameter shall be polyvinyl chloride SDR-14 (200 psi) rated pipe.

Union County utilities will require permitting through NCDENR and NCDWQ. This process will entail a satisfactory review by the Union County Public Works Department and a subsequent submission of a permit application to the appropriate regulatory agency.

**City of Monroe Requirements:**

All water and sewer mains crossing under pavement shall be encased per the City of Monroe Standard Specifications and Details Manual.

All sanitary sewer plans shall contain the 100 year flood elevation, stationing and metes and bounds or in lieu of the metes and bounds, the flow angle can be specified at each manhole.

All sanitary sewers that are to be constructed with ductile iron pipe shall be sewer rated with Protecto 401 coating and shall be noted on the plans in both plan and profile.

All lines and sanitary sewers to be abandoned in place under pavement shall be filled with flowable fill and noted as such on the plans.

The City of Monroe will need to know, in advance of final approval of plans, all the utilities that are to be located within a shared easement with the City of Monroe water lines and sanitary sewers. Adequate separation shall be agreed upon in advance and shall be maintained.

All water meters that are to be removed permanently shall be returned to the City of Monroe Operations Center.

Unless otherwise noted, cross side water services shall be 1-inch services

Water service lines shall be Type K soft copper.

All proposed fire hydrants shall be noted on the plans as a “fire hydrant assembly”, which shall include the 8x6 swivel tee, 6-inch gate valve, and fire hydrant.

All proposed sanitary sewer manholes that are to be installed outside of the NCDOT or NCTA right-of-way shall be noted on the plans as "Cross Country Manholes" or "Cross Country Doghouse Manholes" and shall be installed two (2) feet above final grade as per the City of Monroe Standard Specifications and Details Manual.

**UTILITY CONFLICTS & BETTERMENT REQUESTS (BY OWNER)**

The following conflict descriptions coincide with the Preliminary Routing Plans, dated August 11, 2010 and are based upon the Functional Design Map. These conflicts may increase, decrease, be eliminated and/or other conflicts, not identified herein, created based upon the Design-Build Team's plan. The conflict information contained below was established in coordination with the municipalities and shall not supersede the Design-Build Teams responsibility to design, coordinate, permit and construct all water and sewer utilities impacted by the project.

**UTILITY OWNER: UNION COUNTY**
**CONTACT:** Mr. Scott Huneycutt @ 704-296-4211
**E-MAIL:** scotthuneycutt@co.union.nc.us
**ADDRESS:** 500 North Main Street, Suite 500, Monroe, NC 28112-4730

WATER LINE

**Conflict #3 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-2, UC-3, and UC-5.

The utility owner has approximately 3,056 lf of 8-inch polyvinyl chloride water line, 13 water meters, 5 valves, and 5 hydrants inside the existing right-of-way of US-74 West that is within the proposed control of access limits of the Bypass from Station 125+70 Lt. 125 to Station 156+11.37 Lt. 70 -L2-.

The Design-Build Team shall relocate the 8-inch water main to maintain service to the existing businesses

**Conflict #4 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-3.

The utility owner has a 6-inch water service that crosses US-74 to the southwest side to serve the Toyota dealership from Station 136+11.41 Rt. 169 to Station 136+25.40 Lt. 67.32 -L2-.

The Design-Build Team shall reconnect the existing service line to the relocated water line that is noted in Conflict #3.

**Conflict #5 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-3.

The utility owner has a 6-inch polyvinyl chloride water line that runs along the proposed centerline of McKee Road (-Y111-) from Station 137+31.59 Lt. 66.86 to Station 137+34.63 Lt. 150 -L2-.

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The Design-Build Team shall relocate the water line within the proposed right-of-way of McKee Road to avoid the conflict and tie-in to the relocated water line that is noted in Conflict #3.

**Conflict #8 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-4 through UC-6.

The utility owner has approximately 2,637 lf of 12-inch ductile iron high pressure water main, 8 valves, 4 water meters, and 4 hydrants within the existing right-of-way of Stallings Road (-Y113-) Station 11+00 Rt. 14.75 to Station 41+70 Rt. 26.81 -Y113-.

The Design-Build Team shall relocate the 12-inch water line within the proposed right-of-way for Stallings Road and tie-in to the existing system.

**Conflict #9 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-4 and UC-5.

The utility owner has approximately 1,669 lf of 16-inch ductile iron pipe water line located within the existing right-of-way of Stallings Road (-Y113-) and ties into an existing 16-inch asbestos cement water line (Conflict #9A) at US-74, Station 11+00 Rt. 19.25 to Station 25+66.51 Rt. 92.44 -Y113-. This 16" water line is fed by the water tower on Stallings Road, just west of US-74.

The Design-Build Team shall relocate the 16-inch water line within the proposed right-of-way for Stallings Road and tie-in to the existing system The water tower must stay in service at all times and the Design-Build Team shall provide a phasing plan of construction on conducting the new tie-in to the water tower. The design of this phasing plan shall be closely coordinated with the Union County Utility Department.

**Conflict #9A –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-5 and UC-8 through UC-12.

The utility owner has approximately 6,485 lf of 16-inch asbestos cement water line, 18 water meters, 7 hydrants, 3 valves, 1 air release valve, and 1 blow-off valve located within the existing right-of-way of US-74. The existing water line is located within the proposed travel lane and control of access limits for the Bypass (-L2-) and Business US-74 (-Y112- Rt. -Y112-) from Station 156+02 Rt. 53 to Station 171+82 Rt. 47 -L2-, Rt. Station 10+00 Rt. 12 to Station 32+54.5 Rt. 12 -Y112- and Station 10+00 Rt. 46 to Station 32+80 Rt. 50 -Y112-. The Design-Build Team shall relocate the 16-inch water line outside the control of access limits and tie into the existing 16-inch asbestos cement water line at the southeastern limit of the road work just northwest of Indian Trail Road North.

**Conflict #9B** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-5.

The utility owner has approximately 109 lf of 16-inch asbestos cement water line that crosses existing US-74 and ties the 16-inch asbestos cement water line along US-74 to the 12-inch water line along Stallings Road (-Y113-) from Station 25+62.37 Rt. 67.09 to Station 26+82.52 Rt. 54.22 -Y113-.

The Design-Build Team shall relocate the 16-inch water line to tie into the relocated 12-inch low pressure water line on the east side of US-74.

**Conflict #9C** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-5 and UC-6.

The utility owner has approximately 1,500 lf of 12-inch ductile iron low pressure water line that travels northeast along Stallings Road (-Y113-) from Station 26+82.52 Rt. 54.22 to Station 41+65 Rt. 13.64 -Y113-
The Design-Build Team shall relocate the 12-inch water line within the proposed right-of-way of Stallings Road and tie into the relocated 16-inch water line at the southeast corner of US-74.

**Conflict #9D** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-7.

The utility owner has approximately 64 lf of 12-inch ductile iron pipe low pressure water line within the southeast side of the existing Stallings Road right of way that is located at proposed service road (-SR16-) Station 10+06.54 Rt. 28.56 to Station 10+17.35 Lt. 34.01.
The Design-Build Team shall evaluate whether the road work minimizes the cover over the existing pipe and take measures to ensure service is maintained.

**Conflict #10B** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-7.

The utility owner has approximately 84 lf of 4-inch asbestos cement water line within the existing right-of-way of Meadowbrook Drive that crosses the proposed tie-in point from Station 23+10.14 Rt. 46.86 to Station 23+47 Lt. 26.65 -SR16-. There are also 2 water meters within the proposed right-of-way of -SR16-.

The Design-Build Team shall evaluate whether this utility line is in conflict with the proposed road construction. New water meters shall be installed outside the proposed right-of-way and tie back into the existing service lines to the existing residences.

**Conflict #11** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-5 and UC-6.

The utility owner has approximately 1,902 lf of 2-inch polyvinyl chloride water line, 2 valves, and service line within the existing right-of-way of Stallings Road from Station 26+74 Rt. 30.22 to Station 41+75 Rt. 5.64 -Y113- and ties into an existing 16-inch asbestos cement line at US-74 from Station 155+17 Rt. 64.55 to Station 156+11 Lt. 61.74 -L2-.

The Design-Build Team shall remove the existing 2-inch polyvinyl chloride water line and tie the existing 2-inch polyvinyl chloride water line to the proposed relocated 12-inch low pressure water line within the proposed right-of-way of Stallings Road.

**Conflict #11A –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-7.

The utility owner has approximately 50 lf of 2-inch polyvinyl chloride water line within the northwest side of the existing right-of-way of Stallings Road that is located at the proposed service road (SR 16) tie-in.

The Design-Build Team shall evaluate whether the road work minimizes the cover over the existing pipe and take measures to ensure service is maintained.

**Conflict #12 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-5, UC-8, and UC-9.

The utility owner has approximately 3,363 lf of 8-inch asbestos cement water line, 4 water meters, 10 valves, and 2 hydrants within the existing right-of-way of US-74 and Union West Boulevard that are located within the proposed control of access limits of the Bypass (-L2-) from Station 156+10.55 Lt. 58.22 to Station 182+42.18 Lt. 357.57 -L2-.

The Design-Build Team shall relocate the 8-inch water line outside of the control of access limits to maintain a supply feed to the Union West business park.

**Conflict #16 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-8.

The utility owner has approximately 312 lf of 8-inch asbestos cement water line within the existing right-of-way of Forest Park Road that ties into the 8-inch asbestos cement water line on US-74 (noted in Conflict #12). The facilities are located within the proposed control of access limits of the Bypass (-L2-) from Station 169+98.09 Lt. 50.73 to Station 170+02.34 Lt. 362.61 -L2-.

The Design-Build Team shall abandon the 8-inch water line and connect to the relocated 8-inch water line from Conflict # 12.

**Conflict #19 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-13.

The utility owner has approximately 410 lf of 6-inch polyvinyl chloride water line within the right-of-way of Cupped Oak Road (-Y114A-). Station 12+95.65 Rt. 28.13 to Station 16+85.33 Lt. 19.64 -Y114A-.

The Design-Build Team shall relocate the line as an 8-inch water line within the new right-of-way as an extension of the water line relocation from Conflict #12 to maintain a water feed to the Union West business park.

**Conflict #20A** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-14.

The utility owner has approximately 309 lf of 8-inch water line, 4 water meters, and 4 RPZ's within the existing right-of-way of Union West Blvd which is within the proposed control of access limits of the Bypass (-L2-) from Station 198+25.87 Lt. 150.95 to Station 198+87.26 Rt. 150 -L2- and proposed right-of-way of SR2B.

The Design-Build Team shall remove the water meters and RPZ's in conflict and install new facilities for those businesses/properties to remain. The line shall be encased within a 16-inch steel pipe between the fill slope limits of the roadway embankment.

**Conflict #20B** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-15.

The utility owner has approximately 41 lf of 8-inch water line, within the existing right-of-way of Van Buren Avenue which is located at the proposed right-of-way of SR2A tie in.

The Design-Build Team shall evaluate the proposed SR2A (Union West Boulevard) tie-in at Van Buren Avenue to verify there is no conflict with the existing water line.

**Conflict #21** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-16 and UC-17.

The utility owner has approximately 1,575 lf of 12-inch ductile iron pipe water line, 3 valves, 1 hydrant, 1 blow off assembly, 3 water meters, and 2 large Hot Box RPZ's within or adjacent to the existing right-of-way of Stinson-Hartis Road (-Y116-) from Station 10+55 Rt. 27.20 to Station 17+90 Lt. 89 -Y116-. Union County has a water line extension project in the design phase that will tie-in to the existing blow off at the end of the 12-inch line and could be constructed prior to the start of the Monroe Bypass construction.

The Design-Build Team shall relocate the 12-inch water line and shall encase within a 16" steel encasement pipe where crossing the Bypass.

**Conflict #23** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-20 through UC-22.

The utility owner has approximately 3,996 lf of 6-inch asbestos cement water line, 4 hydrants, and 10 water meters within the existing right-of-way of Indian Trail-Fairview Road that is in conflict with the proposed control of access limits of the proposed Bypass from Station 19+30.31 Rt. 14.16 to Station 59+25.00 Rt. 13.08 -Y107-

The Design-Build Team shall relocate the 6-inch water line as an 8-inch water line within the proposed right-of-way of Indian Trail-Fairview Road.

**Conflict #24** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-24.

The utility owner has approximately 99 lf of 2-inch polyvinyl chloride service line and one valve that taps off of the 6-inch water line and crosses Indian Trail-Fairview Road (-Y107-) then runs along the northeast side of Stinson-Hartis Road from Station 52+83.70 Rt. 12.97 to Station 52+77.30 Lt. 77.93 -Y107

The Design-Build Team shall relocate the 2-inch water line as a 12-inch water line across Indian Trail-Fairview Road and then reduce back to a 2-inch water line at the tie-in point on Stinson-Hartis Road.

**Conflict #25** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-23.

The utility owner has approximately 727 lf of 2-inch water line, 2 valves, and 6 water meters within the existing right-of-way of Oakland Avenue that are located in the proposed control of access limits of the Bypass (-L2-) from Station 296+12.38 Rt. 150 to Station 301+46.85 Rt. 90.54 -L2-.

The Design-Build Team shall abandon/remove these facilities and install a blow off assembly at the proposed end of the existing 2-inch water line at proposed termination of Oakland Avenue. One hydrant shall also be installed on the existing water line before the blow off assembly.

**Conflict #26** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-23.

The utility owner has approximately 385 lf of 6-inch polyvinyl chloride water line, 6 water meters, and 1 hydrant within the existing right-of-way of Beverly Drive that are located in the proposed control of access limits of the Bypass (-L2-) from Station 300+97.85 Rt. 150 to Station 303+37.87 Lt. 150 -L2- or the proposed right-of-way widening of Beverly Drive.

The Design-Build Team shall relocate the 6-inch water line to maintain service along Beverly Drive. The relocated 6-inch water line shall cross proposed Bypass within a 12-inch steel encasement pipe.

**Conflict #27** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-24.

The utility owner has approximately 386 lf of 16-inch ductile iron pipe water line, 7 water meters, and 1 hydrant within the existing right-of-way of Secrest Shortcut Road (-Y109-) that are located in the proposed control of access limits of the Bypass (-L21-) from Station 370+59.27 Lt. 150 to Station 372+85.42 Rt. 150 -L21-. The water line, extends out and around the double 42" CMP culvert pipes under the proposed east bound bridge.

The Design-Build Team shall remove the water meters and hydrant in conflict. A new hydrant shall be installed outside the control of access limits of the Bypass and within the right-of-way of Secrest Shortcut Road. Two (2) water meters shall be installed adjacent to proposed -SR4- and connect to the existing service lines to maintain service to the residences.

**Conflict #28** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-25.

The utility owner has approximately 309 lf of 12-inch ductile iron pipe water line and 1 water meters within the existing right-of-way of Faith Church Road (-Y110-) that are located in the proposed control of access limits of the Bypass (-L21-) from Station 384+86.63 Rt. 150 to Station 385+61.83 Lt. 150 -L21-.

The Design-Build Team shall investigate the potential conflict.

**Conflict #29** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-26.

The utility owner has approximately 365 lf of 8-inch polyvinyl chloride water line within the existing right-of-way of Saratoga Boulevard in the Bonterra Subdivision. Station 421+85.41 Rt. 150 to Station 421+86.14 Lt. 215 -L30-
The Design-Build Team shall relocate the 8-inch ductile iron water line install the water line in a 16-inch steel encasement pipe under the proposed roads.

**Conflict #33** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-27 through UC-29.

The utility owner has approximately 2,203 lf of 8-inch polyvinyl chloride water line, 6 water meters, 1 valve, and 1 hydrant within the existing right-of-way of Unionville Indian Trail Road (-Y201-) and Poplin Road that are within the proposed control of access limits Station 23+00 Lt. 21.3 to Station 47+80 Lt. 103.3 -Y201-.

The Design-Build Team shall relocate the 8-inch water line within the proposed right-of-way and outside of the control of access limits The water line shall be placed in a 16-inch steel encasement pipe at all road crossings.

**Conflict #33A** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-31.

The utility owner has approximately 435 lf of 8-inch polyvinyl chloride water line within the existing right-of-way of Poplin Road, Station 33+00 Lt. 44.7 to Station 37+25 Lt. 16.6 SR15.

The Design-Build Team shall coordinate with the Union County Utility Department and develop a phasing plan to remove the existing 8-inch water line and install new 8-inch water line

**Conflict #34** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-27 through UC-30.

The utility owner has approximately 4,325 lf of 16-inch ductile iron pipe water line, 4 valves, 9 water meters and 2 hydrants within the existing right-of-way of Unionville Indian Trail Road (-Y201-) that are within the proposed control of access limits and road of the Bypass interchange from Station 23+00 Rt. 23.8 to Station 71+50 Rt. 12.1 -Y201-.

The Design-Build Team shall relocate the 16-inch water line within the proposed right-of-way and outside of the control of access limits The water line shall be placed in a 24-inch steel encasement pipe at all road crossings. The Design-Build Team shall coordinate with the Union County Utility Department and develop a phasing plan to remove the existing 16-inch water line and install new 16-inch water line.

**Conflict #36** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-28.
The utility owner has approximately 599 lf of 8-inch polyvinyl chloride water line and 3 water meters within the existing right-of-way of Secrest Shortcut Road (-Y202-), Station 12+50 Rt. 15.9 to Station 18+49 Rt. 27.5 -Y202-.

The Design-Build Team shall remove the 8-inch water line and relocate the 8-inch water line adjacent to the proposed right-of-way line of Secrest Shortcut Road and tie-in to the relocated 8-inch water line noted in Conflict #33.

**Conflict #37** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-28.

The utility owner has approximately 67 lf of 8-inch polyvinyl chloride water line and 3 valves within the existing right-of-way of Unionville Indian Trail Road (-Y201-), Station 18+44 Rt. 37.9 to Station 18+95 Rt. 48.7 -Y202-. This short water line serves as a tie between the existing 8-inch water line and the 16-inch water line that run on opposite sides of Unionville Indian Trail Road.

The Design-Build Team shall remove the 8-inch water line and install new 8-inch water line to connect the relocated 8-inch and 16-inch water lines noted in Conflicts #33 and #34, respectively.

**Conflict #37A** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-28.

The utility owner has approximately 339 lf of 12-inch ductile iron pipe water line, 1 hydrant, and 2 valves adjacent to, but outside the existing right-of-way of Secrest Shortcut Road (-Y202-) that is located along the cut slope lines for the widening of this road and inside the proposed right-of-way from Station 18+97 Rt. 45 to Station 22+35 Rt. 46.6 -Y201-.

The Design-Build Team shall connect the 12-inch water line to the relocated 16-inch water line noted in Conflict #34.

**Conflict #38** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-29 and UC-30.

The utility owner has approximately 2,655 lf of 8-inch polyvinyl chloride water line, 12 water meters, 4 valves, and 3 hydrants within the existing right-of-way of Unionville Indian Trail Road (-Y201-) and Poplin Road that are within the proposed control of access limits, Station 45+19 Rt. 84.4 to Station 71+50 Lt. 103.3 -Y201-.

The Design-Build Team shall relocate the 8-inch water line outside of the road limits within the proposed right-of-way and outside of the control of access limits and connect to the relocated 8-inch water line (noted in Conflict #33) at the proposed termination of Poplin Road.

**Conflict #50** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-42 and UC-43.

The utility owner has approximately 2,629 lf of 8-inch polyvinyl chloride water line, 4 valves, 2 hydrants, and 8 water meters within the existing right-of-way of US-601(-Y302-), Ridge Road, and Baucom Deese Road, Station 139+40 Lt. 24 to Station 161+47 Lt. 23 -Y302-.

The Design-Build Team shall relocate the 8-inch water line and install in a 16-inch steel encasement pipe where the water line crosses under pavement. New water meters shall be set at the proposed right-of-way line and cross side services shall be 1-inch and installed in a 2-inch polyvinyl chloride sleeve where under pavement.

**Conflict #50A** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-42.

The utility owner has approximately 282 lf of 8-inch asbestos cement water line, 1 valve, and 2 water meters within the existing right-of-way of Baucom Deese Road and US-601 (-Y302-), Station 140+97.38 Rt. 209.17 to Station 141+49.73 Lt. 29.30 -Y302-.

The Design-Build Team shall relocate the 8-inch and where the 8-inch water line crosses under pavement, it shall be installed in a 16-inch steel encasement pipe. New water meters shall be set at the proposed right-of-way line.

**Conflict #59** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-55 and UC-56.

The utility owner has approximately 470 lf of 6-inch polyvinyl chloride water line, 3 valves, and 1 hydrant within the existing right-of-way of Monroe Ansonville Road (-Y306-) and Bob White Circle which are located within the proposed control of access limits, Station 963+41 Lt. 62 to Station 967+38 Rt. 190 -L36-.

The Design-Build Team shall relocate the 6-inch water line along Monroe Ansonville Road within the existing right-of-way to connect within the existing right-of-way of Bob White Circle.

**Conflict #59A** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-55.

The utility owner has approximately 306 lf of 2-inch polyvinyl chloride water line and 1 valve within the existing right-of-way of Monroe Ansonville Road (-Y306-) and Bob White Circle which are located within the proposed control of access limits, Station 28+58.36 Rt. 12.8 to Station 31+25.58 Rt. 71.8 -Y306-.This service line feeds the Union County - Rays Branch Station 1 Sanitary Pump Station.

The Design-Build Team shall relocate the 2-inch water line along Monroe Ansonville Road within the existing right-of-way to tie-in to the relocated 6-inch water line (noted in Conflict #59).

**Conflict #61** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-57 and UC-58.

The utility owner has approximately 2,385 lf of 16-inch ductile iron pipe water line, 2 valves, 2 water meters, and 3 hydrants within the existing right-of-way of Old Williams Road (-Y307-) that is located within the proposed control of access limits , Station 11+82 Rt. 14 to Station 35+65 Rt. 13 -Y307-.

The Design-Build Team shall relocate the 16-inch water line within the proposed right-of-way of Old Williams Road and placed inside a 24-inch steel encasement pipe where the water line crosses the Bypass. The Design-Build Team shall install line stops with bypass at each tie-in location in order to perform the tie-ins and keep the water line in service at all times.

**Conflict #65** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-63 and UC-64.

The utility owner has approximately 1,980 lf of 8-inch AC water line, 4 water meters, 3 valves, 2 hydrants, and 1 RPZ within the existing right-of-way of Ansonville Road that are located within the proposed control of access , Station 12+34 Lt. 19 to Station 32+14 Lt. 18 -Y309-.

The Design-Build Team shall install a new 8-inch water line adjacent to the proposed control of access line, then cross the Bypass, , and then back inside the proposed right-of-way of Ansonville Road and connect back into the existing water system. The proposed water shall be installed within a 16-inch steel encasement pipe when crossing the Bypass.

**Conflict #65A –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-63 and UC-64.

The utility owner has approximately 51 lf of 8-inch water line that crosses Ansonville Road (-Y309-) and feeds the large precast concrete water vault of the Glencroft subdivision. The water vault houses 1 water meter and 4 RPZ's. The water vault is located outside the existing right-of-way of Ansonville Road, but inside the proposed right-of-way widening from Station 32+13 Lt. 18 to Station 32+13.2 Rt. 32 -Y309-.

The Design-Build Team shall install a new water vault, RPZ's, water meter, and 8-inch water line tie-in to the existing water main.

**Conflict #67 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-65.

The utility owner has approximately 196 lf of 8-inch asbestos cement water line within the existing right-of-way of Phifer Road (Y313) , Station 19+28 Lt. 14 to Station 21+24 Lt. 41 -Y313-.

The Design-Build Team shall relocate the 8-inch water line.

**Conflict #68 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-65.

The utility owner has approximately 44 lf of 8-inch asbestos cement water line within the existing right-of-way of Phiffer Road (-Y313-), Station 19+79.60 Lt. 16 to Station 19+91 Lt. 57 -Y313-.

The Design-Build Team shall relocate the 2-inch water line and connect to the relocated 8-inch water line (Conflict #67) with a 2-inch tap and valve.

**Conflict #69 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-66 through UC-68.

The utility owner has approximately 938 lf of 2-inch polyvinyl chloride waterline and 2 water meters within the existing right-of-way of Phiffer Road (which is to be abandoned) that

is located within the proposed control of access limits, Station 1142+07.89 Rt. 437.59 to Station 1148+34.14 Lt. 270.63 -L40-.

The Design-Build Team shall abandon this portion of the 2-inch water line and relocate the 2-inch water line as an 8-inch water line within the existing right-of-way of Forest Hills School Road and then along the realignment of Phiffer Road (-Y311-) to end the line with a blow off assembly in the same location as the 2-inch water line ends. The relocated 8-inch water line shall be placed within a 16-inch steel encasement pipe where it crosses the Bypass.

**Conflict #69A –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-68.

The utility owner has approximately 244 lf of 2-inch polyvinyl chloride water line, 5 water meters, and 1 blow off assembly within the existing right-of-way of Phiffer Road (-Y311-) from Station 20+11 Rt. 56 to Station 22+57.23 Lt. 3.22 -Y311-.

The Design-Build Team shall abandon the 2-inch water line and connect the western portion of the 2-inch water line to the relocated 8-inch water line (Conflict #69) with a 2-inch tap and valve.

**Conflict #70 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-66.

The utility owner has approximately 137.66 lf of 8-inch asbestos cement water line within the existing right-of-way of Forest Hills School Road, Station 25+21.51 Lt. 58.42 to Station 26+00.99 Rt. 54.29 - Y313-.

The Design-Build Team shall remove this portion of 8-inch water line to a point 5 feet beyond the fill slopes, install new 8-inch water line, and connect to the existing water line to remain. The proposed 8-inch water line shall be placed in a 16-inch steel encasement pipe where it crosses under relocated Phifer Road (-Y313-).

**Conflict #70A –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-69.

The utility owner has approximately 321 lf of 8-inch asbestos cement water line and one valve within the existing right-of-way of US-74 and Forest Hills School Road that are located within the proposed control of access limits, Station 19+10.71 Lt. 71.68 to Station 20+00 -Y315- and Station 10+00 to Station 12+24.28 Lt. 54.29 -Y310-.

The Design-Build Team shall abandon this portion of 8-inch water line, relocate the 8-inch water line and connect the existing water line to the relocated 16-inch water line. The proposed 8-inch water line shall be placed in a 16-inch steel encasement pipe where it crosses under US-74.

**Conflict #70B** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-71.

The utility owner has approximately 134 lf of 8-inch asbestos cement water line within the existing right-of-way of Forest Hills School Road, Station 10+00 Lt. 14.5 to Station 11+15 Lt. 39.4 -Y312-.

The Design-Build Team shall relocate the 8-inch water line and connect to the existing 8-inch water line to remain.

**Conflict #71** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-69 and UC-72 through UC-76.

The utility owner has approximately 6,986 lf of 16-inch asbestos cement water line, 8 hydrants, 3 water meters, and 3 valves in manholes within the existing right-of-way of US-74 east that are located within the proposed control of access limits of the Bypass and under proposed pavement. On Sheet UC-76 there are 2 concrete water vaults outside the existing right-of-way of US-74, but will be inside the proposed right-of-way from Station 11+30 Rt. 43 to Station 1229+33 Rt. 45.8 -Y314R-. One vault is a 3-inch domestic water vault that supplies the US Cold facility on US-74 east, the other vault is a fire vault that supplies both the US Cold facility and the facility across the highway on the US-74 west side. No records were available to locate the fire piping; red line comments from Union County were used to depict the lines. Union County has a 16-inch water line project in construction along US-74 that will tie-in to the existing 16-inch asbestos cement water line in the vicinity of the driveway to the US Cold facility.

The Design-Build Team shall relocate the 16-inch water line outside the right-of-way limits of the US 74 Bypass and connect to the existing water system outside the conflict areas. The Design-Build Team shall install line stops with bypass at each tie-in location in order to perform the tie-ins and keep the water line in service at all times. The Design-Build Team shall evaluate whether the existing private fire line across US-74 (to Pilgrim's Pride) in the vicinity of the signalized intersection of Cuddy Drive is in conflict with the road work.

**Conflict #72** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-69.

The utility owner has approximately 182 lf of 8-inch polyvinyl chloride water line and one valve along Forest Hills School Road (-Y315-) which are within the existing right-of-way of US-74 east that are located within the proposed control of access limits, Station 17+24.14 Lt. 23.15 to Station 18+96.86 Lt. 55.83 -Y315- and will be obsolete by the relocation of the 16-inch water line (Conflict #70).

The Design-Build Team shall abandon this portion of 8-inch water line and connect the existing 8-inch water line that is to remain to the relocated 16-inch water line.

**SANITARY GRAVITY SEWER**

**Conflict #1 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-2 and UC-3.

The utility owner has approximately 1,877 lf of 8-inch polyvinyl chloride sanitary gravity sewer, 9 manholes, and sewer service laterals inside the existing right-of-way of US-74 East that is within the proposed control of access limits of the Bypass (-L2-) from Station 120+00 Rt. 106 to Station 140+39.38 Rt. 103.16 -L2-.

The Design-Build Team shall relocate the sanitary gravity sewer to maintain service to the existing businesses.

**Conflict #2 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-2 and UC-3.

The utility owner has approximately 1,778 lf of 8-inch polyvinyl chloride sanitary gravity sewer, 6 manholes, and sewer service laterals inside the existing right-of-way of US-74 West that is within the proposed control of access limits, Station 125+42.25 Lt. 125 to Station 142+43.69 Lt. 121 -L2-.

The Design-Build Team shall relocate the gravity sewer to maintain service to the existing businesses

**Conflict #6 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-3.

The utility owner has approximately 147 lf of 8-inch ductile iron pipe and polyvinyl chloride gravity sewer main that crosses existing US-74 and is within the proposed control of access limits, Station 140+60.86 Lt. 68.59 to Station 140+41.19 Rt. 77.55 -L2-.

The Design-Build Team shall relocate the gravity sewer main to avoid crossing under the wall sections and utilize 16” steel encasement pipe to install the new line under the pavement

**Conflict #7 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-3 through UC-5.

The utility owner has approximately 2,268 lf of 8-inch polyvinyl chloride sanitary gravity sewer, 11 manholes, and service laterals, Station 140+16 Rt. 144 -L2- to Station 154+94 Lt. 77 -L2- to Station 17+52.25 Lt. 30 -Y113-.

The Design-Build Team shall relocate the gravity sewer main.

**Conflict #7A –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-4.

The utility owner has approximately 274 lf of 8-inch polyvinyl chloride sanitary gravity sewer and 3 manholes within the existing right-of-way of Stallings Road (-Y113-), Station 12+35.52 Lt. 24.62 to Station 14+64.84 Lt. 23.63 -Y113-.

The Design-Build Team shall relocate the 8-inch sanitary gravity sewer within the proposed right-of-way for Stallings Road and to the existing system.

**Conflict #7B –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-5.

The utility owner has approximately 48 lf of 8-inch polyvinyl chloride sanitary gravity sewer within the existing right-of-way of US-74 from Station 147+11.81 Rt. 65.43 to Station 147+14.66 Rt. 114 -L2-, which connects to the sanitary gravity sewer to be relocated as per Conflict #7.

The Design-Build Team shall reconnect the existing 8-inch sanitary gravity sewer to the proposed relocated 8-inch sanitary gravity sewer from Conflict #7.

**Conflict #10 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-7.

The utility owner has approximately 67 lf of 8-inch polyvinyl chloride sanitary gravity sewer that crosses the proposed right-of-way of SR16 Station 10+56.94 Rt. 30.78 to Station 10+60.45 Lt. 35.76 SR16.
The Design-Build Team shall evaluate whether this sanitary gravity sewer is in conflict with the proposed road construction.

**Conflict #10A –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-7.

The utility owner has approximately 110 lf of 4-inch sanitary gravity sewer and one manhole within the existing right-of-way of Meadowbrook Drive that crosses the proposed tie-in point from Station 22+71 Rt. 60.75 to Station 23+11.32 Lt. 39.8 SR16.

The Design-Build Team shall evaluate whether this sanitary gravity sewer is in conflict with the proposed road construction.

**Conflict #13 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-8.

The utility owner has approximately 200 lf of 8-inch polyvinyl chloride sanitary gravity sewer and one manhole within the existing Forest Park Road right-of-way that are located within the proposed control of access limits, Station 170+56.64 Lt. 85.10 to Station 170+49.80 Lt. 285.08 -L2-.

The Design-Build Team shall abandon the 8-inch sanitary gravity sewer and tie-in the existing portion to remain via proposed manhole to the relocated sanitary gravity sewer noted in Conflict #14.

**Conflict #14** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-8 and UC-9.

The utility owner has approximately 3,368 lf of 8-inch polyvinyl chloride sanitary gravity sewer, 8 manholes, and sewer services that are within the existing right-of-way of US-74 and utility easement through the Union West business park. These facilities are within the proposed control of access limits Station 161+25 Rt. 85.28 to Station 181+12.71 Lt. 374.61 -L2-.

The Design-Build Team shall relocate the 8-inch sanitary gravity sewer outside the control of access limits and connect to a point on the same gravity sewer system.

**Conflict #15** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-8 and UC-8A.

The utility owner has approximately 386 lf of 8-inch polyvinyl chloride sanitary gravity sewer, 2 manholes, and one service line within the existing right-of-way of US-74 and a utility easement. The facilities are located within the proposed control of access limits Station 174+44.58 Rt. 58.60 to Station 174+42.98 Rt. 322..38 -L2-.

The Design-Build Team shall relocate the 8-inch sanitary gravity sewer outside the proposed control of access limits, cross US-74 within a 16” encasement pipe and tie into the relocated gravity sewer noted in Conflict #14.

**Conflict #18** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-9 and UC-10.

The utility owner has approximately 2,606 lf of 8-inch sanitary gravity sewer, 5 manholes, and 3 service lines within the existing right-of-way of US-74 West. The facilities are located within the proposed control of access limits Station 27+22.45 Rt. 191.78 to Station 29+80.81 Lt. 205.90 to Station 9+56.96 Rt. 49.90 -Y112LT-.

The Design-Build Team shall relocate the 8-inch sanitary gravity sewer outside the control of access limits connect to a point on the same gravity sewer system.

**Conflict #20** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-14.

The utility owner has approximately 307 lf of 8-inch sanitary gravity sewer, one (1) sanitary service line with a clean out, and one (1) manhole within the existing right-of-way of Union West Blvd which is within the proposed control of access limits Station 198+25.87 Lt. 150.95 to Station 198+87.26 Rt. 150 -L2-.

The Design-Build Team shall relocate sanitary gravity sewer and install within a 16-inch steel encasement pipe between the fill slope limits of the roadway embankment.

**Conflict #22** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-19.

The utility owner has approximately 457 lf of 8-inch polyvinyl chloride sanitary gravity sewer and 2 manholes within an easement that is located within the proposed control of access limits Station 265+11.40 Rt. 265.81 to Station 266+44.07 Lt. 167.27 -L2-.

The Design-Build Team shall relocate the gravity sewer to cross the control of access limits with no manholes residing within the control of access limits

**Conflict #30** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-26.

The utility owner has approximately 374 lf of 15-inch polyvinyl chloride sanitary gravity sewer and 2 manholes within an existing utility easement that are located in the proposed control of access limits, Station 423+25.20 Rt. 150 to Station 423+77.29 Lt. 215 -L30-.

The Design-Build Team shall remove the existing manholes and piping. Then relocate the 15-inch sewer line as a 16-inch ductile iron sanitary gravity sewer and encase the line in a 24-inch steel encasement pipe under the proposed roads. The new manholes shall be installed outside the proposed control of access limits.

**Conflict #31** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-26.

The utility owner has approximately 155 lf of 8-inch polyvinyl chloride sanitary gravity sewer and 1 manhole within an existing utility easement that are located in the proposed control of access limits, Station 421+65.57 Rt. 64.20 to Station 423+20.10 Rt. 62.36 -L30-.

The Design-Build Team shall remove the manhole and piping.

**Conflict #60** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-55.

The utility owner has approximately 430 lf of 15-inch vitrified clay pipe sanitary gravity sewer and 2 manholes within the existing right-of-way of Monroe Ansonville Road (-Y306-) which are located within the proposed control of access limits Station 28+61.44 Rt. 16.59 to Station 32+88.94 Rt. 17.94 -Y306-. Union County has one sanitary manhole at Station 31+15.03 Rt. 21.92 that is located under a proposed bridge span and may have issues servicing the manhole.

The Design-Build Team shall remove the existing manhole and piping and install a new manhole upstream on the 15-inch gravity sewer along Monroe Ansonville Road within the

existing right-of-way at a point outside the bridge limits and install 16-inch ductile iron pipe sanitary gravity sewer back downstream to an existing manhole near the proposed control of access line to the south.

SANITARY FORCE MAIN

**Conflict #17 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-9 and UC-10.

The utility owner has approximately 2,432 lf of 8-inch sanitary force main within the existing right-of-way of US-74 West. The facilities are located within the proposed control of access limits Station 27+09.49 Rt. 194.35 to Station 29+53.43 Lt. 190.05 to Station 9+34.10 Rt. 30.30 -Y112LT-.

The Design-Build Team shall relocate the 8-inch sanitary force main sewer outside the control of access limits and connect to a point on the same sanitary force main system.

**Conflict #32 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-27 through UC-29.

The utility owner has approximately 2,110 lf of 20-inch ductile iron pipe Sanitary Force Main and one Air Release Valve within the existing right-of-way of Unionville Indian Trail Road (-Y201-) and Poplin Road that is within the proposed control of access limits Station 23+00 Lt. 28.4 to Station 47+60 Lt. 106.1 -Y201-. Union County requests calculations on the loss of pumping capacity due to the added number of bends/fittings on the relocated Sanitary Force Main.

The Design-Build Team shall relocate the 20-inch sanitary force main within the proposed right-of-way and outside of the control of access limits and encase in a 30-inch steel encasement pipe at all road crossings. The Design-Build Team shall install line stops with bypass at each tie-in location in order to perform the tie-ins and keep the force main in service at all times.

**Conflict #32A –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-31.

The utility owner has approximately 403 lf of 20-inch ductile iron pipe Sanitary Force Main within the existing right-of-way of Poplin Road Station 33+30 Lt. 46.6 to Station 37+25 Lt. 26.9 -SR15-.

The Design-Build Team shall install line stops with bypass at each tie-in location in order to perform the tie-ins and keep the force main in service at all times.

**Conflict #35 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-27 through UC-29.

The utility owner has approximately 2,298 lf of 16-inch ductile iron pipe Sanitary Force Main and one Air Release Valve within the existing right-of-way of Unionville Indian Trail Road (-Y201-) and Poplin Road that are within the proposed control of access limits Station 22+30 Rt. 28.2 to Station 48+30 Lt. 98.2 -Y201-.

The Design-Build Team shall relocate the 16-inch sanitary force main within the proposed right-of-way and outside of the control of access limits The force main shall be placed in a 24-inch steel encasement pipe at all road crossings. Union County requests calculations on the loss of pumping capacity due to the added number of bends/fittings on the relocated Sanitary Force Main. The Design-Build Team shall install line stops with bypass at each tie-in location in order to perform the tie-ins and keep the force main in service at all times.

**Conflict #35A –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-31.

The utility owner has approximately 563 lf of 16-inch ductile iron pipe Sanitary Force Main within the existing right-of-way of Poplin Road Station 31+49.66 Lt. 57.7 to Station 37+00 Rt. 17.7 SR15.

The Design-Build Team shall relocate the 16-inch Sanitary Force Main along the east side of the proposed right-of-way of Poplin Road. The Design-Build Team shall install two 16-inch Line Stops with bypass in order to keep the force main in service at all times.

**Conflict #60A –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-55.

The utility owner has a proposed 24-inch sanitary force main project nearing final design and will be constructed during summer 2010. The proposed alignment of the force main has been shown on the plans. Approximately 501 lf of 24-inch sanitary force main crosses through the control of access limits of the proposed Monroe Bypass (-L36-) and then continues within a proposed utility easement adjacent to the north side of the existing right-of-way of Monroe Ansonville Road (-Y306-).

No conflict is anticipated with this force main as the design engineer for the utility owner is aware of this project and was given digital files of the preliminary road design to coordinate their force main design. The Design-Build Team shall coordinate with Union County and obtain the As-Built records of the 24-inch sanitary force main to evaluate and verify no conflict exists with the proposed roadway design.

**Conflict #62 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-57 and UC-58.

The utility owner has approximately 2,400 lf of 3-inch polyvinyl chloride sanitary sewer force main and 1 air release valve within the existing right-of-way of Old Williams Road (Y307). This is located within the proposed control of access limits Station 17+45 Rt. 86 to Station 17+90 Lt. 89 -Y307-.

The Design-Build Team shall relocate the 3-inch sanitary sewer force main within the proposed right-of-way of Old Williams Road and outside the control of access limits The 3-inch sanitary sewer force main shall be placed inside an 8-inch steel encasement pipe where the force main crosses the Bypass.

**UTILITY OWNER: CITY OF MONROE**
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**Betterment Request #3 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-38 (Conflict #47).

The City of Monroe is requesting to have a 24-inch steel encasement pipe be installed under the proposed Bypass in the vicinity of Maple Hill Drive to accommodate future sanitary sewer build out of their system. The City of Monroe shall provide elevation grades for the encasement pipe at a later date during design.

**Betterment Request #4 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-47.

The City of Monroe is requesting to have a 30-inch steel encasement pipe be installed under Morgan Mill Road in the vicinity of Cyrus Edwards Road to accommodate future sanitary sewer build out of their system. The City of Monroe shall provide elevation grades for the encasement pipe at a later date during design.

WATER LINE

**Conflict #41 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-33 through UC-36.

The utility owner has approximately 4,488 lf of 8-inch water line, 22 water meters, 12 valves, and 5 hydrants within the existing right-of-way of Rocky River Road (-Y204-) that is located in the proposed control of access limits and under pavement of relocated Rocky River Road Station 17+45 Rt. 86 to Station 17+90 Lt. 89 –Y204-.

The Design-Build Team shall relocate the 8-inch water line adjacent to the proposed control of access limits crossing the Bypass, then continue along the west side of Rocky River Road until crossing Rocky River Road. . The relocated 8-inch water line shall continue along the east side of Rocky River Road, until it ties back into the existing water line on the north side of the creek beyond the limits of the road work. The 8-inch water line shall be installed inside a 16-inch steel encasement pipe where it crosses roadways. The water main relocation will create excessively long water service laterals across Rocky River Road; therefore, all cross side water services shall be 1-inch and installed inside a 2-inch Schedule 80 polyvinyl chloride encasement pipe with glue joints to a point beyond the shoulder/curb. At SR8, an 8-

inch water line will tie into the relocated 8-inch water line, cross under Rocky River Road in a 16-inch steel encasement pipe, and be located inside the proposed right-of-way for SR8 to provide water service to the adjacent properties. The 8-inch line shall reduce to a 2-inch line along SR8 and end with a blow off assembly.

**Conflict #45 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-37.

The utility owner has approximately 815 lf of 2-inch polyvinyl chloride water line and 2 water meters within the existing right-of-way of Poplin Road Station 623+51.80 Lt. 430.45 to Station 627+21 Rt. 242.7 -L30-.

The Design-Build Team shall install a new 2-inch water line in a 6-inch steel encasement pipe parallel to the existing 2-inch polyvinyl chloride water line where it crosses under the Bypass. The water line shall be relocated through the proposed right-of-way of Poplin Road. The relocated 2-inch polyvinyl chloride water line shall be installed in a 6-inch steel encasement sleeve where it crosses under the new pavement of Poplin Road.

**Conflict #46 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-38.

The utility owner has approximately 711 lf of 8” polyvinyl chloride water line within a 20 ft wide Permanent Utility Easement and the existing right-of-way of Maple Hill Drive that is located within the control of access limits Station 695+48 Lt. 150 to Station 701+07.24 Rt. 155 -L31-.

The Design-Build Team shall relocate the 8-inch water line outside of the proposed control of access limits and cross the Bypass inside a 16-inch steel encasement pipe. The relocated water line shall tie-in to the existing water system within the existing right-of-way of Maple Hill Drive.

**Conflict #48 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-39 through UC-42.

The utility owner has approximately 3,714 lf of 8-inch AC water line, 12 water meters, 4 hydrants, and 3 valves within the existing right-of-way of US 601 (-Y302-) Station 103+00 Lt. 26 to Station 139+72 Lt. 33 -Y302-.

The Design-Build Team shall relocate the 8-inch water line within the proposed right-of-way of US-601 and 10 ft behind the proposed shoulder/curb of US-601. Where the relocated 8-inch water line crosses under any proposed pavement it shall be placed within a 16-inch steel encasement pipe to a point beyond the proposed shoulder/curb. Note that there is also a proposed Commercial Development at the southwest corner of US-601 and Ridge Road that has proposed a right-in/right-out between Ridge Road and the entrance ramp to the Bypass that will require the waterline to be installed in a steel encasement pipe.

**Conflict #51** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-44 through UC-46.

The utility owner has approximately 2,830 lf of 8" polyvinyl chloride water line within the existing R/W of Deese Road (-Y303-) from Station 703+00 Rt. 20 to Station 733+48 Rt. 17 -Y303- and a 15 ft wide General Public Utility Easement that appears to have already been relocated once in anticipation of this project.

The Design-Build Team shall relocate (as needed) the 8-inch water line, fire hydrants, and water meters within the proposed right-of-way of Deese Road. The Design-Build Team shall coordinate with the City of Monroe to evaluate the proposed cross section of the Bypass to insure adequate cover is maintained over the existing steel encasement pipe that carries the existing 8-inch water line.

**Conflict #52** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-47 through UC-50.

The utility owner has approximately 4,775 lf of 8" ductile iron water line, 22 water meters, 5 hydrants, and 7 valves within the existing right-of-way of Morgan Mill Road (-Y304-) Station 11+75 Rt. 13 to Station 59+50 Rt. 6 -Y304-.

The Design-Build Team shall relocate the 8-inch water line within the proposed right-of-way limits of Morgan Mill Road and SR11, outside the control of access limits of the Bypass interchange, and outside of the proposed slope stakes along the eastern side of Morgan Mill Road. Where the relocated water line crosses under the proposed pavement through the control of access for the interchange, the 8-inch water line shall be installed in a 16-inch steel encasement pipe. The water main relocation will create excessively long water service laterals across Morgan Mill Road; therefore, all cross side water services shall be 1-inch diameter and installed inside a 2-inch Schedule 80 polyvinyl chloride encasement pipe with glue joints to a point beyond the shoulder/curb.

**Conflict #53** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-47.

The utility owner has approximately 72 lf of 8" polyvinyl chloride water line and 1 valve within the existing right-of-way of Cyrus Edwards Road and Morgan Mill Road (-Y304-) Station 19+55.67 Rt. 7.48 to Station 19+76.87 Rt. 75 -Y304-.

The Design-Build Team shall abandon the water line as needed to a point where the existing water line to remain can be tied-in to the relocated 8-inch water line along Morgan Mill Road (Conflict #52).

**Conflict #55** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-52 and UC-53.

The utility owner has approximately 1,800 lf of 20-inch ductile iron water line and 6 water meters within the existing right-of-way of Monroe Olive Branch Road (-Y305-) Station 27+00 Rt. 25 to Station 45+00 Rt. 30 -Y305-. This 20-inch water line is a Transmission Main to the City of Monroe. No shut downs shall be authorized without written approval from the City of Monroe Water Resources Engineer. Requests for shut downs or tie-ins must be made three (3) weeks in advance. The City of Monroe requires a written plan outlining the construction sequence and methodology for the shut down and tie-in be submitted, then a pre-construction meeting will be held to review the plan. This shall be applicable when a shut down is required and line stops are not utilized.

The Design-Build Team shall relocate the 20-inch water line within the proposed right-of-way limits of Monroe Olive Branch Road beyond the proposed pavement and away from the proposed bridge structures. The relocated water main shall be placed in a 36-inch steel encasement pipe to a point beyond the existing pavement when crossing Helms Pond Road. New water meters shall be installed at the proposed R/W lines where affected properties are to remain.

**Conflict #56 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-52.

The utility owner has approximately 453 lf of 18-inch ductile iron water line and 30-inch steel encasement pipe crossing the proposed control of access limits Station 860+51 Rt. 243 to Station 860+58 Lt. 210 -L36-. According to the City of Monroe, this line was previously relocated in anticipation of this project and the steel encasement pipe should be of sufficient depth such that no conflict exists. No As-built records of the encasement pipe location were provided.

The Design-Build Team shall coordinate with the City of Monroe to evaluate the proposed cross section of the Bypass and the existing location of the steel encasement pipe to insure adequate cover is maintained over the existing 30-inch steel encasement pipe that carries the existing 18-inch water line.

**Conflict #56A –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-52.

The utility owner has approximately 446 lf of 54-inch steel encasement pipe crossing the proposed control of access limits Station 860+59 Rt. 242 to Station 860+67 Lt. 204 -L36-. According to the City of Monroe, this steel encasement pipe was previously installed in anticipation of this project for future build out of their water system and it should be of sufficient depth such that no conflict exists. No As-built records of the encasement pipe location were provided.

The Design-Build Team shall coordinate with the City of Monroe to evaluate the proposed cross section of the Bypass and the existing location of the steel encasement pipe to insure adequate cover is maintained over the existing 30-inch steel encasement pipe.

**Conflict #58** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-54.

The utility owner has approximately 415 lf of 18-inch ductile iron water line within an existing 20 ft wide General Public Utility Easement that crosses the proposed Bypass Station 880+20.84 Lt. 180.45 to Station 880+31.51 Rt. 223.10 -Y36-. This 18-inch water line is a Transmission Main to the City of Monroe. No shut downs shall be authorized without written approval from the City of Monroe Water Resources Engineer. Requests for shut downs or tie-ins must be made three (3) weeks in advance. The City of Monroe requires a written plan outlining the construction sequence and methodology for the shut down and tie-in be submitted, then a pre-construction meeting will be held to review the plan. This shall be applicable when a shut down is required and line stops are not utilized.

The Design-Build Team shall relocate the 18-inch water line adjacent to the existing 18-inch water line. The relocated 18-inch water line shall be installed in a 30-inch steel encasement pipe where it crosses the Bypass and the pavement of Y317.

SANITARY GRAVITY SEWER

**Conflict #39** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-32.

The utility owner has a sanitary sewer manhole within an existing cross country Permanent Utility Easement that is located on the proposed shoulder of the highway within the control of access limits Station 514+83.21 Lt. 150 to Station 516+59.91 Rt. 150 -L30-.

The Design-Build Team shall remove the manhole and remove the connected piping to a point outside the control of access limits. The Design-Build Team shall install: two (2) sanitary manholes outside the control of access limits; 8-inch gravity sewer between the new manholes; and 16-inch steel encasement to span 5 feet beyond the toe of fill slopes of the highway embankment.

**Conflict #39A** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-34.

The utility owner has approximately 23 lf of 8-inch Sanitary Gravity Sewer and 2 manholes within an existing Permanent Utility Easement and the existing right-of-way of Rocky River Road (-Y204-) that is located in the proposed right-of-way limits and one manhole that is 5.68 ft from the proposed shoulder of relocated Rocky River Road from Station 116+33.48 Lt. 32.4 to Station 116+33.63 Lt. 55.2 -Y204-.

The Design-Build Team shall remove the one manhole and abandon the 23 lf of gravity sewer pipe. The manhole to remain shall have the manhole top adjusted to final grade in the fill slope of the road embankment.

**Conflict #42** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-35 and UC-36.

The utility owner has approximately 1,486 lf of 8-inch sanitary gravity sewer within the existing right-of-way of Rocky River Road (-Y204-) that is located in the proposed control of assess limits and under pavement of relocated Rocky River Road from Station 138+88.96 Rt. 104.3 to Station 153+89.46 Lt. 51.27 -Y204-.

The Design-Build Team shall relocate the 8-inch sanitary gravity sewer along the west side of Rocky River Road within the proposed right-of-way. connect to the existing system at the existing manhole at Station 152+27.14 Lt. 44.61 –Y204-. The existing manhole top shall be adjusted to final grade in the fill slope of the road embankment. The sanitary sewer main relocation on Rocky River Road will create excessively long sewer service laterals. One Cross side sewer services shall be encased within a 6-inch Schedule 80 polyvinyl chloride pipe with glue joints.

**Conflict #43** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-36.

The utility owner has approximately 127 lf of 12-inch polyvinyl chloride Sanitary Gravity Sewer that crosses under Rocky River Road (-Y204-) and 2 manholes within the existing right-of-way that are to remain from Station 153+89.46 Lt. 51.27 to Station 154+03 Rt. 74.1 -Y204-. The existing manholes are within the fill slopes of the proposed road embankment.

The Design-Build Team shall adjust the two existing manhole tops to final grade in the fill slope of the road embankment.

**Conflict #47** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-38.

The utility owner has approximately 175 lf of 8-inch polyvinyl chloride sanitary gravity sewer, 135 lf of sewer service lateral, and 2 manholes within an existing 30 ft wide General Public Utility Easement and the existing right-of-way of Maple Hill Drive that are located within the control of access limits Station 699+87 Rt. 150 to Station 700+11 Lt. 83.9 -L31-.

The Design-Build Team shall remove the service connection and 2 manholes, and abandon the gravity sewer pipe. The Design-Build Team shall install a doghouse manhole at a point on the existing gravity sewer that is 15 ft from the proposed control of access line.

**Betterment #6** - Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-38.

The City of Monroe has requested a betterment in the form of a 24-inch steel encasement pipe to be installed adjacent to the water line encasement pipe (Conflict #46) to accommodate future sanitary sewer build out north of the Bypass. The City of Monroe shall provide elevation grades for the encasement pipe at a later date during design.

**Conflict #49** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-40.

The utility owner has approximately 194 lf of 8-inch polyvinyl chloride sanitary gravity sewer and 2 manholes within the existing right-of-way of US-601 (-Y302-) and an existing 30 ft wide General Public Utility Easement that is located within the proposed right-of-way of US-601 and fill slopes of the road embankment from Station 110+47.69 Rt. 80 to Station 112+49.28 Rt. 46.03 -Y302-.

The Design-Build Team shall adjust the 2 manhole tops to final grade within the fill slopes of the road embankment.

**Conflict #54** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-47.

The utility owner has approximately 67 lf of 8" polyvinyl chloride sanitary sewer and one manhole in an existing 30 ft wide utility easement and the existing right-of-way of Morgan Mill Road (-Y304-) that is within the control of access limits Station 21+82 Rt. 29 to Station 22+25 Rt. 79 -Y304-. The manhole is 6.2 ft beyond the proposed shoulder and in the fill slope of the relocated Morgan Mill Road.

The Design-Build Team shall remove the manhole and abandon the associated gravity sewer pipe to a point 15 feet beyond the proposed control of access line and install a new sanitary manhole.

**Conflict #54A** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-51.

The utility owner has approximately 662 lf of 8-inch polyvinyl chloride and 511 lf of 8-inch ductile iron sanitary gravity sewer and 4 manholes within an existing 30 ft wide General Public Utility Easement and the previously purchased right-of-way for this project that is located in the proposed control of access limits of the Morgan Mill Road interchange from Station 837+27.46 Rt. 491.57 to Station 842+26.36 Lt. 317.26 -L36-.

The Design-Build Team shall relocate the 8-inch sanitary gravity sewer adjacent to the proposed control of access line to a point where the gravity sewer can cross the control of access limits with a 425 lf run of pipe and then tie back to the existing gravity system at the first available manhole. The relocated 8-inch sanitary gravity sewer shall be installed in a 16-inch steel encasement pipe where it crosses the Bypass to a point beyond the fill slope of the road embankment and/or beyond the shoulder of any proposed pavement.

SANITARY FORCE MAIN

**Conflict #40** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-33 through UC-36.

The utility owner has approximately 4,250 lf of 6-inch Sanitary Force Main Sewer within the existing right-of-way of Rocky River Road (-Y204-) that is located in the proposed control of access limits of the Bypass interchange and under pavement of relocated Rocky River Road from Station 112+70 Lt. 12.5 to Station 153+92 Rt. 73.6 -Y204-.

The Design-Build Team shall relocate the 6-inch Sanitary Sewer Force Main adjacent to the proposed control of access limits along Rocky River Road, , then continue along the west side of Rocky River Road until crossing Rocky River Road after the control of access limits. The relocated Sanitary Sewer Force Main shall continue along the east side of Rocky River Road until it ties back into the force main on the north side of the creek. The 6-inch Sanitary Sewer Force Main shall be installed inside a 12-inch steel encasement pipe where it crosses the Bypass and Rocky River Road.

**Conflict #44** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-37.

The utility owner has approximately 815 lf of 10-inch polyvinyl chloride sanitary force main within an existing 20 ft wide General Public Utility Easement adjacent to the existing right-of-way of Poplin Road that crosses under the cut section of the proposed realignment of Poplin Road (-Y206-) and the control of access limits of the Bypass.

The Design-Build Team shall install a new 10-inch sanitary force main in an 18-inch steel encasement pipe parallel to the existing 10-inch sanitary force main where it crosses under the Bypass. The force main shall be relocated through the proposed right-of-way of Poplin Road The relocated 10-inch force main shall be installed in an 18-inch steel encasement sleeve where it crosses under the new pavement of Poplin Road.

**Conflict #57** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-52.

The utility owner has approximately 458 lf of 8-inch polyvinyl chloride sanitary force main and 16-inch steel encasement pipe crossing the proposed control of access limits of the Bypass from Station 860+38 Rt. 246 to Station 860+54 Lt. 213 -L36-. According to the City of Monroe, this line was previously relocated in anticipation of this project and the steel encasement pipe should be of sufficient depth such that no conflict exists. No As-built records of the encasement pipe location were provided.

The Design-Build Team shall coordinate with the City of Monroe to evaluate the proposed cross section of the Bypass and the existing location of the steel encasement pipe to insure adequate cover is maintained over the existing 16-inch steel encasement pipe that carries the existing 8-inch sanitary force main.

**UTILITY OWNER: TOWN OF WINGATE**
**CONTACT:** Mr. Dryw Blanchard @ 704-233-4411
**E-MAIL:** admin@wingatenc.com
**ADDRESS:** 3918 Highway 74 East, Wingate, NC 28174
**MAIL:** P.O. Box 367, Wingate, NC 28174

SANITARY GRAVITY SEWER

**Conflict #63 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-59 through UC-61.

The utility owner has approximately 1,227 lf of 10 inch polyvinyl chloride gravity sewer line and five (5) manholes located within the proposed control of access for the Monroe Bypass at the Austin Chaney Road interchange from Station 17+82.55 Lt. 687 to Station 26+67.26 Rt. 268 -Y308-.

The Design-Build Team shall install a new 10 inch polyvinyl chloride Gravity Sewer line adjacent to the proposed control of access line connect into the Town of Wingate sanitary sewer system.

**Conflict #64 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-62.

The utility owner has one (1) sanitary manhole that resides within the proposed control of access for the Monroe Bypass from Station 1055+66.17 Rt. 155 -L36-, adjacent to McIntyre Road in a wetlands area where the Monroe Bypass will bridge over the wetlands. The existing sewer system is within an existing utility easement.

The Design-Build Team shall remove the existing manhole and replace with 12” pipe. The Design-Build Team shall install a new utility manhole along the existing 12” Gravity Sewer system outside of the proposed control of access, meeting design standards for manhole spacing.

**Conflict #66 –** Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-63.

The utility owner has approximately 270 lf of 8-inch polyvinyl chloride gravity sewer that crosses Ansonville Road where two (2) manholes are located within the proposed control of access and fill slopes of Ansonville Road Station 19+41.60 Lt. 112 to Station 21+09.20 Rt. 119 -Y309-.

The Design-Build Team shall install a new 8-inch polyvinyl chloride Gravity Sewer line adjacent to the proposed control of access line then cross under the fill embankment of Ansonville Road and tie back into the existing Town of Wingate gravity sewer system. The proposed gravity sewer shall be installed within a 16-inch steel encasement pipe to a distance 5 feet beyond the limits of the fill slope.

**Conflict #66A** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-64.

The utility owner has approximately 384 lf of 8-inch polyvinyl chloride gravity sewer that crosses the proposed Monroe Bypass from Station 1093+46.25 Rt. 180.45 to Station 1094+77.07 Rt. 180.45 -L36A-.

No action needed unless otherwise impacted by the Design-Build Team's final design or construction methods.

**UTILITY OWNER: TOWN OF MARSHVILLE**
**CONTACT:** Mr. John Munn @ 704-624-2515 x25
**E-MAIL:** marshvilletownhall@windstream.net
**ADDRESS:** 201 West Main Street, Marshville, NC 28103

WATER LINE

**Conflict #73** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-70.

The utility owner has a 6-inch cast iron water line located within the CSX Railroad right-of-way from Station 17+45 Rt. 86 to Station 17+90 Lt. 89 -Y310-. The proposed bridge structure for Forest Hills School Road (-Y310-) may be located on top of the waterline.
The Design-Build Team shall relocate the water line with ductile iron pipe away from the proposed bridge structure and under the proposed fill for the road embankment. The proposed water line shall be installed within a steel encasement pipe to a distance 5 feet beyond the limits of the fill slope.

**UTILITY OWNER: CHARLOTTE - MECKLENBURG UTILITIES**
**CONTACT:** Mr. William Deal @ 704-391-5150
**E-MAIL:** wmdeal@charlottenc.gov
**ADDRESS:** 5100 Brookshire Blvd., Charlotte, NC 28216

WATER LINE

**Conflict #74** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-2A.

The utility owner has approximately 414 lf of 6-inch ductile iron water line and one valve located within the existing NCDOT right-of-way from Station 105+72 Lt. 110 to Station 106+05 Rt. 296 -L2- that crosses US-74 and the I-485 exit ramp. The waterline provides service to the NCDOT facilities located within the interchange.
No action needed unless otherwise impacted by the Design-Build Team's final design or construction methods.

**Conflict #75** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheets UC-2A and UC-2.

The utility owner has approximately 2,364 lf of 16-inch ductile iron water line, 2 valves, 2 air release valves in manholes, 5 water meters, and 1 blow off assembly located within the existing NCDOT right-of-way from Station 104+50 Rt. 292 to Station 127+77 Rt. 102 -L2- located parallel to the right-of-way line along the I-485 exit ramp and US-74 east.

The Design-Build Team shall install the 16" waterline adjacent to the control of access line The existing 16" waterline on CPCC Lane shall be connected to the relocated 16" water line. New water meters shall be installed at the proposed control of access line where affected properties are to remain. New RPZ devices shall be installed on water service lines as needed per existing conditions and connected to the new water meters and the existing customer service lines.

**Conflict #76** – Refer to the Utility Construction Preliminary Routing Plans R-3329 & R-2559, Sheet UC-2.

The utility owner has approximately 227 lf of 12-inch ductile iron water line and one valve that crosses US-74 within the proposed control of access from Station 125+06 Rt. 102 to Station 125+06 Lt. 125 -L2-. The waterline is connected to the 16" waterline on the southwest side of US-74 and travels along the northwest side of Independence Commerce Drive.

No action needed unless otherwise impacted by the Design-Build Team's final design or construction methods.

# AESTHETIC DESIGN SCOPE OF WORK (08-02-2010)

## General

The aesthetic design and construction of the project shall include aesthetic treatments to roadway, bridge and other elements in a cost and maintenance conscious manner.

The Aesthetic Design Guide, ("Guide") dated July 2010, portrays the general theme for the Monroe Parkway. An architectural review committee of community representatives was consulted to assure that the theme is appropriate for the context in which the Monroe Parkway will be located. The style and detailing of the aesthetic theme was inspired by the Regional Architecture found in the surrounding towns of Stallings, Monroe and Wingate University. Special hardscape applications have been designed for all features for the Monroe Parkway. The purpose of the design of these features is to lend a look and feel to the roadway corridor that is reminiscent of the Region's architectural context. The Guide graphically depicts the appearance of the design. The means and methods of construction is not a part of the Guide. Furthermore, references to proprietary products in the Guide are used to establish a standard and not to require their use. Products that meet or exceed the standards of any proprietary product referenced in the Guide may be used as approved by the Engineer.

The Design-Build Team shall utilize the Guide provided to develop the designs, plans and details necessary for aesthetic treatments of the bridges, roadway, and other elements as outlined herein. The Guide contains guidelines only; however, they shall serve as the basis for retaining aesthetic treatment uniformity throughout the Monroe Parkway. The Design-Build Team shall adapt the aesthetic treatments, materials, or construction techniques while preserving the general theme portrayed in the Guide. The structural member dimensions included in the Guide have not been engineered and shall be modified to suit the design. Dimensions for details such as grooves and indentations may be modified slightly but not to an extent that lessens their visual effect on the travelling public. The Design-Build Team is encouraged to consider aspect ratios in the modification of any dimension shown in the Guide.

The Design-Build Team is cautioned that the Guide does not contain engineered drawings. It is the responsibility of the Design-Build Team to ensure that the aesthetic details incorporated into the plans meet the requirements of the Contract Documents.

Consistent application of the design motif throughout all of the tolling areas, bridge abutments and bents, overhead sign structures, ITS components and other roadway elements is essential to the success of the design. The NCTA priorities for aesthetics in order from top priority to lowest priority are as follows:

1) Aesthetic treatment to the elevated section adjacent to existing US 74
2) Aesthetic treatment to bridges
3) Aesthetic treatment to toll gantries, retaining walls, and sound walls
4) Aesthetic treatment to overhead signs, DMS signs, and ITS devices
5) Remaining mandatory aesthetic treatments
6) Voluntary aesthetic treatments

The Design-Build team should design for approximately two percent of the total construction cost allocated to the Aesthetic Treatments. The Design-Build Team's aesthetic concepts shall be reviewed and approved by the NCTA prior to the submission of the Technical and Price Proposals.

Stained concrete services shall also contain an anti-graffiti coating.

**Bridge Aesthetics**

Bridges shall have the Regional Architecture theme applied to locations visible to motorist and in accordance with the Bridge Elements Table in the Guide. The theme is comprised of brick and stone textures as indicated in the Guide. Bridge walls shall have base courses of a stone texture with the upper walls showing a brick texture. Copings shall also have a stone texture to match the base. If median piers exist, the base of the external piers shall have a stone textured base and coping as well as brick textures on the piers. The base of piers located in the median of the Monroe Parkway shall be designed to be compatible with the double-faced concrete barrier rail that will be required when future lanes are constructed. No aesthetic treatment is required for portions of the bridges concealed by barrier rail. Bridges are classified as Major, Minor or Intermediate based upon preliminary designs and alignments. Major bridges showcase a feature Decorative Pilaster. The pilaster design is reminiscent of a clock tower and features a stone texture base and cap with cast stone details and regional icons that will be selected by the adjacent local municipality. Another feature of a Major Bridge is a traditional arched span. The arched span may be structural, faux, or other approved designs. The arch features cast stone keystones and brick header and running bond courses. Where dual bridges are constructed, decorative pilasters and the arched spans are only required on the exterior of dual bridge(s) facing oncoming traffic.

The appearance/mass of the final design of the bridge and pilaster feature shall remain in scale with the size of the bridge.

Bridge barrier rails shall meet all applicable AASHTO standards and NCHRP 350 testing requirements. Metal rail on parapets will be permissible to meet pedestrian and bicycle height requirements. If metal rail is utilized, it shall be treated to blend with the regional architectural theme. Pedestrian fencing shall be required on some bridges.

**Tolling Gantry**

The gantry structures shall have round uprights attaching to a concrete bases that are compatible with or incorporates the double-faced median concrete barrier rail that will be required when future lanes are constructed. The outside gantry bases will be compatible in appearance to the bases located in the median. The uprights will have a decorative cap on top and a decorative cover over all mounting bolts, which is easily removed and reinstalled for inspection purposes.

**Tolling Gantry Truss System**

The truss system shall be designed so all toll collection equipment is screened from view by oncoming traffic. The screening shall be comprised of a perforated metal panel product (zinc, aluminum, steel or other) that is modular in nature. The back side of each gantry will not have the screening product. The applied aesthetics shall not interfere with operation or maintenance of the toll collection equipment.

**Toll Equipment Building**

The exterior of the building shall have a design that is complementary to the Regional Architecture theme. The features of the building shall have the appearance of brick walls, cut stone bases, copings and water tables and appropriate roofing design and materials. The building design shall include a screen wall to enclose the area indicated for the generator, A/C, fuel tank, electrical panels, etc.

The Design-Build Team has the option to construct a screen wall that completely conceals the toll equipment building form the traffic. The design of this screen wall option shall match the design of the sound walls. The designer shall propose a wall height and location that does not interfere with installation and maintenance of tolling equipment, that is complementary to the design of the gantries, that is not visually obtrusive in scale and that accommodates future landscape development.

Where tolling equipment (electrical panels, data collection enclosures, etc) is not housed in a building, it shall be placed to minimize visual impact and so it can be screened from view with future landscaping.

**Sound and Retaining Walls**

Sound walls shall be detailed and constructed to provide for an attractive and fluid elevation along the top of the wall. Sound and retaining walls shall have an appearance of a traditional brick wall with running bond and header courses. The layout of the colors and coursing shall be as indicated in the Guide. The backside of the walls shall be a broom finish texture with approved concrete stain. The surfaces of walls with aesthetic treatment shall have anti-graffiti coating applied. The sound walls shall have a periodic pilaster on the roadway side of the sound wall and at the terminus of each sound wall section. The pilaster will have a stone textured base and cap with stone textured coping as indicated in the Guide. At locations where single face concrete barrier rail is placed in front of the wall, the aesthetic treatment shall accommodate the barrier rail.

**Signs**

Overhead and cantilever signs shall have round uprights attaching to bases that are compatible with or incorporates the double-faced median concrete barrier rail that will be required when future lanes are constructed. The outside gantry bases will be compatible in appearance to the

bases located in the median. The uprights will have a decorative cap on top and a decorative cover over all mounting bolts, which is easily removed and reinstalled for inspection purposes.

**Submittal of Aesthetics Details Package (Pre-Bid)**

The Proposer shall submit a package (five copies) that conveys their approach to aesthetics and satisfies the requirements herein. The Proposer is cautioned that the aesthetics details for at least all Mandatory Aesthetic Treatments identified herein must be pre-approved in writing by the NCTA within the timeline specified in the Procurement Timeline or the Technical Proposal may be deemed non-responsive. The Proposer must also include, at a minimum, the pre-approved aesthetics details package in the Technical Proposal.

The Proposer shall also address the attributes of their approach to aesthetics in their Oral Presentation with the Technical Review Committee.

**Preliminary Design**

After contract award, the Design-Build Team shall clearly present, with appropriate visual aids, the design intent, their aesthetic theme, general plan, and preliminary details for each design element. The Design-Build Team shall allow 30 days for review of the aesthetic details.

**Final Design**

The Design-Build Team shall include the accepted aesthetics details with the appropriate submittal of preliminary and final designs plans for each element (bridge, roadway, sign structure, gantry, etc.).

The Design-Build Team shall develop and submit for review any specifications, material requirements or construction processes needed to accomplish the aesthetic work along with the final design submittal for each element.

**Mandatory Aesthetic Treatments**

The Design-Build Team shall include the following aesthetic treatments, as a minimum, in their plans and their lump sum price bid for the entire project.

- Bridge abutments, arches and side retaining walls shall have a stone and brick appearance produced by using form liners and concrete stains, and shall have decorative pilasters, emblems, and coping. Incorporate decorative pilasters at locations where pylons are required by the Guide.
- All bridge barrier rails shall contain grooves/indentations and concrete staining to enhance the regional architectural theme. Aesthetic treatments are not required for stream crossing, greenway and railroad structures that cannot be seen by motorist.
- Decorative interior bents and columns to match bridge abutment pilaster details
- Decorative toll gantries, to include uprights and horizontal truss assembly.
- Decorative bases and uprights for overhead and pedestal sign structures

- Brick appearance using form liners and concrete stain on the roadway face of sound walls. Decorative pilasters and caps.
- Unless otherwise noted, brick textures shall be created using form liners and concrete stain on retaining walls and decorative pilasters
- Decorative toll system utility buildings or screening to visually shield the motorist from such toll equipment consistent with the sound wall aesthetics.

**Voluntary Aesthetic Treatments**

The Design-Build Team may elect to include other Voluntary Aesthetic Treatments in their Technical Proposal and/or design, such as the following, that will increase the quality of the visual appearance.

- Brick façade (embedded brick, brick veneer, or full brick) on bridge arches, abutments and piers
- Brick façade (embedded brick, brick veneer, or full brick) on sound walls
- Brick façade (embedded brick, brick veneer, or full brick) on retaining walls
- Ornamental lighting across bridges
- Embossed Street Identification on Bridge Abutments at minor roads
- Identity logos on sound walls
- Arch on bottom side of interior bent caps
- Bridge end column treatments
- Metallization or powder coating of sign supports
- Other such features included in the Guide but not specifically mentioned as Mandatory Aesthetic Treatments

**Materials, Construction, and Fabrication**

The Design-Build Team shall demonstrate the long-term durability of any color application (staining, anodizing, painting, etc.) on any feature proposed. Provide a minimum of three test panels, produced in different batches, of each product to demonstrate the consistency of color.

Proposers shall demonstrate in their aesthetic details package how joints will be eliminated or otherwise masked from affecting the overall appearance and continuity of the walls, piers, pylons and arches.

Three full size mockup panels will be required for each type of colored concrete/brick/stone element on the project. At their own risk, the Design-Build Team may elect to use production elements as the test panels.

Concrete girders are preferred. In the event that steel girders are used, the steel shall be AASHTO M270 Grade 50 and painted in accordance with Article 442-7 of the 2006 NCDOT Standard Specifications. The paint system shall be System 1. All steel girders shall be painted the same color as that specified for the concrete girders in the Guide. Weathering steel girders

are also allowed provided that details accompany the bridge design that will prevent staining of bridge features.

Precast members may be used for structural supports or to hide structural members. Hollow sections may be used if the Design-Build Team can demonstrate to the Engineer's satisfaction that adequate access for maintenance and inspection is also provided.

## PUBLIC INFORMATION SCOPE OF WORK

The Design-Build Team will take the lead role and be responsible for the public information efforts through the Engineer's designee. The Design-Build Team shall employ a person experienced in development and distribution of public information to lead the public information efforts. The lead person shall be identified in the Technical Proposal and shall be approved by the Engineer. The Design-Build Team's responsibilities will include:

- Organizing public meetings, with assistance from the NCTA to secure a facility
- Providing media announcements
- Developing and producing informational print materials
- Develop and maintain a website
- Providing details surrounding the project impacts to the public
- Providing advance notice to the Engineer and the NCDOT Division Engineer in Albemarle of upcoming project impacts
- Attending and/or speaking at public meetings
- Facilitate Pubic Information/Operations Meetings that will be held monthly during construction

The Engineer shall approve the public information materials created by the Design-Build Team for distribution. The NCTA will be responsible for mailing public informational material to the identified target audiences and will also be responsible for any postage necessary for these mailings.

The Design-Build Team shall coordinate with the Engineer to promote public awareness for this project. Prior to beginning construction, the Design-Build Team shall develop a comprehensive Public Information Plan for the project. This plan shall detail target audiences, project impacts and proposed efforts to notify the public about the impacts. The plan shall outline expected major project impacts and methods to ensure adequate public awareness of these impacts.

As part of this Public Information Plan, the Design-Build Team will develop 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
- Chambers of Commerce
- Individual schools affected by the project
- County/City school systems
- Other organization as deemed necessary by the Engineer

Additionally, the Public Information Plan will include:

- The proposed method of providing appropriate advanced notice to the Engineer

- The scope and organization of the proposed web site
- Recommended strategies for ensuring a proactive approach to public awareness
- Recommended strategies for ensuring coordination between any construction and/or public awareness efforts on the other projects
- Crisis Communication Plan to detail mechanisms for responding to any major incident that could adversely impact stakeholders or the project

The Design-Build Team shall hold an initial project coordination meeting with the Engineer one month prior to start of construction to discuss project impacts to the public and the Public Information Plan.

The Design-Build Team shall inform the Engineer at least three (3) weeks in advance of any construction activity that will have significant impact on the public, including the start of construction, major traffic shifts, road closures, ramp closures, detours, night work and project completion. In the event that the Design-Build Team informs the Engineer of a construction activity that significantly impacts the public less than three weeks in advance, the Design-Build Team shall hand deliver informational materials to the target audiences.

The amount of public involvement required for this project is directly related to the Design-Build Team's Traffic Control Plan and construction details. As a minimum, the Design-Build Team shall be responsible for the following involvement:

- Public Meetings – Organizing "beginning of construction" meeting(s) which shall be held for area businesses and residents.
- Distribution of Informational Materials - For the "beginning of construction" meetings and for all major traffic impacts and/or road/ramp closures with detour routes, the Design-Build Team shall be responsible for delivering time sensitive informational material directly to portions of the target audience.

The Design-Build Team shall prepare monthly reports that outline the public involvement activities conducted during the month, issues, problems and complaints addressed and the resolution or status. The report will reveal the Design-Build Team's responsiveness in notifying the public of closures and other impacts, amount, type and outcome of public events and media coverage and a report on response to concerns and complaints received.

The Design-Build Team shall include in their Lump Sum Bid price for the project, all costs associated with their involvement in Public Information scope of work except as noted herein.

The Design-Build Team shall develop a unique web site specifically for dissemination of public information about the Monroe Parkway. The website should identify the Design-Build Team but should not contain promotional information. Information presented on the website will be subject to approval of the Engineer. The Design-Build Team web site will be linked from the NCTA web site.

Separate contracts for installation of ITS components, integration of toll technology, and landscaping will be on going during construction of this project. Marketing efforts for the sale of transponders will also begin shortly after the construction of this project begins. The Design-Build Team shall coordinate the public information efforts with other contractors on the project.

**STANDARD SPECIAL PROVISIONS**

**LIABILITY INSURANCE**

(11-18-08) DB1 G80

**Page 1-68, Article 107-16 is amended to include the following as the first, second, third and fourth paragraphs:**

The Design-Build Team shall be liable for any losses resulting from a breach of the terms of this contract. The Design-Build Team shall be liable for any losses due to the negligence or willful misconduct of its agents, assigns and employees including any sub-contractors which causes damage to others for which the Department is found liable under the Torts Claims Act, or in the General Courts of Justice, provided the Department provides prompt notice to the Design-Build Team and that the Design-Build Team has an opportunity to defend against such claims. The Design-Build Team shall not be responsible for punitive damages.

The Design-Build Team shall at its sole cost and expense obtain and furnish to the Department an original standard ACORD form certificate of insurance evidencing commercial general liability with a limit for bodily injury and property damage in the amount of $5,000,000.00 per occurrence and general aggregate, covering the Design-Build Team from claims or damages for bodily injury, personal injury, or for property damages which may arise from operating under the contract by the employees and agents of the Design-Build Team. The required limit of insurance may be obtained by a single general liability policy or the combination of a general liability and excess liability or umbrella policy. The State of North Carolina shall be named as an additional insured on this commercial general liability policy. The policy may contain the following language as relates to the State as an additional insured: "This insurance with respect to the additional insured applies only to the extent that the additional insured is held liable for your or your agent's acts or omissions arising out of and in the course of operations performed for the additional insured."

The Design-Build Team shall maintain all legally required insurance coverage, including without limitation, worker's compensation and vehicle liability, in the amounts required by law. Providing and maintaining adequate insurance coverage is a material obligation of the Design-Build Team and is of the essence of this contract. All such insurance shall meet all laws of the State of North Carolina. Such insurance coverage shall be obtained from companies that are authorized to provide such coverage and that are authorized by the Commissioner of Insurance to do business in North Carolina. The Design-Build Team shall at all times comply with the terms of such insurance policies.

Upon execution of the contract, provide evidence of the above insurance requirements to the Engineer.

## PLANT AND PEST QUARANTINES
**(Imported Fire Ant, Gypsy Moth, Witchweed, And Other Noxious Weeds)**
(3-18-03) 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, 919-733-6932, or **http://www.ncagr.com/plantind/** 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 or other noxious weeds.

## CONTRACTOR CLAIM SUBMITTAL FORM
(9-16-08) DB1 G140

If the Design-Build Team elects to file a written claim or requests an extension of contract time, it shall be submitted on the *Contractor Claim Submittal Form (CCSF)* available through the Construction Unit or

http://ncdot.org/doh/operations/dp_chief_eng/constructionunit/formsmanuals/.

**GIFTS FROM VENDORS AND CONTRACTORS:**
(12-15-09) DB1 G152

By Executive Order 24, issued by Governor Perdue, and *N.C. G.S.§ 133-32*, it is unlawful for any vendor or contractor (i.e. architect, bidder, contractor, construction manager, design professional, engineer, landlord, offeror, seller, subcontractor, supplier, or vendor), to make gifts or to give favors to any State employee of the Governor's Cabinet Agencies (i.e. Administration, Commerce, Correction, Crime Control and Public Safety, Cultural Resources, Environment and Natural Resources, Health and Human Services, Juvenile Justice and Delinquency Prevention, Revenue, Transportation, and the Office of the Governor). This prohibition covers those vendors and contractors who:

(1) have a contract with a governmental agency; or
(2) have performed under such a contract within the past year; or
(3) anticipate bidding on such a contract in the future.

For additional information regarding the specific requirements and exemptions, vendors and contractors are encouraged to review Executive Order 24 and *G.S. § 133-32*.

Executive Order 24 also encouraged and invited other State Agencies to implement the requirements and prohibitions of the Executive Order to their agencies. Vendors and contractors should contact other State Agencies to determine if those agencies have adopted Executive Order 24.

**EMBANKMENTS**
(5-16-06) (Rev 7-21-09) DB2 R018

Revise the 2006 *Standard Specifications for Roads and Structures* as follows:

**Page 2-22, Article 235-3 Materials**, add the following as the second sentence of the second paragraph:

> Aerate and dry material containing moisture content in excess of what is required to achieve embankment stability and specified density.

**Page 2-22, Subarticle 235-4(B) Embankment Formation**, add the following:

> (16) Do not place rock or broken pavement in embankment areas where piles or drilled shaft foundations are to be constructed. This shall include but not be limited to piles and foundations for structures, metal signal poles, overhead sign structures, and high mount lighting.

## AGGREGATE SUBGRADE:

(09-18-07) (Rev 03-16-10) DB2 R35

### Description

Construct aggregate subgrades in accordance with the contract or as directed by the Engineer. Undercut as needed in cut areas. Install fabric for soil stabilization and place Class IV Subgrade Stabilization at locations shown on the plans.

### Materials

Refer to Division 10 of the 2006 *Standard Specifications for Roads and Structures.*

| Item | Section |
|---|---|
| Select Material, Class IV | 1016 |
| Fabric for Soil Stabilization, Type 4 | 1056 |

Use Class IV Select Material for Class IV Subgrade Stabilization. If Class IV Subgrade Stabilization does not meet the requirements of Article 1010-2 of the 2006 *Standard Specifications for Roads and Structures*, the Engineer may consider the material reasonably acceptable in accordance with Article 105-3 of the 2006 *Standard Specifications for Roads and Structures*.

### Construction Methods

When shallow undercut is required to construct aggregate subgrades, undercut 6 to 24 inches as shown on the plans or as directed by the Engineer. Perform undercut excavation in accordance with Section 225 of the 2006 *Standard Specifications for Roads and Structures*. Install fabric for soil stabilization in accordance with Article 270-3 of the 2006 *Standard Specifications for Roads and Structures*. Place Class IV Subgrade Stabilization (standard size no. ABC) by end dumping ABC on the fabric. Do not operate heavy equipment on the fabric until it is covered with Class IV Subgrade Stabilization. Compact ABC to 92% of AASHTO T180 as modified by the Department or to the highest density that can be reasonably obtained.

Maintain Class IV Subgrade Stabilization in an acceptable condition and minimize the use of heavy equipment on ABC in order to avoid damaging aggregate subgrades. Provide and maintain drainage ditches and drains as required to prevent entrapping water in aggregate subgrades.

## FINE GRADING SUBGRADE, SHOULDERS AND DITCHES

(7-21-09) DB5 R001

Revise the 2006 *Standard Specifications for Roads and Structures* as follows:

**Page 5-1, Article 500-1 Description**, replace the first sentence with the following:

Perform the work covered by this section including but not limited to preparing, grading, shaping, manipulating moisture content, and compacting either an unstabilized or stabilized roadbed to a condition suitable for placement of base course, pavement, and shoulders.

**Page 5-1, Subarticle 500-2(A) General**, insert the following as the fifth paragraph:

Control the moisture content of the material by drying or adding water.

**REINFORCED BRIDGE APPROACH FILL:**

7-18-06 DB4 R 01

**Description**

This work consists of all work necessary to construct reinforced bridge approach fills in accordance with these provisions and the plans, and as directed by the Engineer.

**Materials**

**(A) Geomembrane**

Provide geomembrane that is impermeable, composed of polyethylene polymers or polyvinyl chloride, and meets the following physical requirements:

| Property | Requirements | Test Method |
|---|---|---|
| Thickness | 25 mils Minimum | ASTM D1593 |
| Tensile Strength at Break | 100 lb/inch Minimum | ASTM D638 |
| Puncture Strength | 40 lbs Minimum | ASTM D4833 |
| Moisture Vapor Transmission Rate | 0.018 ounce/yard$^2$ per Day Maximum | ASTM E96 |

**(B) Fabric**

Refer to Section 1056 for Type 2 Engineering Fabric and the following:

Use a woven fabric consisting of strong rot-proof synthetic fibers such as polypropylene, polyethylene, or polyester formed into a stable network such that the filaments or yarns retain their relative positions to each other.

| Fabric Property | Requirements | Test Method |
|---|---|---|
| Minimum Flow Rate | 2 gallons/min/square foot | ASTM D 4491 |

Lamination of fabric sheets to produce the physical requirements of a fabric layer will not be accepted. Furnish letters of certification from the manufacturer with each shipment of the fabric and geomembrane attesting that the material meets the requirements of this provision; however, the material is subject to inspection, test, or rejection by the Engineer at any time.

During all periods of shipment and storage, wrap the geomembrane and fabric in a heavy-duty protective covering to protect the material from ultraviolet rays. After the protective wrapping has been removed, do not leave the material uncovered under any circumstances for longer than 4 days.

**(C) Select Material**

Provide select material meeting the requirements of Class III, Type 1 or Type 2, or Class V select material of Section 1016 of the *2006 Standard Specifications for Roads and Structures*. When select material is required under water, use select material class V only, up to one foot above the existing water elevation.

**(D) 4 inch Diameter Corrugated Drainage Pipe and Fittings**

Provide pipe and fittings that meet all the applicable requirements of Section 815 or 816 of the *2006 Standard Specifications for Roads and Structures.*

**Construction Methods**

Place the geomembrane and fabric as shown on the plans or as directed by the Engineer. Perform the excavation for the fabric reinforced fill to the limits shown on the plans. Provide an excavated surface free of obstructions, debris, pockets, stumps, and cleared of all vegetation. The geomembrane or fabric will be rejected if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation, handling or storage. Lay all layers smooth, and free from tension, stress, folds, wrinkles or creases. Place all the fabric layers with the machine direction (roll direction) parallel to the centerline of the roadway. A minimum roll width of 10.0 feet for the fabric is required. Overlap geomembrane or fabric splices parallel to the centerline of the roadway a minimum of 18 inches. Geomembrane or fabric splices parallel to the backwall face will not be allowed.

Deposit and spread select material in successive, uniform, approximately horizontal layers of not more than 10 inches in depth, loose measurement, for the full width of the cross section, and keep each layer approximately level. Place and compact each layer of select material fill no more than 10 inches thick with low ground pressure equipment. Use hand operated equipment to compact the fill material within three feet of the backwall and wingwalls as directed by the Engineer. Compact select material to a density equal to at least 95% of that obtained by compacting a sample of the material in accordance with AASHTO T99 as modified by NCDOT. Compact the top eight inches of select material to a density to at least 100% of that obtained by compacting a sample of the material in accordance with AASHTO T99 as modified by NCDOT. Density requirements are not applicable to select material, class V; however compact the fill with at least four passes of low ground pressure equipment on the entire surface as directed by the Engineer. The compaction of each layer of select material shall be inspected and approved by NCTA prior to the placement of the next fill layer. No equipment will be allowed to operate on the drainage pipe or any geomembrane/fabric layer until it is covered with at least six inches of fill material. Compaction shall not damage the drainage pipe, geomembrane, or fabric under the fill. Cover the geomembrane/fabric with a layer of fill material within four days after placement

of the geomembrane/fabric. Geomembrane and fabric that are damaged as a result of installation will be replaced as directed by NCTA at no additional cost.

Place the geomembrane on the ground, and attach and secure it tightly to the vertical face of the backwall and wingwalls with adhesives, duct-tape, nails or any other method approved by the Engineer. Place the first fabric layer on the surface of the geomembrane with the same dimensions of the geomembrane. No material or void is allowed between the geomembrane and the first fabric layer. Place and fold the remaining fabric layers on the edges as shown on the plans or as directed by the Engineer. Provide vertical separation between fabric layers as specified on the plans. The number of fabric layers will be shown in the plans.

Place four inch diameter perforated drainage pipe along the base of the backwall and sloped to drain as shown on the plans. Completely wrap perforated drainage pipe and #78M stone with Type 2 Engineering Fabric as shown on the plan detail. Install a pipe sleeve through the bottom of or under the wing wall prior to placing concrete for the wing wall. The pipe sleeve shall be of adequate strength to withstand the wingwall load. Place the pipe sleeve in position to allow the drainage pipe to go through the wing wall with a proper slope. Connect four-inch diameter nonperforated (plain) drainage pipe with a coupling to the perforated pipe near the inside face of the wingwall. Place the nonperforated drainage pipe through the pipe sleeve, extend down to the toe of the slope and connect, to a ditch or other drainage systems as directed by the Engineer. For bridge approaches in cut sections where no side slope is available, direct the drainage pipe outlet to the end slope down to the toe using elbows as directed by the Engineer.

## AGGREGATE BASE COURSE:

(12-19-06) SP5R03

Revise the *2006 Standard Specifications for Roads and Structures* as follows:

**Page 5-11, Article 520-5 Hauling and Placing Aggregate Base Material, 6th paragraph, replace the first sentence with the following:**

Base course that is in place on November 15 shall have been covered with a subsequent layer of pavement structure or with a sand seal. Base course that has been placed between November 16 and March 15 inclusive shall be covered within 7 calendar days with a subsequent layer of pavement structure or with a sand seal.

## PREPARATION OF SUBGRADE AND BASE

(1-16-96) 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 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 or established by the Engineer.

**ASPHALT PAVEMENTS - SUPERPAVE**
(09-14-09) DB6 R01

Revise the *2006 Standard Specifications for Roads and Structures* as follows:

**Page 6-2, Article 600-9 Measurement and Payment, delete the second paragraph.**

**Page 6-12, Subarticle 609-5(C)2, Required Sampling and Testing Frequencies, first partial paragraph at the top of the page, delete last sentence and add the following:**

If the Engineer allows the mix to remain in place, payment will be made in accordance with Article 105-3.

**Page 6-12, Subarticle 609-5(C)2, QUALITY CONTROL MINIMUM SAMPLING AND TESTING SCHEDULE**

**First paragraph, delete and replace with the following**.

Sample and test the completed mixture from each mix design per plant per year at the following minimum frequency during mix production:

**Second paragraph, delete the fourth sentence, and replace with the following**

When daily production of each mix design exceeds 100 tons and a regularly scheduled full test series random sample location for that mix design does not occur during that day's production, perform at least one partial test series consisting of Items A and B in the schedule below.

**Page 6-12, Subarticle 609-5(C)2(c) Maximum Specific Gravity, add after (AASHTO T 209):**

*or ASTM D 2041*

**Page 6-13, last line and on Page 6-14, Subarticle 609-5(C)(2)(e) Retained Tensile Strength, add a heading before the first paragraph as follows:**

(i) Option 1

**Insert the following immediately after the first paragraph:**

(ii) Option 2

Mix sampled from truck at plant with one set of specimens prepared by the Contractor and then tested jointly by QA and QC at a mutually agreed upon lab site within the first 7 calendar days after beginning production of each new mix design.

**Second paragraph, delete and replace with the following**:

Test all TSR specimens required by either option noted above on either a recording test press or a test press that maintains the peak load reading after the specimen has broken.

**Subarticle 609-5(C)(3) Control Charts, delete the second sentence of the first paragraph and replace with the following:**

For mix incorporated into the project, record full test series data from all regularly scheduled random samples or directed samples that replace regularly scheduled random samples, on control charts the same day the test results are obtained.

**Page 6-15, Subarticle 609-5(C)(3) Control Charts, first paragraph on this page, delete the last sentence and substitute the following**:

Denote the moving average control limits with a dash green line and the individual test limits with a dash red line.

**Subarticle 609-5(C)(3)(a), (b) and (c), replace (a) (b) and (c) with the following:**

(a) A change in the binder percentage, aggregate blend, or $G_{mm}$ is made on the JMF, or,

(b) When the Contractor elects to stop or is required to stop production after one or two moving average values, respectively, fall outside the moving average limits as outlined in subarticle 609-5(C)6 or,

(c) If failure to stop production after two consecutive moving averages exceed the moving average limits occurs, but production does stop at a subsequent time, re-establish a new moving average beginning at the actual production stop point.

**Subarticle 609-5(C)(4) Control Limits, replace the first paragraph and the CONTROL LIMITS Table on page 6-16 with the following.**

The following are established as control limits for mix production. Apply the individual limits to the individual test results. Control limits for the moving average limits are based on a moving average of the last 4 data points. Apply all control limits to the applicable target source.

**CONTROL LIMITS**

| Mix Control Criteria | Target Source | Moving Average Limit | Individual Limit |
|---|---|---|---|
| 2.36 mm Sieve | JMF | ± 4.0 % | ± 8.0 % |
| 0.075 mm Sieve | JMF | ± 1.5 % | ± 2.5 % |
| Binder Content | JMF | ± 0.3 % | ± 0.7 % |
| VTM @ $N_{des}$ | JMF | ± 1.0 % | ± 2.0 % |
| VMA @ $N_{des}$ | Min. Spec. Limit | Min. Spec. Limit | - 1.0% |
| $P_{0.075}$ / $P_{be}$ Ratio | 1.0 | ± 0.4 | ± 0.8 |
| $\%G_{mm}$ @ $N_{ini}$ | Max. Spec. Limit | N/A | + 2.0% |
| TSR | Min. Spec. Limit | N/A | - 15% |

**Page 6-16, Subarticle 609-5(C)(5)** Warning Bands, delete this subarticle in its entirety.

**Pages 6-16 through 6-19, Subarticle 609-5(C)(6), delete the word "warning" and substitute the words "moving average".**

**Page 6-16, Subarticle 609-5(C)(6) Corrective Actions, first paragraph, first sentence, delete and replace with the following:**

Immediately notify the Engineer when moving averages exceed the moving average limits.

**Page 6-17, third full paragraph, delete and replace with the following**:

Failure to stop production when required due to an individual mix test not meeting the specified requirements will subject all mix from the stop point tonnage to the point when the next individual test is back on or within the moving average limits, or to the tonnage point when production is actually stopped, whichever occurs first, to being considered unacceptable.

**Sixth full paragraph, delete the first, second, and third sentence and replace with the following:**

Immediately notify the Engineer when any moving average value exceeds the moving average limit. If two consecutive moving average values for any one of the mix control criteria fall outside the moving average limits, cease production of that mix, immediately notify the Engineer of the stoppage, and make adjustments. The Contractor may elect to stop production after only one moving average value falls outside the moving average limits.

**Page 6-18, Subarticle 609-5(C)(6) Corrective Actions second full paragraph, delete and replace with the following:**

If the process adjustment improves the property in question such that the moving average after four additional tests is on or within the moving average limits, the Contractor may continue production with no reduction in payment.

**Page 6-18, delete the third and fourth full paragraphs, including the Table for Payment for Mix Produced in the Warning Bands and substitute the following**:

If the adjustment does not improve the property in question such that the moving average after four additional individual tests is outside the moving average limits, the mix will be evaluated for acceptance in accordance with Article 105-3. Reduced payment for or removal of the mix in question will be applied starting from the plant sample tonnage at the stop point to the sample tonnage when the moving average is on or within the moving average limits. In addition, any mix that is obviously unacceptable will be rejected for use in the work.

**Page 6-19, First paragraph, delete and replace with the following:**

Failure to stop production and make adjustments when required due to two consecutive moving average values falling outside the moving average limits will subject all mix produced from the stop point tonnage to the tonnage point when the moving average is back on or within the moving average limits or to the tonnage point when production is actually stopped, whichever occurs first, to being considered unacceptable. Remove this material and replaced with materials that comply with the Specifications at no additional costs to the Department, unless otherwise approved. Payment will be made for the actual quantities of materials required to replace the removed quantities, not to exceed the original amounts.

**Page 6-20, Subarticle 609-5(D)(1) General, delete the third full paragraph, and replace with the following:**

Perform the sampling and testing at the minimum test frequencies as specified above. Should the density testing frequency fail to meet the minimum frequency as specified above, all mix without the required density test representation will be considered unsatisfactory. If the Engineer allows the mix to remain in place, payment will be made in accordance with Article 105-3.

**Page 6-22, Subarticle 609-5(D)(4) Nuclear Gauge Density Procedures, third paragraph, insert the following as the second sentence:**

Determine the Daily Standard Count in the presence of the QA Roadway Technician or QA Nuclear Gauge Technician on days when a control strip is being placed.

**Page 6-23, Subarticle 609-5(D)(5) Limited Production Procedure, delete the first paragraph including (a), (b), (c) and substitute the following**:

Proceed on limited production when, for the same mix type and on the same contract, one of the following conditions occur (except as noted in the first paragraph below).

(a) Two consecutive failing lots, except on resurfacing*
(b) Three consecutive failing lots on resurfacing*
(c) Two consecutive failing nuclear control strips.

* Resurfacing is defined as the first new uniform layer placed on an existing pavement.

**Page 6-25, Article 609-6 Quality Assurance, Density Quality Assurance, insert the following items after item (E):**

(F) By retesting Quality Control core samples from control strips (either core or nuclear) at a frequency of 100% of the frequency required of the Contractor;

(G) By observing the Contractor perform all standard counts of the Quality Control nuclear gauge prior to usage each nuclear density testing day; or

(H) By any combination of the above

**Page 6-28, Subarticle 610-3(A) Mix Design-General, delete the fourth and fifth paragraphs and replace with the following**:

Reclaimed Asphalt Pavement (RAP) or Reclaimed Asphalt Shingles (RAS) may be incorporated into asphalt plant mixes in accordance with Article 1012-1 and the following applicable requirements.

Reclaimed asphalt pavement (RAP) may constitute up to 50% of the total material used in recycled mixtures, except for mix Type S12.5D, Type S9.5D, and mixtures containing reclaimed asphalt shingle material (RAS). Reclaimed asphalt shingle (RAS) material may constitute up to 6% by weight of total mixture for any mix. When both RAP and RAS are used, do not use a combined percentage of RAS and RAP greater than 20% by weight of total mixture, unless otherwise approved. When the percent of binder contributed from RAS or a combination of RAS and RAP exceeds 20% but not more than 30% of the total binder in the completed mix, the virgin binder PG grade shall be one grade below (both high and low temperature grade) the binder grade specified in Table 610-2 for the mix type, unless otherwise approved. When the percent of binder contributed from RAS or a combination of RAS and RAP exceeds 30% of the total binder in the completed mix, the Engineer will establish and approve the virgin binder PG grade. Use approved methods to determine if any binder grade adjustments are necessary to achieve the performance grade for the specified mix type.

For Type S12.5D and Type S9.5D mixes, the maximum percentage of reclaimed asphalt material is limited to 20% and shall be produced using virgin asphalt binder grade PG 76-

22. For all other recycled mix types, the virgin binder PG grade shall be as specified in Table 610-2A for the specified mix type.

When the percentage of RAP is greater than 20% but not more than 30% of the total mixture, use RAP meeting the requirements for processed or fractionated RAP in accordance with the requirements of Section 1012-1.

When the percentage of RAP is greater than 30% of the total mixture, use an approved stockpile of RAP in accordance with Section 1012-1(C). Use approved test methods to determine if any binder grade adjustments are necessary to achieve the performance grade for the specified mix type. The Engineer will establish and approve the virgin asphalt binder grade to be used.

**Page 6-34, Subarticle 610-3(C)**

Delete Table 610-2 and associated notes. Substitute the following:

**TABLE 610-2**
**SUPERPAVE MIX DESIGN CRITERIA**

| Mix Type | Design ESALs Millions (a) | Binder PG Grade (b) | Compaction Levels No. Gyrations @ | | Max. Rut Depth (mm) | Volumetric Properties (c) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | $N_{ini}$ | $N_{des}$ | | VMA % Min. | VTM % | VFA Min. - Max. | $\%G_{mm}$ @ $N_{ini}$ |
| S4.75A**(e)** | < 0.3 | 64 -22 | 6 | 50 | ----- | 20.0 | 7.0 - 15.0 | ----- | ----- |
| SF9.5A | < 0.3 | 64 -22 | 6 | 50 | 11.5 | 16.0 | 3.0 - 5.0 | 70 - 80 | ≤ 91.5 |
| S9.5B | 0.3 - 3 | 64 -22 | 7 | 65 | 9.5 | 15.5 | 3.0 - 5.0 | 65 - 80 | ≤ 90.5 |
| S9.5C | 3 - 30 | 70 -22 | 7 | 75 | 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 |
| S12.5C | 3 - 30 | 70 -22 | 7 | 75 | 6.5 | 14.5 | 3.0 - 5.0 | 65 - 78 | ≤ 90.5 |
| S12.5D | > 30 | 76 -22 | 8 | 100 | 4.5 | 14.5 | 3.0 - 5.0 | 65 - 78 | ≤ 90.0 |
| I19.0B | < 3 | 64 -22 | 7 | 65 | ----- | 13.5 | 3.0 - 5.0 | 65 - 78 | ≤ 90.5 |
| I19.0C | 3 - 30 | 64 -22 | 7 | 75 | ----- | 13.5 | 3.0 - 5.0 | 65 - 78 | ≤ 90.0 |
| I19.0D | > 30 | 70 -22 | 8 | 100 | ----- | 13.5 | 3.0 - 5.0 | 65 - 78 | ≤ 90.0 |
| B25.0B | < 3 | 64 -22 | 7 | 65 | ----- | 12.5 | 3.0 - 5.0 | 65 - 78 | ≤ 90.5 |
| B25.0C | > 3 | 64 -22 | 7 | 75 | ----- | 12.5 | 3.0 - 5.0 | 65 - 78 | ≤ 90.0 |
| All Mix Types | **Design Parameter**<br>1. Dust to Binder Ratio ($P_{0.075}$ / $P_{be}$)<br>2. Retained Tensile Strength (TSR) (AASHTO T283 Modified) | | | | | **Design Criteria**<br>0.6 – 1.4<br>85% Min. **(d)** | | | |

Notes: (a) Based on 20 year design traffic
(b) When Recycled Mixes are used, select the binder grade to be added in accordance with Subarticle 610-3(A)

(c) Volumetric Properties based on specimens compacted to $N_{des}$ as modified by the Department
(d) AASHTO T 283 Modified (No Freeze-Thaw cycle required). TSR for Type S 4.75A, Type B 25.0B, and Type B 25.0C mixes is 80% minimum
(e) Mix Design Criteria for Type S 4.75A may be modified subject to the approval of the Engineer

**Page 6-34, Insert the following immediately after Table 610-2:**

**TABLE 610-2A**
**SUPERPAVE MIX DESIGN CRITERIA**

| | **Percentage of RAP in Mix** | | |
|---|---|---|---|
| | **Category 1** | **Category 2** | **Category 3** |
| **Mix Type** | % RAP ≤ 20% | 20.1% ≤ %RAP ≤ 30.0% | %RAP > 30.0% |
| All A and B Level Mixes, I19.0C, B25.0C | PG 64 -22 | PG 64 -22 | TBD |
| S9.5C, S12.5C, I19.0D | PG 70 -22 | PG 64-22 | TBD |
| S9.5D and S12.5D | PG 76-22 | N/A | N/A |

Note: (1) Category 1 RAP has been processed to a maximum size of 2 inches.
(2) Category 2 RAP has been processed to a maximum size of 1 inch by either crushing and / or screening to reduce variability in the gradations.
(3) Category 3 RAP has been processed to a maximum size of 1 inch, fractionating the RAP into 2 or more sized stockpiles

**Page 6-35, Table 610-3 delete and replace with the following**:

**TABLE 610-3**
**ASPHALT PLACEMENT- MINIMUM TEMPERATURE REQUIREMENTS**

| **Asphalt Concrete Mix Type** | **Minimum Air Temperature** | **Minimum Surface Temperature** |
|---|---|---|
| ACBC, Type B25.0B, C, B37.5C | 35° F | 35° F |
| ACIC, Type I19.0B, C, D | 35° F | 35° F |
| ACSC, Type S4.75A, SF9.5A, S9.5B | 40° F | 50° F* |
| ACSC, Type S9.5C, S12.5C | 45° F | 50° F |
| ACSC, Type S9.5D, S12.5D | 50° F | 50° F |

* 35° F if surface is soil or aggregate base for secondary road construction.

**Page 6-44, Article 610-8 Spreading and Finishing, third full paragraph, replace the first sentence with the following**:

Use the 30 foot minimum length mobile grade reference system or the non-contacting laser or sonar type ski *with at least four referencing stations mounted on the paver at a*

*minimum length of 24 feet* to control the longitudinal profile when placing the initial lanes and all adjacent lanes of all layers, including resurfacing and asphalt in-lays, unless otherwise specified or approved.

**Page 6-50, Article 610-13 Density Acceptance, delete the second paragraph and replace with the following**:

As an exception, when the first layer of mix is a surface course and is being placed directly on an unprimed aggregate or soil base, the layer will be included in the "Other" construction category.

**Page 6-50, Article 610-13 Density Acceptance, delete the formula and description in the middle of the page and replace with the following**:

$$PF = 100 - 10(D)^{1.465}$$

where: PF = Pay Factor (computed to 0.1%)
D = the deficiency of the lot average density, not to exceed 2.0%

**Page 6-53, Article 620-4 Measurement and Payment**

**Sixth paragraph, delete the last sentence.**

**Seventh paragraph, delete the paragraph and replace with the following:**

The adjusted contract unit price will then be applied to the theoretical quantity of asphalt binder authorized for use in the plant mix placed during the partial payment period involved, except that where recycled plant mix is used, the adjusted unit price will be applied only to the theoretical number of tons of additional asphalt binder materials required by the job mix formula.

**Page 6-54, Article 620-4 Measurement and Payment, add the following pay item:**

| Pay Item | Pay Unit |
|---|---|
| Asphalt Binder for Plant Mix, Grade PG 70-28 | Ton |

**Page 6-69, Table 660-1 Material Application Rates and Temperatures, add the following**:

| Type of Coat | Grade of Asphalt | Asphalt Rate Gal / yd$^2$ | Application Temperature $^oF$ | Aggregate Size | Aggregate Rate lb. / sq. yd. Total |
|---|---|---|---|---|---|
| Sand Seal | CRS-2 or CRS-2P | 0.22-0.30 | 150-175 | Blotting Sand | 12-15 |

**Page 6-75, Subarticle 660-9(B), add the following as sub-item (5)**

(5) Sand Seal

Place the fully required amount of asphalt material in one application and immediately cover with the seal coat aggregate. Uniformly spread the fully required amount of aggregate in one application and correct all non-uniform areas prior to rolling.

Immediately after the aggregate has been uniformly spread, perform rolling.

When directed, broom excess aggregate material from the surface of the seal coat.

When the sand seal is to be constructed for temporary sealing purposes only and will not be used by traffic, other grades of asphalt material meeting the requirements of Articles 1020-6 and 1020-7 may be used in lieu of the grade of asphalt required by Table 660-1 when approved.

**Page 6-76, Article 661-1 Description, add the following as the 2nd paragraph:**

Provide and conduct the quality control and required testing for acceptance of the UBWC in accordance with "Quality Management System for Asphalt Pavements (OGAFC, PADL, and Ultra-Thin HMA Version)", included in the contract.

**Page 6-76, Article 661-2 Materials, add the following after Asphalt Binder, Grade 70-28:**

| Item | Section |
|---|---|
| Asphalt Binder, Grade 76-22 | 1020 |
| Reclaimed Asphalt Shingles | 1012 |

**Page 6-78, Subarticle 661-2(E), Asphalt Binder For Plant Mix, Grade PG 70-28, rename as ASPHALT BINDER FOR PLANT MIX and add the following as the first paragraph:**

Use either PG 70-28 or PG 76-22 binder in the mix design. Where PG 76-22 is being used in the production of Ultra-thin, the grade of asphalt binder to be paid for will be PG 70-28, unless otherwise approved.

**Page 6-79, Subarticle 661-2(G), Composition of Mix, add the following as the third sentence of the first paragraph.**

The percent of asphalt binder contributed from the RAS shall not exceed 20% of the total binder in the completed mix.

**Page 6-80, Article 661-2(G) Composition of Mix, replace Table 661-4 and associated notes with the following:**

| TABLE 661-4 – MIXTURE DESIGN CRITERIA | | | | |
|---|---|---|---|---|
| **Gradation Design Criteria (% Passing by Weight)** | | | | |
| **Standard Sieves** | | **1/2 in. Type A** | **3/8 in. Type B** | **1/4 in. Type C** |
| **ASTM** | **mm** | **(% Passing by Weight)** | | |
| ¾ inch | 19.0 | 100 | | |
| ½ inch | 12.5 | 85 - 100 | 100 | |
| 3/8 inch | 9.5 | 60 - 80 | 85 - 100 | 100 |
| #4 | 4.75 | 28 - 38 | 28 – 44 | 40 - 55 |
| #8 | 2.36 | 19 - 32 | 17 – 34 | 22 - 32 |
| #16 | 1.18 | 15 - 23 | 13 - 23 | 15 - 25 |
| #30 | 0.600 | 10 - 18 | 8 - 18 | 10 - 18 |
| #50 | 0.300 | 8 - 13 | 6 - 13 | 8 - 13 |
| #100 | 0.150 | 6 - 10 | 4 - 10 | 6 - 10 |
| #200 | 0.075 | 4.0 - 7.0 | 3.0 - 7.0 | 4.0 - 7.0 |

| **Mix Design Criteria** | | | |
|---|---|---|---|
| | **1/2 in. Type A** | **3/8 in. Type B** | **1/4 in. Type C** |
| Asphalt Content, % | 4.6 - 5.6 | 4.6 - 5.8 | 5.0 – 5.8 |
| Draindown Test, AASHTO T 305 | 0.1% max. | | |
| Moisture Sensitivity, AASHTO T 283* | 80% min. | | |
| Application Rate, lb/ $yd^2$ | 90 | 70 | 50 |
| Approximate Application Depth, in. | 3/4 | 5/8 | 1/2 |
| Asphalt PG Grade, AASHTO M 320 | PG 70-28 or PG 76-22 | PG 70-28 or PG 76-22 | PG 70-28 or PG 76-22 |

NOTE: *Specimens for T-283 testing are to be compacted using the SUPERPAVE gyratory compactor. The mixtures shall be compacted using 100 gyrations to achieve specimens approximately 95 mm in height. Use mixture and compaction temperatures recommended by the binder supplier.

**Page 6-80, Subarticle 661-3(A) Equipment, add the following as the first paragraph:**

Use asphalt mixing plants in accordance with Article 610-5.

**Page 6-82, Subarticle 661-3(C), Application of Ultra-thin Bonded Wearing Course, delete the first paragraph and add the following as the first and second paragraphs.**

Use only one asphalt binder PG grade for the entire project, unless the Engineer gives written approval.

Do not place Ultra-thin Bonded Wearing Course between October 31 and April 1, when the pavement surface temperature is less than 50°F or on a wet pavement. In addition, when PG 76-22 binder is used in the JMF, place the wearing course only when the road pavement surface temperature is 60°F or higher and the air temperature in the shade away from artificial heat is 60°F or higher.

**Page 10-40, Subarticle 1012-1(A)**, add the following at the end of the last paragraph, last sentence:

or ultra-thin bonded wearing course.

**Page 10-41, Table 1012-1, delete the entries for OGAFC and add new entries for OGAFC and a row for UBWC with entries:**

| Mix Type | Coarse Aggregate Angularity [(b)] ASTM D5821 | Fine Aggregate Angularity % Minimum AASHTO T304 Method A | Sand Equivalent % Minimum AASHTO T176 | Flat & Elongated 5:1 Ratio % Maximum ASTM D4791 Section 8.4 |
|---|---|---|---|---|
| S 9.5 D | 100/100 | 45 | 50 | 10 |
| OGAFC | 100/100 | N/A | N/A | 10 |
| UBWC | 100/85 | 40 | 45 | 10 |

**Delete Note (c) under the Table 1012-1 and replace with the following**:

(c) Does not apply to Mix Types SF 9.5A and S 9.5B.

**Page 10-42, Subarticle 1012-1(B)(6)**, add as the last sentence:

The percentage loss for aggregate used in UBWC shall be no more than 35%.

**Page 10-43, Subarticle 1012-1(F): Reclaimed Asphalt Shingle Material (RAS), insert the following immediately following the first paragraph:**

(1) Mix Design RAS

Incorporate RAS from stockpiles that have been tested for uniformity of gradation and binder content prior to use in an asphalt mix design.

(2) Mix Production RAS

New Source RAS is defined as acceptable material which was not included in the stockpile when samples were taken for mix design purposes. Process new source RAS so that all materials will pass a ½" inch sieve prior to introduction into the plant mixer unit.

After a stockpile of processed RAS has been sampled and mix designs made from these samples, do not add new source RAS to the original stockpile without prior field testing

to insure gradation and binder uniformity. Sample and test new source RAS before blending with the existing stockpile.

Store new source RAS in a separate stockpile until the material can be sampled and tested for comparison with the original recycled mix design data. New source RAS may also be placed against the existing stockpile in a linear manner provided it is sampled for mix design conformity prior to its use in the recycled mix.

RAS contamination including but not limited to excessive dirt, debris, clean stone, concrete will not be allowed.

Field approval of new source RAS will be based on the table below and volumetric mix properties on the mix with the new source RAS included. Provided these tolerances are met, volumetric properties of the new mix will then be performed. If all volumetric mix properties meet the mix design criteria for that mix type, the new source RAS may continue to be used.

If the gradation, binder content, or any of the volumetric mix properties are not within the allowable tolerances of the table below, do not use the new source RAS unless approved by the Engineer. The Contractor may elect to either not use the stockpile, to request an adjustment to the JMF, or to redesign the mix.

**NEW SOURCE RAS GRADATION and BINDER TOLERANCES**
**(Apply Tolerances to Mix Design Data)**

| 0-6% RAS | |
|---|---|
| $P_b$ % | ± 1.6% |
| Sieve Size (mm) | Tolerance |
| 9.5 | ± 1 |
| 4.75 | ± 5 |
| 2.36 | ± 4 |
| 1.18 | ± 4 |
| 0.300 | ± 4 |
| 0.150 | ± 4 |
| 0.075 | ± 2.0 |

**Page 10-43 through 10-45, Subarticle 1012-1(G), delete this in its entirety and replace with the following:**

**(G) Reclaimed Asphalt Pavement (RAP)**

**(1) Mix Design RAP**

Incorporate RAP from stockpiles or other sources that have been tested for uniformity of gradation and binder content prior to use in an asphalt mix design. Use reclaimed asphalt pavement that meets all requirements specified for *one of* the following *two* classifications.

**(a) Millings**

Existing reclaimed asphalt pavement (RAP) that is removed from its original location by a milling process as specified in Section 607. Millings should be such that it has a uniform gradation and binder content and all materials will pass a 2" sieve prior to introduction into the plant mixer unit.

**(b) Processed RAP**

RAP that is processed in some manner (possibly by crushing and / or use of a blending method) to produce a uniform gradation and binder content in the RAP prior to use in a recycled mix. Process RAP so that all materials have a uniform gradation and binder content and will pass a 1" sieve prior to introduction into the plant mixer unit.

**(c) Fractionated RAP**

Fractionated RAP is defined as having two or more RAP stockpiles, where the RAP is divided into coarse and fine fractions. Grade RAP so that all materials will pass a 1" sieve. The coarse RAP stockpile shall only contain material retained on a 3/8 inch screen, unless otherwise approved. The fine RAP stockpile shall only contain material passing the 3/8" screen, unless otherwise approved. The Engineer may allow the Contractor to use an alternate to the 3/8 inch screen to fractionate the RAP. The maximum percentages of fractionated RAP may be comprised of coarse, fine, or the combination of both. Utilize a separate cold feed bin for each stockpile of fractionated RAP used.

**(d) Approved Stockpiled RAP**

Approved Stockpiled RAP is defined as fractionated RAP which has been isolated and tested for asphalt content, gradation, and asphalt

binder characteristics with the intent to be used in mix designs with greater than 30% RAP materials. Fractionate the RAP in accordance with Section 1012-1(G)(c). Utilize a separate cold feed bin for each approved stockpile of RAP used.

Perform extraction tests at a rate of 1 per 1000 tons of RAP, with a minimum of 5 tests per stockpile to determine the asphalt content and gradation. Separate stockpiles of RAP material by fine and coarse fractions. Erect and maintain a sign satisfactory to the Engineer on each stockpile to identify the material. Assure that no deleterious material is allowed in any stockpile. The Engineer may reject by visual inspection any stockpiles that are not kept clean, separated, and free of foreign materials.

Submit requests for RAP stockpile approval to the Engineer with the following information at the time of the request:

(1) Approximate tons of materials in stockpile
(2) Name or Identification number for the stockpile
(3) Asphalt binder content and gradation test results
(4) Asphalt characteristics of the Stockpile.

For the Stockpiled RAP to be considered for approval, the gradation and asphalt content shall be uniform. Individual test results, when compared to the target, will be accepted if within the tolerances listed below:

**APPROVED STOCKPILED RAP GRADATION**
**and BINDER TOLERANCES**
**(Apply Tolerances to Mix Design Data)**

| $P_b$ % | ± 0.3% |
|---|---|
| Sieve Size (mm) | Percent Passing |
| 25.0 | ± 5% |
| 19.0 | ± 5% |
| 12.5 | ± 5% |
| 9.5 | ± 5% |
| 4.75 | ± 5% |
| 2.36 | ± 4% |
| 1.18 | ± 4% |
| 0.300 | ± 4% |
| 0.150 | ± 4% |
| 0.075 | ± 1.5% |

Note: If more than 20% of the individual sieves are out of the gradation tolerances, or if more than 20% of the asphalt binder content test

results fall outside the appropriate tolerances, the RAP shall not be used in HMA unless the RAP representing the failing tests is removed from the stockpile.

Do not add additional material to any approved RAP stockpile, unless otherwise approved by the Engineer.

Maintain at the plant site a record system for all approved RAP stockpiles. Include at a minimum the following: Stockpile identification and a sketch of all stockpile areas at the plant site; all RAP test results (including asphalt content, gradation, and asphalt binder characteristics).

**(2) Mix Production RAP**

During mix production, use RAP that meets the criteria for one of the following categories:

**(a) Mix Design RAP**

RAP contained in the mix design stockpiles as described above may be used in all applicable JMFs. These stockpiles have been pretested: however, they are subject to required QC / QA testing in accordance with Subarticle 609-5(C)(2).

**(b) New Source RAP**

New Source RAP is defined as any acceptable material that was not included in the stockpile or other source when samples were taken for mix design purposes. Process new source RAP so that all materials have a uniform gradation and binder content and will pass a 2" sieve prior to introduction into the plant mixer unit.

After a stockpile of millings, processed RAP, or fractionated RAP has been sampled and mix designs made from these samples, do not add new source RAP to the original stockpile without prior field testing to insure gradation and binder uniformity. Sample and test new source RAP before blending with the existing stockpile.

Store new source RAP in a separate stockpile until the material can be sampled and tested for comparison with the original recycled mix design data. New source RAP may also be placed against the existing stockpile in a linear manner provided it is sampled for mix design conformity prior to its use in the recycled mix.

Unprocessed RAP is asphalt material that was not milled and/ or has not been processed to obtain a uniform gradation and binder content and is not representative of the RAP used during the applicable mix design. Unprocessed RAP shall not be incorporated into any JMFs prior to processing. Different sources of unprocessed RAP may be stockpiled together provided it is generally free of contamination and will be processed prior to use in a recycled mix. RAP contamination in the form of excessive dirt, debris, clean stone, concrete, etc. will not be allowed. Incidental amounts of dirt, concrete, and clean stone may be acceptable. Unprocessed RAP may be processed and then classified as a new source RAP as described above.

Field approval of new source RAP will be based on Table 1012-2 below and volumetric mix properties on the mix with the new source RAP included. Provided the Table 1012-2 tolerances are met, volumetric properties of the new mix will then be performed. If all volumetric mix properties meet the mix design criteria for that mix type, the new source RAP may continue to be used.

If the gradation, binder content, or any of the volumetric mix properties are not within the allowable tolerances of Table 1012-2, do not use the new source RAP unless approved by the Engineer. The Contractor may elect to either not use the stockpile, to request an adjustment to the JMF, or to redesign the mix.

**TABLE 1012-2**
**NEW SOURCE RAP GRADATION and BINDER TOLERANCES**
(Apply Tolerances to Mix Design Data)

| Mix Type | 0 - 20% RAP | | | $20^+$ - 30 % RAP | | | $30^+$ % RAP | | |
|---|---|---|---|---|---|---|---|---|---|
| Sieve (mm) | Base | Inter. | Surf. | Base | Inter. | Surf. | Base | Inter. | Surf. |
| $P_b$ % | ± 0.7% | | | ± 0.4% | | | ± 0.3% | | |
| 25.0 | ± 10 | - | - | ± 7 | - | - | ± 5 | - | - |
| 19.0 | ± 10 | ± 10 | - | ± 7 | ± 7 | - | ± 5 | ± 5 | - |
| 12.5 | - | ± 10 | ± 10 | - | ± 7 | ± 7 | - | ± 5 | ± 5 |
| 9.5 | - | - | ± 10 | - | - | ± 7 | - | - | ± 5 |
| 4.75 | ± 10 | - | ± 10 | ± 7 | - | ± 7 | ± 5 | - | ± 5 |
| 2.36 | ± 8 | ± 8 | ± 8 | ± 5 | ± 5 | ± 5 | ± 4 | ± 4 | ± 4 |
| 1.18 | ± 8 | ± 8 | ± 8 | ± 5 | ± 5 | ± 5 | ± 4 | ± 4 | ± 4 |
| 0.300 | ± 8 | ± 8 | ± 8 | ± 5 | ± 5 | ± 5 | ± 4 | ± 4 | ± 4 |
| 0.150 | - | - | ± 8 | - | - | ± 5 | - | - | ± 4 |
| 0.075 | ± 4 | ± 4 | ± 4 | ± 2 | ± 2 | ± 2 | ± 1.5 | ± 1.5 | ± 1.5 |

**ASPHALT PAVEMENTS - WARM MIX ASPHALT SUPERPAVE:**
(08-24-09) DB6 R002

Warm Mix Asphalt (WMA) is defined as additives or processes that allow a reduction in the temperature at which asphalt mixtures are produced and placed.

Notify the Engineer at least 2 weeks before producing the Warm Mix so the Engineer can arrange a preconstruction meeting. Discuss special testing requirements necessary for warm mix asphalt at the pre-pave meeting. Include at the pre-pave meeting the Design-Build Team's QC manager, Paving Superintendent, and manufacturer's representative for the process or additive used for producing warm mix asphalt, the Department's Roadway Construction Engineer, Resident Engineer, State Pavement Construction Engineer, and Quality Assurance Supervisor.

Require a manufacturer's representative for the process or additive used to be present on site at the plant during the initial production and on the roadway during the laydown of the warm mix asphalt.

Revise the *2006 Standard Specifications for Roads and Structures* as follows:

**Page 6-8, Article 609-1 Description, insert the following as the second paragraph:**

Warm Mix Asphalt (WMA) is defined as additives or processes that allow a reduction in the temperature at which asphalt mixtures are produced and placed. WMA is allowed for use at the Design-Build Team's option where allowed in the contract documents.

**Page 6-9, Article 609-4 Field Verification of Mixture and Job Mix Formula Adjustments,**

**Second paragraph, insert the following immediately after the first sentence:**

When producing a WMA, field verification testing will also consist of performing a Tensile Strength Ratio (TSR) testing in accordance with AASHTO T283 as modified by the Department.

**Third paragraph, delete the third sentence and replace with the following:**

Verification is considered satisfactory for HMA when all volumetric properties except $\%G_{mm}@N_{ini}$ are within the applicable mix design criteria, and the gradation, binder content, and $\%G_{mm}@N_{ini}$ are within the individual limits for the mix type being produced. Verification is considered satisfactory for WMA when all volumetric properties except $\%G_{mm}@N_{ini}$ are within the applicable mix design criteria, the TSR is equal to or above the minimum design criteria, and the gradation, binder content, and $\%G_{mm}@N_{ini}$ are within the individual limits for the mix type being produced.

**Page 6-12, Subarticle 609-5(C)2(d) Bulk Specific Gravity of Compacted Specimens, add after (AASHTO T 312):**

When producing Warm Mix Asphalt, gyrate specimens to specified $N_{des}$ compaction effort without reheating mix other than to desired compaction temperature. Record time needed to reheat samples (if any).

**Page 6-14, Subarticle 609-5(C)(2)(e) Tensile Strength Ratio, insert the following immediately after the third paragraph:**

When producing WMA, perform TSR testing at
i. Beginning of production for each JMF
ii. Monthly thereafter

**Page 6-27, Article 610-1 Description, insert the following as the third paragraph:**

Warm Mix Asphalt (WMA) is defined as additives or processes that allow a reduction in the temperature at which asphalt mixtures are produced and placed. Use WMA at the Design-Build Team's option at locations allowed by the contract documents.

**Page 6-27, Article 610-2 Materials, insert the following at the end of this Article:**

Use only WMA additives or processes listed on the Department's approved list maintained by the Materials and Tests Unit.

**Page 6-31, Subarticle 610-3(B) Mix Design-Criteria, add the following as the fifth paragraph**:

When WMA is used, submit the mix design without including the WMA additive.

**Page 6-32, Subarticle 610-3(C) Job Mix Formula, add the following as the second paragraph**:

When WMA is used, document the additive or process used and recommended rate on the JMF submittal. Verify the JMF based on plant produced mixture from the trial batch.

**Immediately following PG 76-22 335ºF, add the following paragraph:**

When WMA is used, produce an asphalt mixture within the temperature range of 225°F and 275 °F.

## ASPHALT BINDER CONTENT OF ASPHALT PLANT MIXES

(10-6-05) DB6 R15

The approximate asphalt binder content of the asphalt concrete plant mixtures used on this project will be as follows:

| | | |
|---|---|---|
| Asphalt Concrete Base Course | Type B 25.0_ | 4.3% |
| Asphalt Concrete Intermediate Course | Type I 19.0_ | 4.7% |
| Asphalt Concrete Surface Course | Type S 4.75_ | 7.0% |
| Asphalt Concrete Surface Course | Type SF 9.5_ | 6.5% |
| Asphalt Concrete Surface Course | Type S 9.5_ | 6.0% |
| Asphalt Concrete Surface Course | Type S 12.5_ | 5.5% |

The actual asphalt binder content will be established during construction by the Engineer within the limits established in the *2006 Standard Specifications for Roads and Structures* or Project Special Provisions.

## ASPHALT PLANT MIXTURES

(07-01-95) DB6 R20

Place asphalt concrete base course material in trench sections with asphalt pavement spreaders made for the purpose or with other equipment approved by the Engineer.

## FINAL SURFACE TESTING - ASPHALT PAVEMENTS

(07/15/08) DB6 R45

On –Y- lines of this project where the typical section requires two or more layers of new pavement, perform acceptance testing of the longitudinal profile of the finished pavement surface in accordance with these provisions using a North Carolina Hearne Straightedge (Model No. 1). Furnish and operate the straightedge to determine and record the longitudinal profile of the pavement on a continuous graph. Final surface testing is an integral part of the paving operation and is subject to observation and inspection by the Engineer as deemed necessary.

Push the straightedge manually over the pavement at a speed not exceeding 2 miles per hour (3 kilometers per hour). For all lanes, take profiles in the right wheel path approximately 3 ft (1 m) from the right edge of pavement in the same direction as the paving operation, unless otherwise approved due to traffic control or safety considerations. As an exception, lanes adjacent to curb and gutter, expressway gutter, or shoulder berm gutter may be tested in the left wheel path. Make one pass of the straightedge in each full width travel lane. The full lane width should be comparable in ride quality to the area evaluated with the Hearne Straightedge. If deviations exist at other locations across the lane width, utilize a 10 foot (3 meters) non-mobile straightedge or the Hearne Straightedge to evaluate which areas may require corrective action. Take profiles as soon as practical after the pavement has been rolled and compacted but in no event later than 24 hours following placement of the pavement, unless otherwise authorized by the Engineer. Take profiles over the entire length of final surface travel lane pavement exclusive of -Y- line travel lanes less than or equal to 1000 feet (300 meters) in length, turn lanes less than or equal to 1000 feet (300 meters) in length, structures, approach slabs, paved shoulders, and tapers or other irregular shaped areas of pavement, unless otherwise approved by the Engineer.

At the beginning and end of each day's testing operations, and at such other times as determined necessary by the Engineer, operate the straightedge over a calibration strip so that the Engineer can verify correct operation of the straightedge. The calibration strip must be a 100 ft (30 m) section of pavement that is reasonably level and smooth. Submit each day’s calibration graphs

with that day's test section graphs to the Engineer. Calibrate the straightedge in accordance with the current NCDOT procedure titled "North Carolina Hearne Straightedge - Calibration and Determination of Cumulative Straightedge Index". Copies of this procedure may be obtained from the Department's Pavement Construction Section.

Plot the straightedge graph at a horizontal scale of approximately 25 ft per inch (3 m per cm) with the vertical scale plotted at a true scale. Record station numbers and references (bridges, approach slabs, culverts, etc.) on the graphs, and distances between references/stations must not exceed 100 ft (30 m). Have the operator record the Date, Project No., Lane Location, Wheel Path Location, Type Mix, and Operator's Name on the graph.

Upon completion of each day's testing, evaluate the graph, calculate the Cumulative Straightedge Index (CSI), and determine which lots, if any, require corrective action. Document the evaluation of each lot on a QA/QC-7 form. Submit the graphs along with the completed QA/QC-7 forms to the Engineer, within 24 hours after profiles are completed, for verification of the results. The Engineer will furnish results of their acceptance evaluation to the Design-Build Team within 48 hours of receiving the graphs. In the event of discrepancies, the Engineer's evaluation of the graphs will prevail for acceptance purposes. The Engineer will retain all graphs and forms.

Use blanking bands of 0.2 inches, 0.3 inches, and 0.4 inches (5 mm, 7.5 mm, and 10 mm) to evaluate the graph for acceptance. The 0.2 inch and 0.3 inch (5 mm and 7.5 mm) blanking bands are used to determine the Straightedge Index (SEI), which is a number that indicates the deviations that exceed each of the 0.2 inch and 0.3 inch (5 mm and 7.5 mm) bands within a 100 ft (30 m) test section. The Cumulative Straightedge Index (CSI) is a number representing the total of the SEIs for one lot, which consist of not more than 25 consecutive test sections. In addition, the 0.4 inch (10 mm) blanking band is used to further evaluate deviations on an individual basis. The Cumulative Straightedge Index (CSI) will be determined by the Engineer in accordance with the current procedure titled "North Carolina Hearne Straightedge - Calibration and Determination of Cumulative Straightedge Index".

The pavement will be accepted for surface smoothness on a lot by lot basis. A test section represents pavement one travel lane wide not more than 100 ft (30 m) in length. A lot will consist of 25 consecutive test sections, except that separate lots will be established for each travel lane, unless otherwise approved by the Engineer. In addition, turn lanes will be evaluated as separate lots.

If during the evaluation of the graphs, 5 lots (full width -Y- line travel lanes greater than 300 feet in length only) require corrective action, then proceed on limited production for unsatisfactory laydown in accordance with Article 610-12. Proceeding on limited production is based upon the Design-Build Team's initial evaluation of the straightedge test results and must begin immediately upon obtaining those results. Additionally, the Engineer may direct the Design-Build Team to proceed on limited production in accordance with Article 610-12 due to unsatisfactory laydown or workmanship.

Limited production for unsatisfactory laydown is defined as being restricted to the production, placement, compaction, and final surface testing of a sufficient quantity of mix necessary to construct only 2500 feet (750 meter) of pavement at the laydown width. Once this lot is complete, the final surface testing graphs will be evaluated jointly by the Design-Build Team and the Engineer. Remain on limited production until such time as acceptable laydown results are obtained or until three consecutive 2500 foot (750 meter) sections have been attempted without achieving acceptable laydown results. The Engineer will determine if normal production may resume based upon the CSI for the limited production lot and any adjustments to the equipment, placement methods, and/or personnel performing the work. Once on limited production, the Engineer may require the Design-Build Team to evaluate the smoothness of the previous asphalt layer and take appropriate action to reduce and/or eliminate corrective measures on the final surface course. Additionally, the Design-Build Team may be required to demonstrate acceptable laydown techniques off the project limits prior to proceeding on the project.

If the Design-Build Team fails to achieve acceptable laydown results after three consecutive 2500 foot (750 meter) sections have been attempted, cease production of that mix type until such time as the cause of the unsatisfactory laydown results can be determined.

As an exception, the Engineer may grant approval to produce a different mix design of the same mix type if the cause is related to mix problem(s) rather than laydown procedures. If production of a new mix design is allowed, proceed under the limited production procedures detailed above.

After initially proceeding under limited production, the Design-Build Team shall immediately notify the Engineer if any additional lot on the project requires corrective action. The Engineer will determine if limited production procedures are warranted for continued production.

If the Design-Build Team does not operate by the limited production procedures as specified above, the 5 lots, which require corrective action, will be considered unacceptable and may be subject to removal and replacement.

The adjustment schedule for the Cumulative Straightedge Index (CSI) test results per lot is as follows:

| **Adjustment Schedule for Cumulative Straightedge Index (CSI) (Obtained by adding SE Index of up to 25 consecutive 100 ft. (30m) sections)** | | |
|---|---|---|
| ***CSI** | **ACCEPTANCE CATEGORY** | **CORRECTIVE ACTION** |
| 0-0 | Acceptable | None |
| 1-0 or 2-0 | Acceptable | None |
| 3-0 or 4-0 | Acceptable | None |
| Any Other Number | Unacceptable | Required |

***Either Before or After Corrective Actions**

Correct any deviation that exceeds a 0.3 inch (7.5 mm) blanking band such that the deviation is reduced to 0.2 inches (5 mm) or less.

Corrective actions shall be performed at the Design-Build Team's expense and shall be presented for evaluation and approval by the Engineer prior to proceeding. Any corrective action performed shall not reduce the integrity or durability of the pavement which is to remain in place. Corrective action for deviation repair may consist of overlaying or removing and replacing. Scraping of the pavement with any blade type device will not be allowed as a corrective action. Provide overlays of the same type mix, full roadway width, and to the length and depth established by the Engineer. Tapering of the longitudinal edges of the overlay will not be allowed.

Take corrective actions as specified if the CSI indicates “Required” corrective action. The CSI after corrective action should meet or exceed “Acceptable” requirements.

Where corrective action is required, the test section(s) requiring corrective action will be retested, unless the Engineer directs the retesting of the entire lot.

Test sections and/or lots that are initially tested by the Design-Build Team which indicate excessive deviations such that corrective action is required, may be re-rolled with asphalt rollers while the mix is still warm and in a workable condition, to possibly correct the problem. In this instance, reevaluation of the test section(s) must be completed within 24 hours of pavement placement and these test results will serve as the initial test results.

Areas excluded from testing by the N.C. Hearne Straightedge will be tested by using a non-mobile 10-foot (3 m) straightedge. Assure that the variation of the surface from the testing edge of the straightedge between any two contact points with the surface is not more than 1/8 inch (3 mm). Correct deviations exceeding the allowable tolerance in accordance with the corrective actions specified above, unless the Engineer permits other corrective actions.

Furnish the North Carolina Hearne Straightedge(s) necessary to perform this work. Maintain responsibility for all costs relating to the procurement, handling, and maintenance of these devices. The Department has entered into a license agreement with a manufacturer to fabricate, sell, and distribute the N.C. Hearne Straightedge. The Department’s Pavement Construction Section may be contacted for the name of the current manufacturer and the approximate price of the straightedge.

## QUALITY MANAGEMENT SYSTEM FOR ASPHALT PAVEMENTS: (OGAFC, PADC, and ULTRA-THIN HMA Version)

(3-20-07)(Rev 4-20-10) DB 06 R062

### Description

Produce and construct Open Graded Asphalt Friction Course, Permeable Asphalt Drainage Course, and Ultra-thin Hot Mix Asphalt Concrete Wearing Surface asphalt mixtures and pavements in accordance with a Quality Management System described herein. All materials and work shall conform to Division 6 of the *2006 Standard Specifications* except as modified

herein. Perform all applicable quality control activities in accordance with the Department's *Hot Mix Asphalt Quality Management System (HMA/QMS) Manual* in effect on the date of contract advertisement, unless otherwise approved.

**Description of Responsibilities**

**(A) Quality Control (QC)**

Provide and conduct a quality control program. A quality control program is defined as all activities, including mix design, process control inspection, plant and equipment calibration, sampling and testing, and necessary adjustments in the process that are related to production of a pavement which meets all requirements of the Specifications.

**(B) Quality Assurance (QA)**

The Department will conduct a quality assurance program in accordance with Article 609-6 of the *Standard Specifications* and this provision. A quality assurance program is defined as all activities, including inspection, sampling, and testing related to determining that the quality of the completed pavement conforms to specification requirements.

**Mix Design/Job Mix Formula Requirements**

All applicable mix design and job mix formula requirements of Article 650-3, Article 652.3, or Article 661-2 of the *2006 Standard Specifications* and the contract documents shall apply. In addition, submit Superpave gyratory compactor printouts for all specimens required to be compacted during the mix design process.

**Field Verification Of Mixture And Job Mix Formula Adjustments**

Conduct field verification of the mix at each plant within 30 calendar days prior to initial production of each mix design, when required by the Allowable Mix Adjustment Policy, and when directed as deemed necessary.

Field verification testing consists of performing a minimum of 1 test series on mix sampled and tested in accordance *Required Sampling and Testing Frequencies*. Mix obtained from NCDOT or non-NCDOT work may be used for this purpose provided it is sampled, tested, and the test data handled in accordance with current procedures in the Department's *HMA/QMS Manual* and the following provisions. Obtain the mix verification sample and split in accordance with the Department's *HMA/QMS Manual*. Do not begin normal plant production until all field verification test results have been completed and the Design-Build Team's Level II Technician has satisfactorily verified the mix. Verification is considered satisfactory when the mix meets all applicable individual test control limits as specified elsewhere in these provisions, except that the drain down test shall meet the requirements as specified in Section 661 of the *2006 Standard Specifications* for the applicable mix type.

In addition to the required sampling and testing for field verification, perform all preliminary inspections and plant calibrations as shown in the *HMA/QMS Manual*.

Retain records of these calibrations and mix verification tests, including Superpave Gyratory Compactor (SGC) printouts, at the QC laboratory. In addition, furnish copies, including SGC printouts, to the Engineer for review and approval within one (1) working day after beginning production of the mix.

Conduct the initial mix verification of all new mix designs with the plant set up to produce the aggregate blend and binder content in accordance with the initially approved job mix formula (JMF). If the Design-Build Team and/or the Engineer determine from results of quality control tests conducted during mix verification that adjustments to the job mix formula are necessary to achieve specified mix properties, adjustments to the JMF may be made within tolerances permitted by specifications for the mix type being produced, subject to approval. All JMF adjustments will be approved and documented in writing by the Engineer.

Failure by the Design-Build Team to fully comply with the above mix verification requirements will result in immediate production stoppage by the Engineer. Do not resume normal production until all mix verification sampling, testing, calibrations, and plant inspections have been performed and approved. Any mix produced that is not verified may be assessed a price reduction at the Engineer's discretion in addition to any reduction in pay due to mix and/or surface deficiencies.

**Design-Build Team's Quality Control System**

**(A) Personnel Requirements**

Obtain all certifications in accordance with the Department's QMS Asphalt Technician Certification Program as shown in the *HMA/QMS M*anual. Perform all sampling, testing, data analysis and data posting by or under the direct supervision of a certified QMS Asphalt Plant Technician.

Provide a certified Asphalt Plant Technician Level I to perform quality control operations and activities at each plant site at all times during production of material for the project. A plant operator who is a certified Asphalt Plant Technician Level I may be utilized to meet this requirement when daily production for each mix design is less than 100 tons provided the randomly scheduled increment sample is not within that tonnage. When performing in this capacity, the plant operator shall be responsible for all quality control activities that are necessary and required. Absences of the Level I Technician, other than those for normal breaks and emergencies, shall be pre-approved by the appropriate QA Supervisor or his designated representative. Any extended absence of the Technician that has not been approved will result in immediate suspension of production by the Engineer. All mix produced during this absence will be accepted in accordance with Article 105-3 of the *2006 Standard Specifications*.

Provide and have readily available a certified Asphalt Plant Technician Level II to supervise, coordinate, and make any necessary adjustments in the mix quality control process in a timely manner. The Level II Technician may serve in a dual capacity and fulfill the Level I Technician requirements specified.
Provide a certified QMS Roadway Technician with each paving operation at all times during placement of asphalt. This person is responsible for monitoring all roadway paving operations and all quality control processes and activities, to include stopping production or implementing corrective measures when warranted.

Post in the quality control laboratory an organizational chart, including names, telephone numbers and current certification numbers of all personnel responsible for the quality control program while asphalt paving work is in progress.

**(B) Field Laboratory Requirements**

Furnish and maintain a Department certified laboratory at the plant site. A minimum of 320 square feet of floor space (exclusive of toilet facilities), equipment, and supplies necessary for performing Design-Build Team quality control testing is required. Provide convenient telephone and fax machine access for QMS personnel at the plant site.

Provide testing equipment meeting the requirements of the test methods identified herein. Provide equipment that is properly calibrated and maintained. Allow all measuring and testing devices to be inspected to confirm both calibration and condition. If at any time the Engineer determines that the equipment is not operating properly or is not within the limits of dimensions or calibration described in the applicable test method, the Engineer may stop production until corrective action is taken. Maintain and have available a record of all calibration results at the laboratory.

**(C) Plant Mix Quality Control**

(1) General

Include in the quality control process the preliminary inspections, plant calibrations and field verification of the mix and JMF. In addition, conduct at a minimum but not limited to, the sampling, testing, and determination of all parameters outlined in these provisions using test methods and minimum frequencies as specified herein. Perform additional sampling and testing when conditions dictate. Obtain, split, and retain all scheduled samples at randomly selected locations in accordance with the Department's *HMA/QMS Manual*, except as modified below. Log all samples taken on forms provided by the Department. Provide documentation in accordance with Subarticle 609-5(E) of the *Standard Specifications*. Identify any additional quality control samples taken and tested at times other than the regularly scheduled random samples or directed samples that take the place of regularly scheduled as process control (PC) samples on the appropriate forms. Process Control test results shall not be plotted on control charts nor reported to Quality Assurance Laboratory.

Split and retain samples in accordance with procedures in the Department's *HMA/QMS Manual*. Obtain at least 2000 grams of mix for each QC, QA, and retained sample. QC samples shall be tested immediately. Place QA samples and retained samples in silicone-lined sample boxes and store for possible testing in accordance with the procedures established below.

Retain the untested split portion of quality control aggregate and mix samples and the tested TSR specimens for 5 calendar days at the plant site, commencing the day the samples are tested. Quality Assurance personnel may give permission for disposal prior to these minimum storage periods. Retain the split portion of the Design-Build Team's mix verification and referee mix samples until either procured by or permission for disposal is given by QA. Store all retained samples in a dry and protected location.

(2) Required Sampling and Testing Frequencies

All mix sampling, testing, data analysis and data posting shall be performed or directly supervised by a certified QMS Asphalt Plant Technician.

Maintain minimum test frequencies as established in the schedule below. Complete all tests within 24 hours of the time the sample is taken, unless specified otherwise within these provisions. Should the specified tests not be completed within the required time frame, cease production at that point until such time the tests are completed.

Should the Design-Build Team's testing frequency fail to meet the minimum frequency requirements as specified, all mix without the specified test representation will be considered unsatisfactory. If the Engineer allows the mix to remain in place, payment will be made in accordance with Article 105-3 of the *2006 Standard Specifications*.

If desired, innovative equipment or techniques not addressed by these specifications to produce or monitor the production of mix may be utilized, subject to approval.

Quality Control Minimum Sampling and Testing Schedule

Sample and test the completed mixture from each mix design per plant per year at the following minimum frequency during mix production:

| Accumulative Production Increment | Number of Samples per Increment |
|---|---|
| 500 tons | 1 |

If production is discontinued or interrupted before the accumulative production increment tonnage is completed, continue the increment on the next production day(s) until the increment tonnage is completed. Obtain a random sample within

the specified increment at the location determined in accordance with the current edition of the Department's *HMA/QMS Manual*. Conduct quality control sampling and testing on each random sample as scheduled below. When daily production of each mix design exceeds 100 tons and a regularly scheduled test series random sample location for that mix design does not occur during that day's production, perform a partial test series consisting of Items (a) and (b) in the schedule below. This partial test series does not substitute for the regularly scheduled random sample for that increment.

Perform the following test series on all regularly scheduled random samples:

Asphalt Mixture - Sampled From Truck at Plant (AASHTO T-168 Modified) (Split Sample Required)

(a) Asphalt Binder Content, % (Design-Build Team may select either option below)

1. Ignition Furnace (AASHTO T 308 Modified)
2. Other (Design-Build Team may request and use other means of determining percent asphalt binder subject to approval)

(b) Gradation on Recovered Blended Aggregate from Mix Sample (AASHTO T-30 Modified) (Graded on all sieves specified on the job mix formula.)

In addition to the above schedule, conduct the following sampling and testing as indicated:

(a) Aggregate Stockpile Gradations (AASHTO T 27 and T 11) (Sampled from stockpiles or cold feed system as follows; split samples not required)

1. Coarse Aggregates (Approved Standard Sizes)
   a. At beginning of production*****
   b. Weekly thereafter*****
2. Fine Aggregates (Stone Screenings, Natural Sands, Etc.)
   a. At or within 1 week prior to mix verification (Gradations valid for multiple mix designs).
   b. Weekly after mix verification *****
   c. Anytime production is stopped due to plant mix gradation related problems.

*****In lieu of the aggregate stockpile gradations performed by QC personnel, gradation quality control data conducted by the aggregate producer, which is representative of the Design-Build Team's current stockpiles, may be furnished.

(b) Reclaimed Asphalt Shingle Material (RAS) Binder Content and Gradation (AASHTO T 308 Modified or T 164 and AASHTO T 30 Modified) (sample from stockpiles or cold feed system at beginning of production and weekly thereafter). Have RAS approved for use in accordance with Article 1012-1 (F) of the *Standard Specifications*. (Split Sample Required)

(c) Combined Aggregate Moisture Content (AASHTO T 255) Drum Plant Only (sampled from stockpiles or cold feed system a minimum of once daily).

(d) Asphalt Drain Down Test Procedure, AASHTO T 305; Copy of procedure may be obtained from the M & T Asphalt Design Engineer. Mix sampled from truck at plant within the first day's production and weekly thereafter. **Note**: Drain Down Test not required for Permeable Asphalt Drainage Course.

(e) Retained Tensile Strength (TSR) - (AASHTO T 283 Modified)
**Note**: TSR only required for Ultra-thin HMA.

1. Option 1
Mix sampled from truck at plant, tested, and results furnished to the Engineer within seven (7) calendar days after beginning production of each new mix design. From the split sample, QC will prepare and submit within 5 calendar days of the sample date, an additional set of specimens to the QA Lab for TSR testing (Split Sample Required).

2. Option 2
Mix sampled from truck at plant with one set of specimens prepared by the Design-Build Team and then tested jointly by QA and QC at a mutually agreed upon lab site within the first seven (7) calendar days after beginning production of each new mix design.

Test all TSR specimens required by either option noted above on either a recording test press or a test press that maintains the peak load reading after the specimen has broken.

Additional TSR testing required prior to mix production in accordance with above procedures is required when a change is made in anti-strip additive dosage or when a new anti-strip additive source or grade is utilized, unless otherwise approved. Other TSR test(s) may be directed as deemed necessary. TSR testing not required for mix verification, but may be performed at that time.

(3) Control Charts

Maintain standardized control charts furnished by the Department at the field laboratory. For mix incorporated into the project, record test data from all regularly scheduled random samples or directed samples that replace regularly scheduled random samples, on control charts the same day the tests results are obtained. Process Control (PC) test results shall not be plotted on control charts nor reported to Quality Assurance Laboratory.

In addition, partial test series results obtained due to reasons outlined above will be reported to Quality Assurance personnel on the proper forms, but will not be plotted on the control charts.

Results of quality assurance tests performed by the Engineer will be posted on the Design-Build Team's control charts as data becomes available.

Record the following data on the standardized control charts:

(a) Aggregate Gradation Test Results:

1. 12.5 mm (Types P57 & FC-2 Mod. Only)
2. 9.5 mm (Excluding Type P57)
3. 4.75 mm
4. 2.36 mm
5. 0.075 mm Sieves

(b) Binder Content, %, $P_b$

Both the individual test values and the moving average of the last four (4) data points shall be plotted on each chart. The Design-Build Team's test data shall be shown in black and the moving average in red. The Engineer's assurance data will be plotted in blue. Denote the moving average limits with a dash green line and individual test limits with a dash red line.

Maintain a continuous moving average with the following exceptions. Re-establish a new moving average only when:

1. A change in the binder percentage or aggregate blend is made in the JMF, or,
2. When the Design-Build Team elects to stop or is required to stop production after one or two moving average values, respectively, fall outside the moving average limits or,
3. If failure to stop production after two consecutive moving averages exceed the moving average limits occurs, but production does stop

at a subsequent time, re-establish a new moving average beginning at the actual production stop point.

In addition, re-establish the moving averages for all mix properties. Moving averages will not be re-established when production stoppage occurs due to an individual test result exceeding the individual test limits and/or specifications.

All individual test results for regularly scheduled samples or directed samples that replace regularly scheduled samples are part of the plant quality control record and shall be included in moving average calculations with the following exception. When the Design-Build Team's testing data has been proven incorrect, use the correct data as determined by the Engineer in lieu of the Design-Build Team's data.

(4) Control Limits

The following are established as control limits for mix production. Apply the individual limits to the individual test results. Control limits for the moving average limits are based on a moving average of the last four (4) data points. Apply all control limits to the applicable target on the job mix formula.

| **Mix Control Criteria** | **Control Limits, %** | |
|---|---|---|
| | Moving Average | **Individual Test** |
| Asphalt Binder Content | +/-0.3 | +/-0.7 |
| 12.5 mm Sieve (Types P57 & FC-2 Mod) | +/-4.0 | +/-8.0 |
| 9.5 mm Sieve (Excluding Type P57) | +/-4.0 | +/-8.0 |
| 4.75 mm Sieve | +/-4.0 | +/-8.0 |
| 2.36 mm Sieve | +/-4.0 | +/-8.0 |
| 0.075 mm Sieve | +/-1.5 | +/-2.5 |
| TSR (Ultra-thin Only) | N/A | 15% |

(5) Corrective Actions

All required corrective actions are based upon initial test results and shall be taken immediately upon obtaining those results. In the event situations occur which warrant more than one corrective action and/or adjustment, give precedence to the more severe of these actions. Stopping production when required takes precedence over all other corrective actions. Document all corrective actions.

(a) Immediately cease production and immediately notify the Engineer when any of the following occur:

1. When an individual test result for a mix control criteria exceeds both the individual test control limits and the applicable specification design criteria, or,

2. When two consecutive field TSR values fail to meet the minimum specification requirement, or,

3. When two consecutive binder content test results exceed the individual limits.

(b) Do not resume normal plant production until one of the following has occurred:

1. Option 1 - Approval has been granted by the appropriate QA Supervisor.

2. Option 2 - The mix in question has been satisfactorily verified. Normal production may resume based on the approval of the Design-Build Team's Level II technician, provided notification and the verification test results have been furnished to the QA Laboratory.

Failure to comply fully with one of the above provisions will result in immediate production stoppage by the Engineer. Normal production shall not then resume until a complete verification process has been performed and approved by the Engineer.

Acceptance of all mix failing to meet the individual test control or minimum TSR requirements as described above will be determined in accordance with Article 105-3 of the *Standard Specifications*. In addition, any mix, which is deemed unacceptable, will be rejected for use in the work.

Failure to stop production when required due to an individual mix test not meeting the specified requirements shall subject all mix from the stop point tonnage to the point when the next individual test is back on or within the moving average limits, or to the tonnage point when production is actually stopped, whichever occurs first, to being considered unacceptable.

Failure to stop production when required due to two consecutive TSR tests failing to meet the specification requirements will subject all mix from the stop point tonnage to the point when the next TSR test meets or exceeds the specification requirement, or to the tonnage point when production is actually stopped, whichever occurs first, to being considered unacceptable.

In either case, remove and replace this mix with materials that comply with the specifications at no additional costs to the Department.

Immediately notify the Engineer when any moving average value exceeds the moving average limit. If two consecutive moving average values for any one of the mix control criteria fall outside the moving average limits, cease production of that mix, immediately notify the Engineer of the stoppage, and make adjustments. The Design-Build Team may

elect to stop production after only one moving average value falls outside the moving average limits. In either case, do not determine a new moving average until the fourth test after the elective or mandatory stop in production.

Do not resume normal plant production until one of the following has occurred:

(a) Option 1 - Approval has been granted by the appropriate QA Supervisor.

(b) Option 2 - The mix in question has been satisfactorily verified. Normal production may resume based on the approval of the Design-Build Team's Level II technician, provided notification and the verification test results have been furnished to the QA Laboratory.

Failure to comply fully with one of the above provisions will result in immediate production stoppage by the Engineer. Normal production shall not then resume until a complete verification process has been performed and approved by the Engineer.

If the process adjustment improves the property in question such that the moving average after four additional tests is on or within the moving average limits, the Design-Build Team may continue production with no reduction in payment.

If the adjustment does not improve the property in question such that the moving average after four (4) individual tests is outside the moving average control limits, the mix will be evaluated for acceptance. If the Engineer determines the mix is reasonably acceptable based on the test data and an inspection of the completed pavement, the mix will be accepted in accordance with Article 105-3 of the *Standard Specifications*. If the mix is determined to be unacceptable, the mix will be removed and replaced with materials that comply with the specifications. In either case, the adjustment or removal, respectively, for the mix in question will be applied starting from the plant sample tonnage at the stop point to the sample tonnage when the moving average is on or within the moving average limit. In addition, any mix that is obviously unacceptable will be rejected for use in the work.

Failure to stop production and make adjustments when required due to two consecutive moving average values falling outside the moving average limits will subject all mix produced from the stop point tonnage to the tonnage point when the moving average is back on or within the moving average limits or to the tonnage point when production is actually stopped, whichever occurs first, to being considered unacceptable. Remove this material and replace with materials that comply with the specifications at no additional costs to the Department.

(6) Allowable Retesting for Mix Deficiencies

The Design-Build Team may elect to resample and retest for plant mix deficiencies when individual QC test(s) exceed one or more mix property target(s) by more than the tolerances indicated below. Perform the retesting within 10 days

after initial test results are determined. Retesting shall be approved prior to being performed and in accordance with the Department's Guidelines for Retests of Plant Mix Deficiencies as shown in the *HMA/QMS Manual*. The Design-Build Team, under the supervision of the Department's QA personnel will perform these retests. Retests for any mix deficiency other than as listed below will not be allowed unless otherwise permitted. Acceptance of the mix in question will be based on the retest data in accordance with Article 105-3 of the *Standard Specifications*.
The Department reserves the right to require the Design-Build Team to resample and retest at any time or location as directed.

| | | | |
|---|---|---|---|
| (a) | % Binder Content | | by more than +/- 1.0% |
| (b) | 12.5 mm Sieve (Types P 57 & FC-2 Mod) | | by more than +/- 9.0% |
| (c) | 9.5 mm Sieve (Excluding Type P 57) | | by more than +/- 9.0% |
| (d) | 4.75 mm sieve | | by more than +/- 9.0% |
| (e) | 2.36 mm sieve | | by more than +/- 9.0% |
| (f) | 0.075 mm sieve | | by more than +/- 3.0% |
| (g) | TSR (Ultra-thin only) | | by more by more than -15% from Specification limit |

(7) Documentation (Records)

Document all quality control observations, records of inspection, samples taken, adjustments to the mix, and test results on a daily basis. Note the results of observations and records of inspection as they occur in a permanent field record. Record adjustment to mix production and test results on forms provided.

Identify any additional quality control samples taken and tested at times other than the regularly scheduled random samples or directed samples that take the place of regularly scheduled as process control (PC) samples on the appropriate forms. Process Control test results shall not be plotted on control charts nor reported to Quality Assurance Laboratory. Process control sample test results are for the Design-Build Team's informational purposes only.

Make all such records available to the Engineer, upon request, at any time during project construction. Complete all QC records and forms and distribute in accordance with the most current edition of the Department's *HMA/QMS Manual*. Maintain all QC records, forms and equipment calibrations for a minimum of 3 years from their completion date. Failure to maintain QC records and forms as

required, or to provide these records and forms to the Engineer upon request, may result in production and/or placement stoppage until the problem is resolved.

Falsification of test results, documentation of observations, records of inspection, adjustments to the process, discarding of samples and/or test results, or any other deliberate misrepresentation of the facts will result in the revocation of the applicable person's QMS certification. The Engineer will determine acceptability of the mix and/or pavement represented by the falsified results or documentation. If the mix or pavement in question is determined to be acceptable, the Engineer may allow the mix to remain in place at no pay for the mix, asphalt binder and other mix components. If the mix and/or pavement represented by the falsified results are determined not to be acceptable, remove and replace with mix that complies with the Specifications.

**Quality Assurance**

The Department's quality assurance program will be conducted by a certified QMS technician(s) and will be accomplished in the following ways:

Plant Mix Quality Assurance

**(A)** By conducting assurance testing of split samples obtained by the Design-Build Team at a frequency equal to or greater than 5% of the frequency required of the Design-Build Team;

**(B)** By periodically observing sampling and testing procedures performed by the Design-Build Team;

**(C)** By monitoring required control charts exhibiting test results of control parameters;

**(D)** By directing the Design-Build Team to take additional samples at any time and any location during production (in lieu of the next scheduled random sample for that increment);

**(E)** By conducting verification sampling and testing on samples taken independently of the Design-Build Team's quality control samples at a frequency equal to or greater than 10% of the QC sample frequency; or

**(F)** By any combination of the above

The Engineer will periodically obtain quality assurance and verification samples for testing independently of the Design-Build Team's quality control process. The Engineer will conduct assurance tests on both split QC samples taken by the Design-Build Team and verification samples taken by the Department. These samples may be the regular quality control samples or a sample selected by the Engineer from any location in the process, or verification samples taken

at random by the Department. The Engineer may select any or all split samples for assurance testing.

Results of quality assurance tests will be provided to the Design-Build Team within 3 working days after the sample has been obtained, except for verification TSR test results that will be provided within 7 calendar days.

Limits of Precision

Differences between the Design-Build Team's and the Department's split sample test results will be considered acceptable if within the following limits of precision:

| **Mix Property** | **Acceptable Limits of Precision** |
|---|---|
| Asphalt Binder Content | ±0.5 % |
| 12.5 mm Sieve (Types P 57 & FC-2 Mod. Only) | ±6.0 % |
| 9.5 mm Sieve (Excluding Type P 57) | ±5.0 % |
| 4.75 mm Sieve | ±5.0 % |
| 2.36 mm Sieve | ±5.0 % |
| 0.075 mm Sieve | ±2.0 % |
| TSR (Ultra-thin HMA Only) | ±15.0 % |

The Engineer will immediately investigate the reason for differences if any of the following occur:

**(A)** QA test results of QC split sample does not meet above limits of precision, or

**(B)** QA test results of QC split sample does not meet the individual test control limits or the specification requirements, or

**(C)** QA verification sample test results exceed the allowable retesting tolerances.

If the potential for a pavement failure exists, the Engineer may suspend production, wholly or in part, in accordance with Article 108-7 of the *Standard Specifications* while the investigation is in progress. The Engineer's investigation may include, but not be limited to the following:

**(A)** Joint testing of any remaining split samples,

**(B)** Review and observation of the QC technician's sampling and testing procedures,

**(C)** Evaluation and calibration of QC testing equipment, and/or

**(D)** Comparison testing of other retained quality control samples

If additional mix samples or core samples are necessary to resolve the difference, these samples will be taken as directed and tested jointly by the Design-Build-Team's quality

control and Department's quality assurance personnel. If reasons for the difference cannot be determined, payment for the mix in question will be determined in accordance with Article 105-3 of the *Standard Specifications*. If the reason for the difference is determined to be an error or other discrepancy in the quality control test results, the applicable quality assurance test results or verification test results will be used to determine compliance with the applicable mix specification requirements.

The Engineer will periodically witness the sampling and testing being performed by the Design-Build Team. If the Engineer observes that the sampling and quality control tests are not being performed in accordance with the applicable test procedures, the Engineer may stop production until corrective action is taken. The Engineer will promptly notify the Design-Build Team of observed deficiencies, both verbally and in writing. The Engineer will document all witnessed samples and tests.

**Acceptance**

The Engineer will base final acceptance of the mix on the results of random testing made on split samples during the assurance process and validation of the Design-Build Team's quality control process.

**Measurement and Payment**

All reductions in payment that are based on Unit Cost / Unit Bid Price shall be based on $45 per ton of material placement.

## CONCRETE PAVEMENTS AND SHOULDERS

(08-24-09)(Rev. 07-20-10) DB7 R20

Revise the 2006 *Standard Specifications for Roads and Structures* as follows:

### SECTION 700
### GENERAL REQUIREMENT FOR PORTLAND CEMENT CONCRETE PAVING

**Page 7-1, Article 700-3 Concrete Hauling Equipment**, delete the fourth paragraph and substitute the following:

For concrete hauled in a transit mix (ready mix) truck, use Table 1000-2 to determine the maximum elapsed time. For concrete hauled in other equipment, minimize the elapsed time to be 60 minutes or less, unless otherwise approved. The elapsed time is defined as the period from first contact between mixing water and cement until the entire operation of placing and finishing up to micro-surfacing, including corrective measures if necessary, has been completed.

**Page 7-2, Article 700-4 Preparation of Subgrade and Base**, fourth paragraph, delete the 3rd and 4th sentence and substitute the following:

Set pins at a distance no farther than 50 feet apart. When located on a vertical curve, set pins no farther than 25 feet apart.

**Page 7-3, Article 700-5 (A)(4),** delete the 2nd and 3rd paragraphs and substitute the following:

Where additional pavement, aggregate or soil must be placed adjacent to new pavement by machine methods, do not place it until the concrete has attained a compressive strength of at least 3000 psi.
Construction equipment or hauling equipment will not be allowed over the pavement until the concrete has attained a compressive strength of 3,000 psi.

**Page 7-5, Article 700-7 Finishing**, insert the following as the second sentence.

The use of excessive water for finishing will not be allowed

**Page 7-5, Subarticle 700-8(C) Hot Weather**, 1st sentence

Substitute 90°F for 80°F.

**Page 7-7, 700-11(A) General**, delete the fourth paragraph and substitute the following:

Immediately after sawing the joint to the dimensions shown on the plans, completely remove the resulting slurry from the joint. Immediately reapply curing membrane following the sawing operation to damaged areas in the vicinity of the joint.

**Page 7-8, insert the following as Subarticle 700-11(G)**

**(G) Verification of Dowel Bar Alignment**

Use either properly secured dowel baskets or a dowel bar inserter, provided the ability to correctly locate and align the dowels at the joints is demonstrated as described below.

Provide a calibrated magnetic imaging device that will document dowel bar location and alignment. Calibrate the magnetic imaging device to the type and size dowel bar used in the work. Utilize this device as a process control and make necessary adjustment to ensure the dowels are placed in the correct location.

Scan at least 25% percent of the joints in the initial placement or 1.0 mile of pavement, whichever is greater, at random intervals throughout the pavement each time the paving train is mobilized. Mark scanned joints on the pavement.

Scan all joints in this initial section if the dowel bars exhibit longitudinal translation (side shift), horizontal translation, vertical translation (depth), horizontal skew, or vertical tilt, above the allowable tolerances defined below. In addition, continue scanning 25% of the joints until it is established that the dowel

bar inserter or secured dowel basket assemblies are consistently placing the dowel bars at the correct location (meeting the tolerances defined below). Once the Engineer determines that consistency is established, the Contractor may reduce the percentage of scanned joints to no less than 10%. At any time inconsistency in the placement of the dowel bars become evident, additional scanning may be required up to 100% of the joints.

If consistency of the proper dowel bar alignment cannot be established within a reasonable time frame, the Engineer will have the option of suspending the paving operation.

Provide a report of the scanned joints within 48 hours of completing the day's production. The report should include the station and lane of the joint scanned, as well as the horizontal location, depth, longitudinal translation (side shift), horizontal skew, and vertical tilt of each dowel bar in the joint. If a dowel bar inserter is used, the joint score described below should also be provided in the report.

Longitudinal translation (side shift) is defined as the position of the center of the dowel bar in relation to the sawed joint. The maximum allowable longitudinal translation (side shift) is 2 inches.

Horizontal translation is defined as difference in the actual dowel bar location from its theoretical position as detailed in the standard details. The maximum allowable horizontal translation is 2 inches.

Vertical translation (depth) is the difference in the actual dowel bar location from the theoretical midpoint of the slab. The maximum allowable vertical translation is 1/2 inch higher than the theoretical midpoint, and 1 inch lower than the theoretical midpoint.

Dowel bar misalignment, either vertical tilt or horizontal skew, is defined as the difference in position of the dowel bar ends with respect to each other. Vertical tilt is measured in the vertical axis whereas horizontal skew is measured in the horizontal axis.

If a dowel bar inserter is used, determine a joint score for each joint scanned. The joint score is a measure of combined effects from the dowel's horizontal skew or vertical tilt. The joint score is determined by summing the product of the weight (shown in the table below) and the number of bars in each misalignment category and adding 1. The vertical tilt and horizontal skew should be evaluated and the greater misalignment shall be utilized in determining the joint score. If two lanes are poured simultaneously, the joint score is calculated for the 24 foot section.

| Misalignment Category, mm | Weight |
|---|---|
| 0 <= d <= 15 | 0 |
| 15< d <= 20 | 2 |
| 20< d <= 25 | 4 |
| 25 < d <= 38 | 5 |
| 38 <= d | 10 |

where d is the individual dowel bar misalignment.

A joint that has a joint score of 10 or greater will be considered locked.

When a locked joint as defined above is discovered, scan the two joints immediately adjacent to the locked joint. If either of the adjacent joints are deemed to be locked, provide a written proposal to address the dowel misalignment for each locked joint. No corrective action should be performed without written approval.

Any and all corrective action necessitated by improper joint alignment shall be at no cost to the Department.

**Page 7-9, Article 700-13 USE OF NEW PAVEMENT OR SHOULDER,** delete the Article in its entirety and substitute the following:

**700-13 USE OF NEW PAVEMENT OR SHOULDER**

Traffic or other heavy equipment will not be allowed on the concrete pavement or shoulder until the estimated compressive strength of the concrete using the maturity method has exceeded 3,000 psi unless otherwise permitted.

Estimate the compressive strength of concrete pavement in accordance with the most current version of ASTM C 1074 Standard Practice for Estimating Concrete Strength by the Maturity Method unless otherwise specified herein.

Furnish thermocouples or thermistors and digital data logging maturity meters that automatically compute and display the maturity index in terms of a temperature-time factor. The maturity meters must be capable of storing a minimum of 28 days worth of data and exporting data into an excel spreadsheet. Submit the proposed equipment to the Engineer for approval.

When establishing a strength-maturity relationship, perform compressive tests at ages 1, 3, 7, 14 and 28 days in accordance with AASHTO Test Method T22.

Use the temperature-time factor maturity function to compute the maturity index from the measured temperature history of the concrete. Set the datum temperature at –10°C to calculate the temperature-time factor in Equation 1 of ASTM C 1074.

Establish and submit a strength-maturity relationship in conjunction with each concrete pavement mix design. Determine the temperature-time factor corresponding to the strength-maturity relationship at 3,000 psi, TTF. Any changes to plant operations, material sources, or mix proportions will affect the strength-maturity relationship. If any changes occur during production, develop a new strength-maturity relationship unless otherwise directed.

Verify the strength-maturity relationship during the first day's production. Utilize the temperature-time factor developed at mix design TTF to verify the production strength-maturity relationship. Verify the strength-maturity relationship at a minimum of every 10 calendar days or when production is suspended for more than 10 days. If the verification sample's compressive strength when tested at TTF is less than 3,000 psi, immediately suspend early opening of traffic on pavement that has not obtained TTF until a new strength-maturity relationship is developed.

No permanent traffic will be allowed on the pavement until construction of the joints, including all sawing, sealing, and curing that is required, has been completed.

Take particular care to protect the exposed pavement edges and ends.

**Page 7-11, Subarticle 700-15(E), Flexural Strength,** delete the Subarticle and replace with the following:

### (E) Compressive Strength

Determine the compressive strength of concrete using one set of two 6"' x 12" cylinders at 28 calendar days. Test samples will be made by the Engineer from the concrete as it comes from the mixer. The samples will be made and cured in accordance with AASHTO T 23. Test specimens will be tested by the Engineer in accordance with AASHTO T 22. Furnish curing facilities for the test samples in accordance with Section 725.

**Page 7-11, Subarticle 700-15(F), Thickness,** replace the first and second paragraphs with the following:

The thickness of the pavement will be determined by measurement of cores in accordance with AASHTO T 148.

Take 4-inch diameter cores in the presence of the Engineer. Take the cores when the concrete has attained a compressive strength of at least 3,000 psi and at least 72 hours have elapsed since placement of the pavement. If the concrete has not attained a compressive strength of at least 3,000 psi, the gross vehicle weight rating of vehicles supporting the coring operation may not exceed 7,000 pounds. Take cores no later than 30 days after the pavement has been placed. The core locations for each lot will be selected at random by the Engineer.

Patch all core holes within 72 hours of taking the core, using a Department approved nonshrink grout compatible with the pavement or shoulder concrete.

## SECTION 710
## CONCRETE PAVEMENT

**Page 7-12. Article 710-1 Description,** 1st sentence

Insert *and cylinders* after the words *test beams*

Insert *verifying dowel bar alignment*; after the words *sealing joints*;

**Page 7-12. Article 710-3 COMPOSITION OF CONCRETE**, after the first paragraph, insert the following:

Design all concrete pavement mixes in accordance with the Shilstone Design method.

Prior to placement, concrete produced by the plant must demonstrate that it is represented by the mix design submitted. The Engineer will make compressive and flexural samples from plant produced mix for testing at 1, 3, 7, 14 and 28 days of age. The strength results must be within 10% of the strengths reported by the Contractor during the mix design process. If the plant produced mix meets this criteria at 14 days of age, the Engineer will notify the Contractor that placement of concrete may commence.

If any major change as defined in section 1000-3 is made to the mix design, the process shall be initiated again.

**Page 7-12. Article 710-4 ACCEPTANCE OF CONCRETE,** delete the first sentence and replace with the following:

Test the concrete pavement for acceptance with respect to compressive strength and thickness on a lot by lot basis in accordance with the requirements of Article 700-15 and the following requirements:

For all concrete pavement, including mainline, shoulders, ramps, tapers, intersections, entrances, crossovers, and irregular areas not otherwise defined, produce a lot consisting of 1,333.3 square yards or fraction thereof placed within 28 calendar days. From each lot, make a minimum of one set of two 6” x 12" cylinders from a randomly selected batch of concrete. The average compression strength of the two cylinders is considered one test. If Division of Highways personnel make and test additional sets of cylinders for a lot, these sets will be averaged with the original set to determine the strength. In the case of low strength, the Engineer will perform an investigation.

**Page 7-13, Article 710-6, Finishing**, if the full diamond grind option is proposed, then delete the third and fourth paragraphs of this Article and substitute the following:

> Following the finishing of the pavement by screeding, floating, and checking with straightedges, further finish the surface to provide a uniform texture utilizing an Astroturf drag. Pull the Astroturf drag in the longitudinal direction.

**Page 7-13, Article 710-6 Finishing**, insert the following at the end of the 6th paragraph.

> Provide a textured surface with an average texture depth of 0.8 mm as tested in accordance with ASTM E 965 (*Test Method for Measuring Pavement Macrotexture Depth Using a Sand Volumetric Technique*) with no single test having a texture depth of 0.5 mm or less. Perform four randomly located tests in accordance with ASTM E 965 within the initial pavement lot of each mobilization and provide test results to the Engineer. A lot is defined in Article 710-4. If the average of the four tests does not meet the above criteria, make appropriate changes to the surface texture operations and test the next lot as detailed above. Once the surface texture process is established to meet minimum texture requirements, maintain consistency within the operation to provide the above minimum texture depth. Perform additional sand patch tests in accordance with ASTM E 965 when directed.
>
> Should the surface texture become damaged or reduced by rain, or any other action, reestablish or restore surface texture by an approved method.
>
> The Design-Build Team has the option of longitudinally tining the concrete pavement provided an acceptable method and special provision is submitted and approved by the NCTA.

**Page 7-14, Article 710-7, Final Surface Testing**, delete this Article and substitute the following:

> Perform final surface smoothness testing of Portland cement concrete pavement in accordance with the Standard Special Provision titled “International Roughness Index (IRI).”
>
> If 25% of the test lots for Portland cement concrete pavement mainline lanes, collectors, auxiliary lanes, acceleration and deceleration lanes greater than 1000 feet in length require corrective action, then perform 100% diamond grinding of all Portland cement concrete pavement.

**Page 7-15, Article 710-9 Thickness Tolerances**, delete the 4th and 5th paragraph and substitute with the following:

> When the measurement of the core from a lot is deficient by 0.2" or less from the plan thickness, full payment will be made. When such measurement is deficient by more than

0.2" from the plan thickness, take 2 additional cores at random within the lot and calculate the average thickness of the lot from the 3 cores.

In determining the average thickness of the pavement lot, the Engineer will use all 3 core measurements. Individual core measurements which are greater than the plan thickness plus 0.2" will be considered as the plan thickness plus 0.2". Individual cores which are less than the plan thickness minus 1.0" will be considered as the plan thickness minus 1.0 inch. If the average measurement of the 3 cores is within 0.2" from the plan thickness, full payment will be made. If the average measurement of the 3 cores is deficient by more than 0.2" from the plan thickness, an adjusted unit price in accordance with Subarticle 710-10(B) will be paid for the lot represented.

Areas found deficient in thickness by more than 1.0" will be removed and replaced with concrete of the thickness shown on the plans. Any full lane or full shoulder width repairs to the concrete pavement must be performed in accordance with the North Carolina Department of Transportation Partial and Full Depth Repair Manual and not be less than 1/2 of the panel length (7.5 feet)

When the measurement of any core (original core or additional cores taken to calculate the average) is less than the plan thickness by more than 1.0", the extent of the removal area due to thickness deficiency will be determined by taking additional exploratory cores at approximately 10 foot intervals parallel to the center line in each direction from the deficient core until an exploratory core is found in each direction which is within 1.0” of the plan thickness. The pavement between these exploratory cores will be removed full lane width wide and replaced with concrete of the thickness shown on the plans. Exploratory cores for deficient thickness will not be used in averages for adjusted unit price.

Patch all core holes within 72 hours of taking the core, using a Department approved nonshrink grout compatible with the pavement concrete.

**Page 7-16, Subarticle 710-10 (A) GENERAL**, delete the second paragraph and substitute the following:

Separate measurement will be made of pavement that is deficient in thickness by more than 0.2" and of pavement that is deficient in compressive strength.

**Page 7-17, Subarticle 710-10 (C) Concrete Pavement Varying in Flexural Strength**, delete the title, first paragraph and the equation for the pay factor calculation and substitute the following:

**(C) Concrete Pavement Varying In Compressive Strength**

The pay factor for pavement achieving a compressive strength in 28 days of 4,500 psi or greater is 100%. The pay factor for pavement achieving a compressive strength in 28 days between 3000 psi and 4,500 psi is determined by the following formula:

Pay Factor (%) = 0.0333(PSI) - 50

(pay factor rounded to nearest tenth of one percent)

**Page 7-17, Subarticle 710-10 (C) Concrete Pavement Varying in Flexural Strength**, delete the first sentence of the third paragraph and substitute the following:

Any pavement that fails to attain 3,000 psi in compression is subject to removal.

**Page 7-19, Article 720-4 ACCEPTANCE OF CONCRETE**, delete the first sentence and substitute the following:

Concrete shoulders will be tested for acceptance with respect to compressive strength and thickness on a lot by lot basis.

**Page 7-19, Subarticle 720-9**, **Thickness Tolerances**, replace the first paragraph with the following:

The thickness of the shoulder will be determined by measurement of cores in accordance with AASHTO T 148.

**Page 7-20, Subarticle 720-10 (C) Concrete Shoulder Varying in Flexural Strength,** delete the title and the first sentence of the second paragraph and substitute the following, respectively:

**(C) Concrete Shoulder Varying in Compressive Strength**

The quantities of concrete shoulder that fail to meet 4,500 psi, measured as provided in Article 710-10, will be paid for at an adjusted unit price per square yard, completed in place and accepted.

## SECTION 725
## FIELD LABORATORY FOR PORTLAND CEMENT CONCRETE PAVEMENT

**Page 7-21, Subarticle 725-2, General Requirements**, replace with the following:

Furnish and maintain for the exclusive use of the Engineer a field office and laboratory in which to house and use all testing equipment needed. Only Department representatives will have access to these facilities. Provide a field office that is dust and water tight, floored, and has an adequate foundation so as to prevent excessive floor movement. Provide a field office that contains 6 or more 110 volt electrical double outlets properly grounded and spaced; a telephone; at least 2 windows, satisfactory locks on all doors and windows; adequate lighting, heating, and air conditioning; sink; running water to sink; and satisfactory exhaust fan. Provide a field office that meets the following approximate minimum requirements: 200 square feet of floor space; 10 feet interior width; 6 feet 6 inches interior height; 20 square feet of counter space, 2.5 to 3 feet high and 2 feet deep with cabinets or drawers below the counter top; and 6 square feet of desk space not enclosed with cabinets. Locate the office in a position that will permit full view of the plant from the interior of the office. At or near the office, furnish toilet facilities, with waste

disposal, available for use of the Department personnel. Maintain these toilets in a neat and clean condition.

Provide a laboratory trailer adjacent to the field office that is at least 400 square feet in area, approximately 20 feet wide, 20 feet long, and 7 feet in height. Provide a laboratory trailer that contains 6 or more 110 volt electrical double outlets properly grounded and spaced; satisfactory locks on all doors and windows; adequate lighting, heating, and air conditioning; sink; running water to sink; and satisfactory exhaust fans. Provide two workbenches that are approximately 10 feet long, 2 feet wide, and 2.5 feet high. One workbench shall be installed inside the trailer and the other across the end of the trailer. Provide a shelter or roof over the outside workbench to provide protection from weather. Provide, in the laboratory, an adequate number of water storage tanks to hold all acceptance beams and cylinders and any additional beams and cylinders made for the purpose of determining early strengths. Construct the water storage tanks of non-corroding materials and have requirements for automatic control of the water temperature. Maintain the water in the tank at a temperature of 73° F ± 3° F. Equip each tank with a recording thermometer with its bulb located in the water. Provide sufficient tank volume to maintain all beams and cylinders, stored with the long axis vertical, in a fully submerged condition for the duration of the required curing period. Furnish a wooden mixing board at least 3/4 inch thick and approximately 4 feet wide and 4 feet long, that is covered on one side with sheet metal of at least 22 gage, at the shelter. Provide facilities to maintain the test beams and cylinders at temperature between 60° F and 80° F during initial curing.

## SECTION 1000
## PORTLAND CEMENT CONCRETE PRODUCTION AND DELIVERY

**Page 10-2, Subarticle 1000-3(A) Composition and Design**, delete the Subarticle and substitute the following:

Submit concrete paving mix design in terms of saturated surface dry weights on M&T Form 312U for approval a minimum of 30 days prior to proposed use. Use a mix that contains a minimum of 526 pounds of cement per cubic yard, a maximum water cement ratio of 0.559, an air content in the range of 4.5 to 5.5 percent, a maximum slump of 1.5" and a minimum flexural strength of 650 psi and a minimum compressive strength of 4,500 psi at 28 days.

The cement content of the mix design may be reduced by a maximum of 20% and replaced with fly ash at a minimum rate of 1.2 pounds of fly ash to each pound of cement replaced. Use a maximum water-cementitious material ratio not to exceed 0.538.

The cement content of the mix design may be reduced by a maximum of 50% and replaced with blast furnace slag pound for pound.

Include in the mix design the source of aggregates, cement, fly ash, slag, and admixtures; the gradation and specific gravity of the aggregates; the fineness modulus (F.M.) of the fine aggregate; and the dry rodded unit weight and size of the coarse aggregate. Submit test results showing that the mix design conforms to the criteria, including the 1, 3, 7, 14 and 28-day strengths of the average of two beams and the average of two cylinders for each age made and

tested in accordance with AASHTO R39, T22 and T97. Design the mix to produce an average strength sufficient to indicate that a minimum strength of 650 psi in flexure and 4,500 psi in compression will be achieved in the field within 28 days.

If any change is made to the mix design, submit a new mix design.

If any major change is made to the mix design, also submit new test results showing the mix design conforms to the criteria. A major change to the mix design is defined as:

1) A source change in Coarse aggregate, Fine aggregate, Cement or Pozzolan (applies only to a change from one type of pozzolan to another; e.g., Class F fly ash to Class C fly ash)

2) A quantitative change in Coarse aggregate (applies to an increase or decrease greater than 5 %), Fine aggregate (applies to an increase or decrease greater than 5 %), Water (applies to an increase only), Cement (applies to a decrease only), Pozzolan (applies to a decrease only).

Where concrete with a higher slump for hand methods of placing and finishing is necessary, submit an adjusted mix design for approval to provide a maximum slump of 3" and to maintain the water-cementitious material ratio established by the original mix design.

**Page 10-6, Table 1000-1**, under column titled “Minimum compressive Strength at 28 days, psi”, in row titled “Pavement”, delete “560 flexural” and substitute “4,500”

## DIAMOND GRINDING CONCRETE PAVEMENT

The operations detailed in this special provision will take effect if the design build team elects to diamond grind the completed concrete pavement surface or is required to diamond grind due to excessive corrective action to achieve a satisfactory International Roughness Index (IRI) in accordance with the Standard Special Provisions.

Perform the work covered by this provision including but not limited to diamond grinding and regrinding concrete pavement to meet final smoothness IRI testing requirements, evaluating existing concrete pavement and aggregate properties, selecting diamond tipped saw blades and configuration of cutting head; continual removal of residual slurry from pavement and disposal; providing necessary traffic control; furnishing all labor, materials, supplies, tools, equipment and incidentals as necessary.

Use equipment with diamond tipped saw blades gang mounted on a power driven self propelled machine with a minimum wheel base length of 15 feet (4.6 meter) that is specifically designed to smooth and texture portland cement concrete pavement. Utilize equipment that does not cause ravels; aggregate fracture; spalls or disturbance to the longitudinal or transverse joints; or damage and/or strain to the underlying surface of the pavement. Should any of the above problems occur immediately suspend operations.

Provide a minimum 3 feet (1 meter) wide grinding head with 50 (164) to 60 (200) evenly spaced grooves per foot (meter). Prior to designing the grinding head, evaluate the aggregate hardness

of the concrete pavement and select the appropriate diamond size, diamond concentration and bond hardness for the individual saw blades.

Provide vacuuming equipment to continuously remove slurry residue and excess water from the pavement as part of the grinding operation. Transport slurry material and properly dispose of this material. Do not allow the slurry material to flow into a travel lane occupied by traffic or into any drainage facility, tributary, or waterway.

Grind the pavement surface to a uniform appearance with a high skid resistant longitudinal corduroy type texture. Provide grooves between 0.09 (2.28mm) and 0.15 (3.81mm) inches wide with the land area between the grooves between 0.06 (1.52mm) and 0.13 (3.30mm) inches wide. Ensure a ridge peak of approximately 0.0625 inches (1.59mm) higher than the bottom of the grooves.

Begin and end diamond grinding at lines normal to the pavement centerline. Grind only in the longitudinal direction. All grooves and adjacent passes shall be parallel to each other with no variation. Completely lap adjacent passes with no unground surface remaining between passes and no overlap of more than 1 1/2 inches (35 mm). Adjacent passes shall be within 1/8 inch (10mm) of the same height as measured with a 3 foot (0.914meter) straightedge. Maintain positive cross-slope drainage for the duration of the grinding operation.

Grind all travel lanes to include auxiliary lanes, ramps and loops with not less than 98 percent of the specified surface being textured by grinding. Grinding of the bridge decks and concrete shoulders will not be required. Remove a minimum 0.0625 inches at all locations except dips. Extra grinding to eliminate minor depressions is not required. There shall be no ridge between lanes. In a separate operation, transition the grinding of any remaining ridges greater than 1/8 inch (10 mm) in height on the outside edge next to the shoulder or at a tie to an existing facility to the satisfaction of the Engineer.

## SUBSURFACE DRAINAGE

(7-20-10) DB8 R05

Revise the *2006 Standard Specifications for Roads and Structures* as follows:

**Page 8-13, Delete Section 815 SUBSURFACE DRAINAGE** and replace it with the following:

### Description

The Design-Build Team shall construct subsurface drains, underdrains, blind drains and other types of drains where groundwater is within 6 feet of subgrade. Install markers to locate concrete pads for drains. This provision does not apply to shoulder drains.

### Materials

Refer to Division 10 of the *Standard Specifications.*

| Item | Section |
|---|---|
| Portland Cement Concrete, Class B | 1000 |
| Select Material, Class V | 1016 |
| Subsurface Drainage Materials | 1044 |
| Filter Fabric for Subsurface Drains, Type 1 | 1056 |
| Steel Markers | 1072-4 |
| Steel Marker Paint | 1080-14 |
| Pavement Marker Paint | 1087 |

Use Class B Concrete for concrete pads and Class V Select Material for subdrain coarse aggregate. Provide subdrain coarse aggregate for subsurface drains and subdrain fine aggregate for underdrains and blind drains.

**Construction Methods**

Do not leave filter fabrics uncovered for more than 7 days. Excavate trenches as necessary in accordance with the contract or as directed by the Engineer. For subsurface drains, line trench with filter fabric and overlap fabric ends a minimum of 6” on top of subdrain coarse aggregate.

Install blind drains at a depth of 4 to 6 ft below subgrade elevation. Install subdrain pipes for subsurface drains and underdrains at a depth of 4 to 6 ft below subgrade elevation unless the subgrade will be proof rolled. For subsurface drains and underdrains in subgrades that will be proof rolled, install subdrain pipes at a depth of 6 ft below subgrade elevation. Firmly connect subdrain pipes together as needed. Place perforated subdrain pipes with perforations down except for pipes in dry materials, in which case turn perforations up or use non-perforated pipes. For concrete pipes in dry materials, construct mortar joints in accordance with Subarticle 300-6(A) of the *Standard Specifications*.

Place subdrain aggregate beneath, around and over subdrain pipes such that pipes are covered by at least 6” of aggregate unless shown otherwise on the plans. Do not displace or damage subdrain pipes while placing and compacting subdrain aggregate. Lightly compact backfill material such that settlement is minimized.

Use solvent cement for connecting polyvinyl chloride (PVC) outlet pipes and fittings such as wyes, tees and elbows. Provide connectors for outlet pipes and fittings that are watertight and suitable for gravity flow conditions. Cover open ends of outlet pipes with rodent screens as shown on the plans.

Connect drains to concrete pads or existing drainage structures at ends of outlet pipes. Construct concrete pads and provide an Ordinary Surface Finish in accordance with Subarticle 825-6(B) of the *Standard Specifications*. Furnish and install steel and pavement markers at concrete pads as shown on the plans.

Allow drains to function for up to 30 days or a sufficient time as determined by the Engineer before undercutting, proof rolling or constructing embankments over drains.

## GUARDRAIL ANCHOR UNITS, TYPE M-350

(04-20-04) DB8 R60

### Description

Furnish and install guardrail anchor units in accordance with the details in the plans developed by the Design-Build Team, the applicable requirements of Section 862 of the 2006 *Standard Specifications for Roads and Structures*, and at locations shown in the plans.

### Materials

The Design Build Team may, at his option, furnish any one of the following guardrail anchor units.

The guardrail anchor unit (SRT-350) as manufactured by:

TRINITY INDUSTRIES, INC.
2525 N. STEMMONS FREEWAY
DALLAS, TEXAS 75207
TELEPHONE: 800 644-7976

The guardrail anchor unit (FLEAT) as manufactured by:

ROAD SYSTEMS, INC.
3616 OLD HOWARD COUNTY AIRPORT
BIG SPRINGS, TEXAS 79720
TELEPHONE: 915-263-2435

The guardrail anchor unit (REGENT) as manufactured by:

ENERGY ABSORPTION SYSTEMS, INC.
ONE EAST WACKER DRIVE
CHICAGO, ILLINOIS 60601-2076
TELEPHONE: 888-32-ENERGY

Prior to installation the Design Build Team shall submit to the Engineer:

1. FHWA acceptance letter for each guardrail anchor unit certifying it meets the requirements of NCHRP Report 350, Test Level 3, in accordance with Section 106-2 of the 2006 *Standard Specifications for Roads and Structures.*

2. Certified working drawings and assembling instructions from the manufacturer for each guardrail anchor unit in accordance with Section 105-2 of the 2006 *Standard Specifications for Roads and Structures*.

No modifications shall be made to the guardrail anchor unit without the express written permission from the manufacturer. Perform installation in accordance with the details in the plans, and details and assembling instructions furnished by the manufacturer.

**Construction**

Guardrail end delineation is required on all approach and trailing end sections for both temporary and permanent installations. Guardrail end delineation consists of yellow reflective sheeting applied to the entire end section of the guardrail in accordance with Section 1088-3 of the 2006 *Standard Specifications for Roads and Structures* and is incidental to the cost of the guardrail anchor unit.

## GUARDRAIL ANCHOR UNITS, TYPE 350

(04-20-04) DB8 R65

**Description**

Furnish and install guardrail anchor units in accordance with the details in the plans as developed by the Design-Build Team, the applicable requirements of Section 862 of the 2006 *Standard Specifications for Roads and Structures*, and at locations shown in the plans.

**Materials**

The Design-Build Team may at his option, furnish any one of the guardrail anchor units.

Guardrail anchor unit (ET-2000) as manufactured by:

TRINITY INDUSTRIES, INC.
2525 N. STEMMONS FREEWAY
DALLAS, TEXAS 75207
TELEPHONE: 800-644-7976

The guardrail anchor unit (SKT 350) as manufactured by:

ROAD SYSTEMS, INC.
3616 OLD HOWARD COUNTY AIRPORT
BIG SPRING, TEXAS 79720
TELEPHONE: 915 263-2435

Prior to installation the Design-Build Team shall submit to the Engineer:

1. FHWA acceptance letter for each guardrail anchor unit certifying it meets the requirements of NCHRP Report 350, Test Level 3, in accordance with Section 106-2 of 2006 *Standard Specifications for Roads and Structures*.

2. Certified working drawings and assembling instructions from the manufacturer for each guardrail anchor unit in accordance with Section 105-2 of the 2006 *Standard Specifications for Roads and Structures*.

No modifications shall be made to the guardrail anchor unit without the express written permission from the manufacturer. Perform installation in accordance with the details in the plans, and details and assembling instructions furnished by the manufacturer.

**Construction**

Guardrail end delineation is required on all approach and trailing end sections for both temporary and permanent installations. Guardrail end delineation consists of yellow reflective sheeting applied to the entire end section of the guardrail in accordance with Section 1088-3 of the 2006 *Standard Specifications for Roads and Structures* and is incidental to the cost of the guardrail anchor unit.

## IMPACT ATTENUATOR UNITS, TYPE 350

(04-20-04) (Rev. 7-18-06) 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 and at locations shown in the plans.

**Materials**

NON-GATING IMPACT ATTENUATOR UNITS:

The impact attenuator unit (QUADGUARD) as manufactured by:

ENERGY ABSORPTION SYSTEMS, INC.
ONE EAST WACKER DRIVE
CHICAGO, ILLINOIS 60601-2076
TELEPHONE: 312-467-6750

The impact attenuator unit (TRACC) as manufactured by:

TRINITY INDUSTRIES, INC.
2525 N. STEMMONS FREEWAY
DALLAS, TEXAS 75207
TELEPHONE: 1-800-644-7976

GATING IMPACT ATTENUATOR UNITS:

The impact attenuator unit (BRAKEMASTER) as manufactured by:

ENERGY ABSORPTION SYSTEMS, INC.
ONE EAST WACKER DRIVE
CHICAGO, ILLINOIS 60601-2076
TELEPHONE: 312-467-6750

The impact attenuator unit (CAT) as manufactured by:

TRINITY INDUSTRIES, INC.
2525 N. STEMMONS FREEWAY
DALLAS, TEXAS 75207
TELEPHONE: 1-800-644-7976

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 Section 106-2 of the 2006 *Standard Specifications for Roads and Structures.*

2. Certified working drawings and assembling instructions from the manufacturer for each impact attenuator unit in accordance with Section 105-2 of the 2006 *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, 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 one of the NON-GATING Impact Attenuator Units listed in the Materials Section herein.

If the median width is greater than 40 feet, the Design-Build Team may use any of the GATING or NON-GATING Impact Attenuator Units listed in the Materials Section herein.

**FENCE:**
(3-6-06) DB8 R86

Revise the *2006 Standard Specifications for Roads and Structures* as follows:

Page 8-54, Subarticle 866-3(A), second sentence,

Add *existing fencing* after stumps

## STREET SIGNS AND MARKERS AND ROUTE MARKERS

(7-1-95) DB9 R01

Move any existing street signs, markers, and route markers out of the construction limits of the project and install the street signs and markers and route markers so that they will be visible to the traveling public if there is sufficient right-of-way for these signs and markers outside of the construction limits.
Near the completion of the project and when so directed by the Engineer, move the signs and markers and install them in their proper location in regard to the finished pavement of the project.

Stockpile any signs or markers that cannot be relocated due to lack of right of way, or any signs and markers that will no longer be applicable after the construction of the project, at locations directed by the Engineer for removal by others.

The Design Builder will be responsible to the owners for any damage to any street signs and markers or route markers during the above described operations.

## PREFORMED SCOUR HOLE WITH LEVEL SPREADER APRON

(08-24-09) DB8 R105

### Description

Construct and maintain preformed scour holes with spreader aprons at the locations shown on the plans and in accordance with the details in the plans. Work includes excavation, shaping and maintaining the hole and apron, furnishing and placing filter fabric, rip rap (class as specified in the plans) and permanent soil reinforcement matting.

### Materials

| Item | Section |
|---|---|
| Plain rip rap | 1042 |
| Filter Fabric | 1056 |

The permanent soil reinforcement matting shall be permanent erosion control reinforcement mat and shall be constructed of synthetic or a combination of coconut and synthetic fibers evenly distributed throughout the mat between a bottom UV stabilized netting and a heavy duty UV stabilized top net. The matting shall be stitched together with UV stabilized polypropropylene thread to form a permanent three dimensional structure. The mat shall have the following minimum physical properties:

| *Property* | *Test Method* | *Value Unit* |
|---|---|---|
| Light Penetration | ASTM D6567 | 9 % |
| Thickness | ASTM D6525 | 0.40 in |
| Mass Per Unit Area | ASTM D6566 | 0.55 lb/sy |
| Tensile Strength | ASTM D6818 | 385 lb/ft |
| Elongation ( Maximum) | ASTM D6818 | 49 % |

| | | |
|---|---|---|
| Resiliency | ASTM D1777 | >70 % |
| UV Stability * | ASTM 4355 | ≥80 % |
| Porosity (Permanent Net) | ECTC Guidelines | ≥85 % |
| Maximum Permissible Shear Stress (Vegetated) | Performance Bench Test | ≥8.0 lb/ft$^2$ |
| Maximum Allowable Velocity (Vegetated) | Performance Bench Test | ≥16.0 ft/s |

*ASTM D1682 Tensile Strength and % strength retention of material after 1000 hours of exposure.

A certification (Type 1, 2, or 3) from the manufacturer showing:

(A) the chemical and physical properties of the mat used, and

(B) conformance of the mat with this specification will be required.

**Construction Methods**

All areas to be protected with the mat shall be brought to final grade and seeded in accordance with Section 1660 of the *Standard Specifications*. The surface of the soil shall be smooth, firm, stable and free of rocks, clods, roots or other obstructions that would prevent the mat from lying in direct contact with the soil surface. Areas where the mat is to be placed will not need to be mulched.

## CABLE GUIDERAIL:

(12-19-06) (Revised 11-29-07) DB8 R69

Revise the *2006 Standard Specifications for Roads and Structures* as follows:

**Page 8-51, Article 865-1 Description**, add the following as the second sentence of the first paragraph:

> Install additional double faced cable guiderail posts without cable at median hazards as shown in Roadway Standard Drawing No. 865.01 (Sheet 1 of 12)

**Page 8-52, Article 865-2 Materials**, add the following as the last paragraph:

Additional guiderail posts shall be double faced guiderail intermediate posts.

## DETECTABLE WARNINGS FOR PROPOSED WHEELCHAIR RAMPS;

(6-15-10) DB8 R126

**Description**

Construct detectable warnings consisting of integrated raised truncated domes on proposed concrete wheelchair ramps in accordance with the *2006 Standard Specifications for Roads and Structures*, plan details, the requirements of the *28 CFR Part 36 ADA Standards for Accessible Design* and this provision.

**Materials**

Detectable warning for proposed wheelchair ramps shall consist of integrated raised truncated domes. The description, size and spacing shall conform to Section 848 of the *2006 Standard Specifications for Roads and Structures.*

Use material for detectable warning systems as shown herein. Material and coating specifications must be stated in the Manufacturers Type 3 Certification and all Detectable Warning systems must be on the NCDOT Approved Product List for Wheelchair Ramps.

Install detectable warnings created from one of the following materials: precast concrete blocks or bricks, clay paving brick, gray or ductile iron castings, mild steel, stainless steel, and engineered plastics, rubber or composite tile. Only one material type for detectable warning will be permitted per project, unless otherwise approved by the Engineer.

**(A)** **Detectable Warnings shall** consist of a base with integrated raised truncated domes**,** and **when constructed of precast concrete** they shall conform to the material requirements of Article 848-2 of the *2006 Standard Specifications for Roads and Structures.*

**(B)** **Detectable Warnings shall** consist of a base with integrated raised truncated domes, and **may be comprised of other materials including but not limited to clay paving brick, gray iron or ductile iron castings, mild steel, stainless steel, and engineered plastics, rubber or composite tile**, which are cast into the concrete of the wheelchair ramps. The material shall have an integral color throughout the thickness of the material. The detectable warning shall include fasteners or anchors for attachment in the concrete and shall be furnished as a system from the manufacturer.

Prior to installation, the Contractor shall submit to the Engineer assembling instructions from the manufacturer for each type of system used in accordance with Article 105-2 of the *2006 Standard Specifications for Roads and Structures*. The system shall be furnished as a kit containing all consumable materials and consumable tools, required for the application. They shall be capable of being affixed to or anchored in the concrete ramp, including green concrete (concrete that has set but not appreciably hardened). The system shall be solvent free and contain no volatile organic compounds (VOC). The static coefficient of friction shall be 0.8 or greater when measured on top of the truncated domes and when measured between the domes in accordance with ASTM C 1028 (dry and wet). The system shall be resistant to deterioration due to exposure to sunlight, water, salt or adverse weather conditions and impervious to degradation by motor fuels, lubricants and antifreeze.

**(C)** When steel or gray iron or ductile iron casting products are provided, only products that meet the requirements of Article 106-1(B) of the *2006 Standard Specifications for Roads and Structures* may be used. Submit to the Engineer a Type 6 Certification, catalog cuts and installation procedures at least 30 days prior to installation for all.

**Construction Methods**

**(A)** Prior to placing detectable warnings in proposed concrete ramps, adjust the existing subgrade to the proper grade and in accordance with Article 848-3 of the *2006 Standard Specifications for Roads and Structures*.

**(B)** Install all detectable warning in proposed concrete ramps in accordance with the manufacturer's recommendations.

**STEEL U-CHANNEL POSTS:**

(7-18-06) DB9 R02

Amend the *2006 Standard Specifications for Roads and Structures* as follows:

**Page 9-15 Subarticle 903-3(D) first paragraph, last sentence**, delete the last sentence and add the following:

Use posts of sufficient length to permit the appropriate sign mounting height. Spliced posts are not permitted on new construction.

**SHIPPING SIGNS:**

5-15-07 DB9 R03

Revise the 2006 *Standard Specifications for Roads and Structures* as follows:

**Page 9-2, Section 901-3(A), General**, add the following as the 7th paragraph:

Ship all multi-panel signs to the project intact, completely assembled and ready to be hung. Fabricate signs taller than 12 ft as 2 separate signs with a horizontal splice, ready to be spliced and hung. No assembly other than a horizontal splice will be permitted.

**GALVANIZED HIGH STRENGTH BOLTS, NUTS AND WASHERS**

(02-17-09) DB10 R02

Revise the *2006 Standard Specifications for Roads and Structures* as follows:

**Page 10-126, Subarticle 1072-7(F)(3)** Change the AASHTO reference to B 695 Class 55

**Page 10-247, Table 1092-2, Steel Sign Materials**, Change High Strength Bolts, Nuts & Washers ASTM Specifications for Galvanizing to B695 Class 55.

**Page 10-259, Subarticle 1094-1(A) Breakaway or Simple Steel Beam Sign Supports,** replace the third paragraph with the following:

> Fabricate high strength bolts, nuts, and washers required for breakaway supports from steel in accordance with ASTM A325 and galvanize in accordance with AASHTO B 695 Class 55.

**Page 10-261, Article 1096-2 Steel Overhead Sign Structures,** replace the last sentence with the following:

> The galvanizing shall meet the requirement of AASHTO B 695 Class 55 for fasteners and of ASTM A123 for other structural steel.

## GALVANIZING

(8-17-10) DB10 R03

Revise the *Standard Specifications* as follows:

**Page 10-150, Subarticle 1076-1, Galvanizing,** add a second paragraph as the follows:

Allow the Engineer to obtain samples of molten zinc directly from the galvanizing vat upon request.

## AGGREGATE PRODUCTION

(11-20-01) DB10 R05

Provide aggregate from a producer who utilizes the new Aggregate Quality Control/Quality Assurance Program that is in effect at the time of shipment.

No price adjustment is allowed to Design-Build Team or producers who utilize the new program. Participation in the new program does not relieve the producer of the responsibility of complying with all requirements of the *2006 Standard Specifications*. Copies of this procedure are available upon request from the Materials and Test Unit.

## CONCRETE BRICK AND BLOCK PRODUCTION

(11-20-01) DB10 R10

Provide concrete brick and block from a producer who utilizes the new Solid Concrete Masonry Brick / Unit Quality Control / Quality Assurance Program that is in effect on the date that material is received on the project.

No price adjustment is allowed to Design-Build Team or producers who utilize the new program. Participation in the new program does not relieve the producer of the responsibility of complying with all requirements of the *2006 Standard Specifications*. Copies of this procedure are available upon request from the Materials and Test Unit.

## QUALIFICATION OF WELDS AND PROCEDURES

(06-3-09) DB 10 R43

**Page 10-143, Subarticle 1072-20(D) Qualification of Welds and Procedures**, replace the third sentence of the first paragraph with the following:

For all prequalified field welds, submit Welding Procedure Specifications (WPS) for each joint configuration for approval at least 30 days prior to performing any welding. In lieu of this, use

the WPS provided and preapproved by the Department. These preapproved WPS are available from the Materials and Tests Unit or at:

http://www.ncdot.org/doh/operations/materials/structural/appr_proc.html.

Use non-prequalified welds only if approved by the Engineer. Submit WPS for all non-prequalified welds to the Engineer for approval. At no cost to the Department, demonstrate their adequacy in accordance with the requirements of the Bridge Welding Code.

**EXCAVATION, TRENCHING, PIPE LAYING & BACKFILLING FOR UTILITIES**
(2-17-09) DB15 R001

Revise the *2006 Standard Specifications for Roads and Structures* as follows:

**Page 15-5, Article 1505-4 Repair of Pavements, Sidewalks and Driveways, first paragraph, add at the end of the first sentence**

in accordance with Section 848.

**PAINT SAMPLING AND TESTING:**
(8-15-06) DB10 R 45

Revise the *2006 Standard Specifications for Roads and Structures* as follows:

**Page 10-190, Article 1080-4, Delete the first paragraph and replace with the following:**

All paint will be sampled, either at the point of manufacture or at the point of destination. Inspection and sampling will be performed at the point of manufacture wherever possible. The Design-Build Team shall not begin painting until the analysis of the paint has been performed, and the paint has been accepted.

**GLASS BEADS**
(7-18-06) DB10 R35

Revise the *2006 Standard Specifications for Roads and Structures* as follows:

**Page 10-223, 1087-4(C) Gradation & Roundness**

Replace the second sentence of the first paragraph with the following:

*All Drop-On and Intermixed Glass Beads shall be tested in accordance with ASTM D1155.*

Delete the last paragraph.

## CHANGEABLE MESSAGE SIGNS

(11-21-06) DB11 R 11

Revise the 2006 *Standard Specifications for Roads and Structures* as follows:

**Page 11-9, Article 1120-3, Replace the 3rd sentence with the following:**

Sign operator will adjust flash rate so that no more than two messages will be displayed and be legible to a driver when approaching the sign at the posted speed.

## ENGINEERING FABRICS TABLE 1056-1

(7-18-06) (Rev 12-21-09) DB10 R40

Revise the 2006 *Standard Specifications for Roads and Structures* as follows:

**Page 10-100, Table 1056-1, replace the values for Trapezoidal Tear Strength with the following:**

| **Physical Property** | **ASTM Test Method** | **Type 1** | **Type 2** | **Type 3** | | **Type 4** |
|---|---|---|---|---|---|---|
| | | | | **Class A** | **Class B** | |
| **Typical Applications** | | **Shoulder Drain** | **Under Riprap** | **Temporary Silt Fence** | | **Soil Stabilization** |
| Trapezoidal Tear Strength | D4533 | *45* lb | *75* lb | -- | -- | *75* lb |

## PORTABLE CONCRETE BARRIER

(2-20-07) DB10 R50

The 2006 *Standard Specifications for Roads and Structures* shall be revised as follows:

**Page 10-245, Article 1090-1(A) General, add the following after the first sentence:**

The requirement for approved galvanized connectors will be waived if the barrier remains the property of the Design-Build Team.

## CHANNELIZING DEVICES (Drums):

7-20-10 DB10 R60

Revise the *2006 Standard Specifications for Roads and Structures* as follows:

**Page 10-236, Subarticle 1089-5(A) Drums (1) General,** replace the paragraph with the following:

(1) General

Provide drums composed of a body, alternating orange and white 4 band pattern of Type III-High Intensity Microprismatic Sheeting and ballasts that have been evaluated by NTPEP.

The following guidelines will be used during the transition from drums with the standard 5 band engineer's grade sheeting to the new 4 band configuration.

(a) All **new** drums purchased **after July 20, 2010** shall have the new sheeting and 4 band configuration.

(b) Existing 5 band drums with engineer's grade sheeting (both new and used devices in existing inventories) will be allowed for use on all on-going construction projects until project completion and will also be allowed for use on other projects until a sunset date has been established.

(c) Intermixing of "old drums" and "new drums" on the same project is acceptable during the transition.

(d) 4 band drums with engineer's grade sheeting will not be allowed at anytime.

**Page 10-236, Subarticle 1089-5(A) Drums (3) Retroreflective Stripes,** replace the paragraph with the following:

(3) Retroreflective Bands

Provide a minimum of 4 retroreflective bands- 2 orange and 2 white alternating horizontal circumferential bands. The top band shall always be orange. Use a 6" to 8" wide band Type III-High Intensity Microprismatic Retroreflective Sheeting or better that meets the requirement of Section 1093 for each band. Do not exceed 2" for any non-reflective spaces between orange and white stripes. Do not splice the retroreflective sheeting to create the 6-inch band. Apply the retroreflective sheeting directly to the drum surface. Do not apply the retroreflective sheeting over a pre-existing layer of retroreflective sheeting. Do not place bands over any protruding corrugations areas. No damage to the reflective sheeting should result from stacking and unstacking the drums, or vehicle impact.

**Page 10-237, Subarticle 1089-5 (B) Skinny-Drums (1) General,** replace the paragraph with the following:

(1) General

All existing skinny-drums that do not have Type III-High Intensity Microprismatic Sheeting as a minimum will have the same transition requirements as drums as stated above. All **new** skinny-drums purchased **after July 20, 2010** shall have Type III-High

Intensity Microprismatic Sheeting as the minimum. Type IV and higher grade sheeting is acceptable for use on both new and used devices.

Provide skinny-drums composed of a body, reflective bands, and ballasts that have been evaluated by NTPEP.

**Page 10-237, Subarticle 1089-5 (B) Skinny Drums (3) Retroreflective Stripes,** replace the paragraph with the following:

(3) Retroreflective Bands

Provide a minimum of 4 retroreflective bands- 2 orange and 2 white alternating horizontal circumferential bands for each skinny-drum. The top band shall always be orange. Use a 6" to 8" wide band Type III-High Intensity Microprismatic Retroreflective Sheeting or better that meets the requirement of Section 1093 for each band. Do not exceed 2" for any non-reflective spaces between orange and white stripes. Do not splice the retroreflective sheeting to create the 6-inch band. Apply the retroreflective sheeting directly to the skinny-drum surface. Do not apply the retroreflective sheeting over a pre-existing layer of retroreflective sheeting. Do not place bands over any protruding corrugations areas. No damage to the reflective sheeting should result from stacking and unstacking the skinny-drums, or vehicle impact.

**PORTLAND CEMENT CONCRETE (Alkali-Silica Reaction)**
(2-20-07) DB10 R16

Revise the 2006 *Standard Specifications for Roads and Structures* as follows:

**Article 1024-1(A), replace the 2nd paragraph with the following:**

Certain combinations of cement and aggregate exhibit an adverse alkali-silica reaction. The alkalinity of any cement, expressed as sodium-oxide equivalent, shall not exceed 1.0 percent. For mix designs that contain non-reactive aggregates and cement with an alkali content less than 0.6%, straight cement or a combination of cement and fly ash, cement and ground granulated blast furnace slag or cement and microsilica may be used. The pozzolan quantity shall not exceed the amount shown in Table 1024-1. For mixes that contain cement with an alkali content between 0.6% and 1.0%, and for mixes that contain a reactive aggregate documented by the Department, regardless of the alkali content of the cement, use a pozzolan in the amount shown in Table 1024-1.

Obtain the list of reactive aggregates documented by the Department at:

http://www.ncdot.org/doh/operations/materials/pdf/quarryasrprob.pdf

| Table 1024-1<br>Pozzolans for Use in Portland Cement Concrete | |
|---|---|
| ***Pozzolan*** | ***Rate*** |
| Class F Fly Ash | 20% by weight of required cement content, with 1.2 lbs Class F fly ash per lb of cement replaced |
| Ground Granulated Blast Furnace Slag | 35%-50% by weight of required cement content with 1 lb slag per lb of cement replaced |
| Microsilica | 4%-8% by weight of required cement content, with 1 lb microsilica per lb of cement replaced |

## TEMPORARY SHORING

(09/25/07) DB11 R02

### Description

Design and construct temporary shoring in accordance with the contract. Temporary shoring includes standard shoring, temporary mechanically stabilized earth (MSE) walls and non-anchored temporary shoring. Trench boxes are not considered temporary shoring. "Standard shoring" refers to *standard temporary shoring* and *standard temporary MSE walls*. Notes on plans may restrict the use of one or both types of standard shoring. Notes on plans may also require or prohibit temporary MSE walls.

Unless noted otherwise on the plans, temporary shoring is required as shown on the plans and to maintain traffic. Temporary shoring to maintain 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 5 ft from the edge of pavement of the open travelway.

This provision is not applicable to anchored temporary shoring or the installation of pipes, drop inlets and utilities unless noted otherwise on the plans. Provide all shoring submittals before beginning work.

### Materials

#### (A) Certifications, Storage and Handling

Provide Type 7 Contractor's Certifications in accordance with Article 106-3 of the 2006 *Standard Specifications for Roads and Structures* for all shoring materials used with the exception of reinforcing fabrics and geogrids. Furnish Type 2 Typical Certified Mill Test Reports in accordance with Article 106-3 of the 2006 *Standard Specifications for Roads and Structures* for all seam strengths and reinforcing fabric and geogrid properties. Provide minimum average roll values (MARV) in accordance with ASTM D4759 for test reports. For testing reinforcing fabric and geogrids, a lot is defined as a single day's production.

Load, transport, unload and store shoring materials such that they are kept clean and free of damage. Identify, store and handle all geogrids and geotextile fabrics in accordance with ASTM D4873. Geogrids and fabrics with defects, flaws, deterioration or damage will be rejected. Do not leave fabrics or geogrids uncovered for more than 7 days.

**(B) Shoring Backfill**

Use shoring backfill for the construction of all temporary shoring including backfilling behind non-anchored temporary shoring and in the reinforced zone for temporary MSE walls. Unless backfilling around culverts, use shoring backfill that meets the requirements of Class II Type I, Class III, Class V or Class VI select material in accordance with Section 1016 of the 2006 *Standard Specifications for Roads and Structures* or AASHTO M145 for soil classification A-2-4 with a maximum plasticity index (PI) of 6. For backfilling around culverts, use shoring backfill as defined herein except for A-2-4 soil.

**(C) Non-anchored Temporary Shoring**

Use steel shapes, plates and piles that meet the requirements of ASTM A36 and steel sheet piles that meet the requirements of Article 1084-2 of the *Standard Specifications*. Use timber lagging with a minimum allowable bending stress of 1000 psi that meets the requirements of Article 1082-1 of the 2006 *Standard Specifications for Roads and Structures*. For standard temporary shoring, use pile sections and lengths and lagging sizes as shown on the plans.

**(D) Temporary MSE Walls**

Use welded wire reinforcement forms, facings, mesh and mats that meet the requirements of AASHTO M55 or M221. Use connector bars and wires for welded wire wall components and support struts that meet the requirements of AASHTO M32. For standard temporary MSE walls, use wire gauges, strut sizes and welded wire components as shown on the plans.

**(1) Geotextile Fabrics**

Use geotextile fabrics that meet the requirements of Article 1056-1 of the 2006 *Standard Specifications for Roads and Structures*.

**(a) Reinforcing Fabric**

The reinforcement direction (RD) is defined as the direction perpendicular to the wall face and the cross-reinforcement direction (CRD) is defined as the direction parallel to the wall face.

Use woven polyester or polypropylene fabric that meets the following properties:

| Property | Test Method | Requirement (MARV) |
|---|---|---|
| Wide Width Tensile Strength @ Ultimate (RD) | ASTM D4595 | Varies – 200 lb / in min |
| Wide Width Tensile Strength @ Ultimate (CRD) | ASTM D4595 | 100 lb / in min |
| Trapezoidal Tear Strength | ASTM D4533 | 100 lb min |
| CBR Puncture Strength | ASTM D6241 | 600 lb min |
| UV Resistance after 500 hrs | ASTM D4355 | 70 % |
| Apparent Opening Size (AOS), US Sieve | ASTM D4751 | 20 min – 70 max |
| Permittivity | ASTM D4491 | 0.20 $sec^{-1}$ |

For standard temporary MSE walls (temporary fabric wall) use reinforcing fabric wide width tensile strengths and lengths in the RD as shown on the plans.

**(b) Retention Fabric**

Retain shoring backfill at the face of temporary MSE walls with retention fabric. Use fabric that meets the requirements of Class 3 and the UV resistance, AOS and permittivity for separation geotextile in accordance with AASHTO M288.

**(2) SierraScape Temporary Wall**

Use uniaxial (UX) geogrids composed of high-density polyethylene (HDPE) manufactured by Tensar Earth Technologies. Test geogrids in accordance with ASTM D6637. Use connection rods manufactured by Tensar Earth Technologies to transfer the load between the facings and geogrids.

For standard temporary MSE walls (SierraScape temporary wall) use geogrid types and lengths as shown on the plans.

**(3) Terratrel Temporary Wall**

Use ribbed reinforcing steel strips manufactured by The Reinforced Earth Company that meet the requirements of ASTM A572, Grade 65. Use connector rods that meet the requirements of AASHTO M31, Grade 60 and hair pin connectors that meet the requirements of ASTM A1011, Grade 50. Use bolts, nuts and washers that meet the requirements of AASHTO M164.

For standard temporary MSE walls (Terratrel temporary wall) use ribbed steel strip size and lengths, rod lengths and diameters, hairpin connectors, bolts, nuts and washers as shown on the plans.

**Embedment**

"Embedment" is defined as the depth of shoring below the bottom of the excavation or the grade in front of the shoring. For cantilever shoring, embedment is the depth of the piling below the grade in front of the shoring. For temporary MSE walls, embedment is the difference between the grade elevation in front of the wall and the elevation of the bottom of the reinforced zone.

**Portable Concrete Barriers**

Provide portable concrete barriers in accordance with the plans and if shoring is located within the clear zone as defined in the *AASHTO Roadside Design Guide*. Use NCDOT portable concrete barriers (PCBs) in accordance with Roadway Standard Drawing No. 1170.01 and Section 1170 of the 2006 *Standard Specifications for Roads and Structures*. Use Oregon Tall F-Shape Concrete Barriers in accordance with detail drawing and special provision obtained from:

http://www.ncdot.org/doh/preconstruct/wztc/DesRes/English/DesResEng.html

The clear distance is defined as the horizontal distance from the back face of the barrier to the edge of pavement and the minimum required clear distance is shown on the traffic control plans. At the Contractor's option or if the minimum required clear distance is not available, set an unanchored PCB against the traffic side of the shoring and design shoring for traffic impact or use the "surcharge case with traffic impact" for the standard temporary shoring. An anchored PCB or Oregon barrier is required for barriers above and behind temporary MSE walls.

**Contractor Designed Shoring**

"Contractor designed shoring" is defined as non-anchored temporary shoring or temporary MSE walls designed by the Contractor. Unless prohibited or required, Contractor designed shoring is optional. Contractor designed shoring is required when notes on plans prohibit the use of standard shoring. Non-anchored Contractor designed shoring is prohibited when notes on plans require the use of temporary MSE walls and Contractor designed temporary MSE walls are prohibited when notes on plans prohibit the use of temporary MSE walls.

Before beginning design, survey the shoring location to determine existing elevations and actual design heights. Submit design calculations and drawings including typical sections for review and acceptance showing details of the proposed design and construction sequence in accordance with Article 105-2 of the 2006 *Standard Specifications for Roads and Structures*. Have shoring designed, detailed and sealed by a Professional Engineer registered in the State of North Carolina. Submit 3 hard copies of design calculations and 10 hard copies of drawings and an electronic copy (pdf or jpeg format on CD or DVD) of both the calculations and drawings.

Design non-anchored temporary shoring in accordance with the *AASHTO Guide Design Specifications for Bridge Temporary Works* and temporary MSE walls in accordance with the *AASHTO Allowable Stress Design Standard Specifications for Highway Bridges*. Use the following soil parameters for shoring backfill in the reinforced zone.

Total Unit Weight = 120 pcf
Friction Angle = 30 degrees
Cohesion = 0 psf

Design temporary shoring in accordance with the in-situ assumed soil parameters shown on the plans. Design shoring for a 3-year design service life and a traffic surcharge equal to 240 psf. This surcharge is not applicable for construction traffic. If a construction surcharge will be present within a horizontal distance equal to the height of the shoring, design the shoring for the required construction surcharge. If the edge of pavement or a structure to be protected is within a horizontal distance equal to the height of the shoring, design shoring for a maximum deflection of 3". Otherwise, design shoring for a maximum deflection of 6".

For non-anchored temporary shoring, the top of shoring elevation is defined as the elevation where the grade intersects the back face of the shoring. For traffic impact, apply 2 kips / ft to the shoring 1.5 ft above the top of shoring elevation. When designing for traffic impact, extend shoring at least 32" above the top of shoring elevation. Otherwise, extend shoring at least 6" above the top of shoring elevation.

**Standard Shoring**

Unless notes on plans prohibit the use of one or both types of standard shoring, standard shoring is optional. Submit a "Standard Temporary MSE Wall Selection Form" for each standard temporary MSE wall location and a "Standard Temporary Shoring Selection Form" for up to three standard temporary shoring locations. Submit selection forms at least 14 days before beginning shoring construction. Obtain standard shoring selection forms from:

http://www.ncdot.org/doh/preconstruct/highway/geotech/formdet/standards.html

**(A) Standard Temporary Shoring**

Determine the shoring height, traffic impact, groundwater condition and slope or surcharge case for each standard temporary shoring location. Determine the minimum required extension, embedment and sheet pile section modulus or H pile section from the plans for each location.

**(B) Standard Temporary MSE Walls**

Choose a standard temporary MSE wall from the multiple temporary MSE wall options shown in the plans. Do not use more than one option per wall location.

Step bottom of reinforced zone in increments equal to vertical reinforcement spacing for the wall option chosen. Determine the wall height and slope or surcharge case for each section of standard temporary MSE wall. With the exception of either the first or last section of wall, use horizontal section lengths in increments equal to the following for the wall option chosen.

| Standard Temporary MSE Wall Option | Increment |
|---|---|
| Temporary Fabric Wall | 9 ft min (varies) |
| Hilfiker Temporary Wall | 10 ft min (varies) |
| SierraScape Temporary Wall | 18 ft – 7 ¼ in |
| Retained Earth Temporary Wall | 24 ft |
| Terratrel Temporary Wall | 19 ft – 8 in |

Determine the appropriate facings and/or forms and reinforcement length, spacing, strength, type, density and/or size from the plans for each wall section.

**Construction Methods**

When using an anchored PCB, anchor the barrier in accordance with Roadway Standard Drawing 1170.01 and Section 1170 of the 2006 *Standard Specifications for Roads and Structures*. Control drainage during construction in the vicinity of temporary shoring. Collect and direct run off away from temporary MSE walls, shoring and shoring backfill.

**(A) Non-anchored Temporary Shoring**

Install and interlock sheet piling or install piles as shown on the plans or accepted submittals with a tolerance of 1/2 inch per foot from vertical. Contact the Engineer if the design embedment is not achieved. If piles are placed in drilled holes, perform pile excavation to the required elevations and backfill excavations with concrete and lean sand grout.

Remove grout as necessary to install timber lagging. Install timber lagging with a minimum bearing distance of 3” on each pile flange. Backfill voids behind lagging with shoring backfill.

Perform welding in accordance with the accepted submittals and Article 1072-20 of the 2006 *Standard Specifications for Roads and Structures*.

**(1) Pile Excavation**

Excavate a hole with a diameter that will result in at least 3” of clearance around the entire pile. 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 is not permitted to advance excavations. Blasting for core removal is permitted only when approved by the Engineer. Dispose of drilling spoils in accordance with Section 802 of the 2006 *Standard Specifications for Roads and Structures*. Drilling spoils consist of all excavated material including water removed from excavations by either pumping or drilling tools.

If unstable, caving or sloughing soils are encountered, stabilize excavations with clean watertight steel casing. Steel casings may be either sectional type or one continuous corrugated or non-corrugated piece. Provide casings 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.

Before placing concrete, check the water inflow rate in the excavation after any pumps have been removed. If the inflow rate is less than 6" 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 6" per half hour, propose and obtain approval of the concrete placement procedure before placing concrete.

Center the pile in the excavation and fill the excavation with Class A concrete in accordance with Section 1000 of the 2006 *Standard Specifications for Roads and Structures* except as modified herein. Provide concrete with a slump of 6 to 8 inches. Use an approved high-range water reducer to achieve this slump. Place concrete in a continuous manner to the bottom of shoring or the elevations shown on the accepted submittals. Fill the remainder of the excavation with a lean sand grout and remove all casings.

**(B) Temporary MSE Walls**

The Engineer may require a wall preconstruction meeting to discuss the construction and inspection of the temporary MSE walls. If required, conduct the meeting with the Site Superintendent, the Resident or Bridge Maintenance Engineer, the Bridge Construction Engineer and the Geotechnical Operations Engineer before beginning wall construction.

Perform all necessary clearing and grubbing in accordance with Section 200 of the 2006 *Standard Specifications for Roads and Structures*. Excavate as necessary as shown on the plans or accepted submittals. Notify the Engineer when foundation excavation is complete. Do not place shoring backfill or first reinforcement layer until obtaining approval of the excavation depth and foundation material.

If applicable, install foundations located within the reinforced zone in accordance with the plans or accepted submittals.

Erect and maintain facings and forms as shown on the plans or accepted submittals. Stagger vertical joints of facings and forms to create a running bond when possible unless shown otherwise on the plans or accepted submittals.

Place facings and forms as near to vertical as possible with no negative batter. Construct temporary MSE walls with a vertical and horizontal tolerance of 3" when measured with a 10 ft straight edge and an overall vertical plumbness (batter) and horizontal alignment of less than 6".

Place reinforcement at locations and elevations shown on the plans or accepted submittals and in slight tension free of kinks, folds, wrinkles or creases. Repair or replace any damaged reinforcement. Contact the Engineer when existing or future structures such as foundations, pavements, pipes, inlets or utilities will interfere with reinforcement. To avoid structures, deflect, skew and modify reinforcement.

Do not splice reinforcement in the reinforcement direction (RD), i.e., parallel to the wall face. Seams are allowed in the cross-reinforcement direction (CRD). Bond or sew adjacent reinforcing fabric together or overlap fabric a minimum of 18" with seams oriented perpendicular to the wall face.

Place shoring backfill in 8 to 10 inch thick lifts and compact in accordance with Subarticle 235-4(C) of the 2006 *Standard Specifications for Roads and Structures*. Use only hand operated compaction equipment within 3 ft of the wall face. Do not damage reinforcement when placing and compacting shoring backfill. End dumping directly on the reinforcement is not permitted. Do not operate heavy equipment on reinforcement until it is covered with at least 10" of shoring backfill. Do not use sheepsfoot, grid rollers or other types of compaction equipment with feet.

Cover reinforcing and retention fabric with at least 3" of shoring backfill. Place top reinforcement layer between 4 and 24 inches below top of wall as shown on the plans or accepted submittals.

Bench temporary MSE walls into the sides of excavations where applicable. If the top of wall is within 5 ft of finished grade, remove top form or facing and incorporate the top reinforcement layer into the fill when placing fill in front of the wall. Temporary MSE walls remain in place permanently unless required otherwise.

## PAVEMENT MARKING LINES

(11-21-06) (Rev. 8-17-10) DB 12 R001

Revise the 2006 *Standard Specifications for Roads and Structures* as follows:

**Page 12-2, 1205-3(D) Time Limitations for Replacement,** add the following at the beginning of the chart:

| Facility Type | Marking Type | Replacement Deadline |
|---|---|---|
| Full control of access multi-lane roadway (4 or more total lanes) and ramps, including Interstates | All markings including symbols | By the end of each workday's operation if the lane is opened to traffic |

**Page 12-5, 1205-3 (H) Observation Period**, delete 1205-3 (H) and replace with the following:

Maintain responsibility for debonding and color of the pavement markings during a 12 month observation period beginning upon final acceptance of the project as defined under Article 105-17. Guarantee the markings under the payment and performance bond in accordance with Article 105-17.

During the 12 month observation period, provide pavement marking material that shows no signs of failure due to blistering, chipping, bleeding, discoloration, smearing or spreading under heat or poor adhesion to the pavement materials. Pavement markings that debond due to snowplowing will not be considered a failed marking. Replace, at no additional expense to the Department, any pavement markings that do not perform satisfactorily under traffic during the 12 month observation period.

**Page 12-8, 1205-4 (C) Application**, delete the last two sentences of the second paragraph and replace with the following:

Produce in place markings with minimum retroreflective values shown below, as obtained with a LTL 2000 Retroreflectometer or Department approved mobile retroreflectometer. Retroreflective measurements will be taken within 30 days after final placement of the pavement marking.

**Page 12-9, 1205-4 (D) Observation Period**, delete the entire section and replace with the following:

In addition to the requirements of Subarticle 1205-3(H), maintain responsibility for minimum retroreflective values for a 30-day period beginning upon the Engineer's acceptance of all markings on the project. Guarantee retroreflective values of the markings during the 30-day period under the payment and performance bond in accordance with Article 105-17.

**Page 12-9, 1205-5 (B) Application**, delete the second sentence of the fourth paragraph and replace with the following:

Produce in place markings with minimum retroreflective values shown below, as obtained with a LTL 2000 Retroreflectometer or Department approved mobile retroreflectometer. Retroreflective measurements will be taken within 30 days after final placement of the pavement marking.

**Page 12-10, 1205-5 (C) Observation Period**, delete this entire section and replace with the following:

Maintain responsibility for minimum retroreflective values for a 30-day period beginning upon satisfactory final placement of all markings on the project. Guarantee retroreflective values of the markings during the 30-day period under the payment and performance bond in accordance with Article 105-17.

**Page 12-14, Article 1205-9, Maintenance**, delete Article 1205-9 and replace with the following:

Replace pavement markings that prematurely deteriorate, fail to adhere to the pavement, lack reflectorization, or are otherwise unsatisfactory during the life of the project or during the 12 month observation period as determined by the Engineer at no cost to the Department.

Upon notification from the Engineer, winterize the project by placing an initial or additional application of paint pavement marking lines in accordance with Article 1205-8. Payment for *Paint Pavement Marking Lines* required to winterize the project will be made in accordance with Article 1205-10 except that no payment will be made on resurfacing projects where paving is completed more than 30 days prior to the written notification by the Department that winterization is required.

## ON-THE-JOB TRAINING

(10-16-07) (Rev 6-3-09) 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 must be given to training employees on NCDOT Federal-Aid funded projects.

### Minorities and Women

Developing, training and upgrading of minorities and women toward journeymen 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.

### Assessing 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. A sample agreement is available at www.ncdot.org/business/ocs/ojt/.

**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 shall 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 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.

**INTERNATIONAL ROUGHNESS INDEX (IRI)** (06-25-08)

Final surface smoothness testing of mainline lanes, collectors, auxiliary lanes, acceleration and deceleration lanes greater than 1000 feet in length and ramps/loops on the project will be conducted in accordance with this provision. The smoothness testing for all remaining roadways shall be tested in accordance with the Standard Special Provision titled *Final Surface Testing - Asphalt Pavements* found elsewhere in this RFP.

**Description**

The NCTA will provide the equipment, perform the IRI testing, analyze and evaluate the test results to determine the smoothness of the final surface for those roadways detailed above. The

NCTA will perform IRI testing for acceptance purposes only. The Design-Build Team shall perform quality control testing throughout final surface operations and implement changes, if necessary, to meet the smoothness criteria contained herein.

Upon completion of the final surface, the NCTA will determine the smoothness utilizing either a certified high-speed or lightweight inertial profiler conforming to AASHTO PP 50. Pavement profiles will be simultaneously measured in both wheel paths of the lane, approximately 3 feet from the edges, parallel to the right edge and in the direction of travel. The NCTA will take profiles over the entire length of the lanes detailed above. The Design-Build Team shall be responsible for traffic control and surveying/ stationing needed for the NCTA to perform the smoothness testing.

A smoothness test lot will be 0.1 mile (528 ft) of a single pavement lane. Lots will be designated as starting 25 feet after the beginning limit of paving and continue to 25 feet before the ending limit of paving within each travel lane.

**Evaluation of Profiles**

The NCTA will utilize the latest version of ProVAL software to import, display, and analyze the pavement profiles for acceptance purposes.

**Corrective Action**

Correct any 0.1-mile section of hot mix asphalt concrete pavement having an average IRI of over 65 inches/mile. Corrective measures shall consist of milling and resurfacing or diamond grinding.

Correct any 0.1-mile section of portland cement concrete pavement having an average IRI of over 75 inches/mile. Corrective measures shall consist of diamond grinding.

After making corrections, the Design-Build Team shall notify the NCTA to re-profile the pavement lot to verify that corrections have produced the required improvements. If 40% of lot requires corrective action, then perform corrective action over the entire lot distance (0.1 miles section).

The NCTA will evaluate areas of localized roughness utilizing a 25-ft moving average filter. ProVAL will average each elevation point from the two longitudinal profiles from a travel lane to produce a single averaged wheel path. The average wheel path profiles will then be evaluated through a 25-foot moving average filter. The difference between the 25-foot moving average and the reported relative elevation for every profile point will be determined. Deviations greater than 0.15 inches are considered areas of localized roughness and shall require corrective action by the Design-Build Team. Corrective measures shall consist of diamond grinding or milling and resurfacing (option only for hot mix asphalt). If corrective action is required, notify the NCTA when the corrections have been made. The NCTA will re-profile the corrected area to ensure that the corrective action was successful.

In the event the Contractor does not produce a final pavement surface that will meet the requirements of this special provision, the Engineer may suspend the Contractor's operations until such time as the Contractor satisfies the Engineer, by making necessary adjustments to equipment, methods, or personnel, that he can produce a pavement surface that will meet these surface requirements.

**ROLLER COMPACTED CONCRETE** (06-03-08)

**Description**

Construct Roller Compacted Concrete (RCC) pavement on a prepared base, in accordance with these provisions and with lines, grades, thicknesses, and typical sections as shown on the plans or detailed within the Pavement Management Scope of Work. This work includes, but is not limited to, the designing of the mix; producing, furnishing and placing of the concrete; compaction; finishing; constructing joints; curing the pavement; coring for test specimens and associated patching of the pavement; and quality control testing.

Submit the following to NCTA for approval a minimum of 30 days prior to the start of any production of RCC:

A. Submit RCC mix design in accordance with Section 1000 of the NCDOT Standard Specifications for Roads and Structures. The submitted design shall include aggregate gradation, cementitious materials, admixtures (if used), compressive strength (minimum 3,500 psi), required moisture and density to be achieved and quantities of individual materials per cubic yard for the mix design.

B. Submit a Process Control Plan describing the production, placement and testing operations.

**Materials**

**(A) General**

All materials shall meet the requirements of the NCDOT Standard Specifications for Roads and Structures.

| Item: | Section: |
|---|---|
| Portland Cement Concrete | 1000 |
| Curing Agents | 1026 |
| Joint filler | 1028-1 |
| Low modulus Silicone Sealant | 1028-4 |
| Water | 1024-4 |

**(B) Aggregates**

Furnish aggregates conforming to Section 1014 of the NCDOT Standard Specifications for Roads and Structures. The plasticity index of the aggregate shall not exceed five. Provide a well-

graded aggregate blend conforming to the following gradation. Other aggregate blends may be considered provided demonstration of past performance and mix approval prior to production:

| Sieve Size | % Passing by Weight |
|---|---|
| 1” | 100 |
| ¾” | 90-100 |
| ½” | 70-100 |
| 3/8” | 60-85 |
| No. 4 | 40-60 |
| No. 16 | 20-40 |
| No. 100 | 6 -18 |
| No. 200 | 2 - 8 |

**Equipment**

**(A) General**

Provide maintained equipment and tools that will produce a completed RCC pavement meeting the requirements of this provision. All equipment shall be on hand, inspected and operating before work may proceed.

**(B) Concrete Mixing Plants**

Use batch plants or central mix plants that meet the requirements of Section 1000 and operate plant scales in accordance with Sub-article 1000-10(C) of the NCDOT Standard Specifications for Roads and Structures. Minimize segregation during loading of delivery trucks. Loading directly from a belt or auger will not be permitted.

**(C) Paver**

Utilize an asphalt type or high density paver, which provides a minimum of 90% of the maximum wet density in accordance with ASTM D 1557 or equivalent test method at placement.

Provide a paver of suitable weight and stability to place and finish the RCC material, without segregation, to the required thickness, smoothness, surface texture, cross-section and grade.

**(D) Compactors**

Provide self-propelled steel drum vibratory rollers having a minimum static weight of 10 tons for primary compaction. Provide rollers equipped with controls that automatically disengage the vibration mechanism before the roller stops.

Use walk-behind vibratory rollers or plate tampers for compacting areas inaccessible to the large rollers.

### (E) Hauling Equipment

Use non-agitating hauling equipment having bodies which are smooth, watertight, metal containers with rounded internal corners equipped with vibrators and gates to discharge the concrete without segregation or damage. Provide fitted covers to protect the material from rain and excessive evaporation.
Prevent the accumulation of hardened concrete in the delivery vehicles. Discharge all flushing water before charging with the next RCC load.

### Preparation of Subgrade and Base

Prior to the placement of RCC pavement, verify the subgrade and base has proper density and repair any soft or yielding areas. Correct all damaged areas in the subgrade or base prior to placing concrete. Keep the base clean and free of foreign material.

Dampen the surface of the base uniformly at the time the RCC pavement mixture is placed. Ensure that no free water or ponding is present at the time of concrete placement.

## WEATHER LIMITATIONS

### (A) Cold Weather

RCC paving operations should not begin and should be discontinued when any of the following conditions exist.

(1) When base contains frost or frozen material.
(2) When descending air temperature in the shade and away from artificial heat is 35°F or lower.

Maintain a sufficient supply of insulating blankets, plastic sheeting or other suitable material. Apply insulating materials to maintain a minimum temperature of 40°F at the pavement surface for a minimum of five days.

### (B) Hot Weather Precautions

Take special precautions during periods of hot weather or windy conditions to minimize moisture loss due to evaporation. The Design-Build Team must submit to NCTA for approval, a detailed proposal detailing methods for minimizing moisture loss and protecting the RCC under conditions of excessive surface evaporation due to a combination of air temperature, relative humidity, concrete temperature and wind conditions.

### (C) Rain

Do not place RCC pavement while it is raining hard enough to be detrimental to the finished product.

## Construction Methods

### (A) Delivery

Provide a sufficient number of trucks to ensure an adequate and continuous supply of RCC material to the paver. Deliver the concrete to the work site in a thoroughly mixed and uniform mass. Minimize the elapsed time to be 60 minutes or less, unless otherwise approved. The elapsed time is defined as the period from first contact between mixing water and cement until the entire operation of placing and compacting, including corrective measures if necessary, has been completed.

### (B) Placement

Deposit the RCC material directly into the hopper of the paver or material transfer device.

If at discharge, the concrete is not thoroughly mixed and homogeneous, the hauling distance, charging sequence, size of load, mixing time or any combination thereof should be altered to meet these requirements; otherwise, utilize other equipment capable of delivering a thoroughly mixed and uniform concrete mass.

Maintain an adequate quantity of RCC in the paver and do not allow the paver to become empty between loads. Maintain the material above the auger shaft at all times during paving.

Operate the paver in a manner that will prevent segregation and produce a smooth continuous surface without tearing, pulling or shoving. Limit the placement of RCC to a length that can be compacted and finished within the appropriate time limit under the prevailing air temperature and wind conditions.

Advance the paver in a steady, continuous operation with minimal starts and stops. Limit the paver speed during placement operations to ensure that density requirements are met and surface distress is minimized.

Broadcasting or fanning the RCC material across areas being compacted will not be permitted. Such additions of material may only be done immediately behind the paver and before any compaction has taken place. Any segregated coarse aggregate shall be removed from the surface before rolling.

If segregation occurs in the RCC during paving operations, the placement shall cease until the cause is determined and corrected. Remove and replace the segregated areas.

### (C) Compaction

Immediately after the concrete has been placed, thoroughly and uniformly compact the pavement.

Determine the sequence and number of roller passes by vibratory and non-vibratory rolling to obtain the specified density and surface finish. Avoid displacement of the RCC pavement. Immediately correct any displacement of the surface resulting from reversing or turning action of

the roller. Smooth any uneven marks left during the vibrating rolling with static rolling or rubber tire rolling. Provide a final surface that is smooth, flat, and free of tearing and cracking.

Areas inaccessible to either the paver or rollers may be placed by hand and compacted with equipment specified below. Compaction of these areas must satisfy the same minimum density requirements as specified below. An alternate and preferred method for paving inaccessible areas is to use cast-in-place, air-entrained concrete with a minimum compressive strength of 3,500 psi.

Provide additional rolling to longitudinal joints as necessary to produce the specified density for the full depth of the lift and produce a tight smooth joint.

**(D) Density Testing**

The RCC Pavement will be evaluated for density on a lot by lot basis. A lot will consist of 2,000 SY of newly placed RCC. In-place field density tests shall be performed in accordance with ASTM C 1040, direct transmission, as soon as possible, but no later than 30 minutes after completion of rolling. Only wet density shall be used for evaluation. The required density shall be not less than 98% of the maximum wet density obtained by ASTM D 1557 or equivalent test method.

Any RCC pavement lot not meeting density requirements outlined above will be evaluated for acceptance based on the compressive strength of 6 inch pavement cores tested at 28 days from date of placement. The average compressive strength value of three cores taken from random locations within a lot shall be at least 3,500 psi. If the average compressive strength of the cores does is not at least 3,500 psi, then the representative lot will be evaluated in accordance with Article 105-3 of the NCDOT Standard Specifications for Roads and Structures.

**(E) Curing**

After final finish and immediately after the free surface moisture has disappeared, apply curing compound at a rate of 0.0067 gallons per square foot. Provide an inline flow metering device to ensure the proper application rate is provided. Apply the curing compound such that puddling or ponding does not occur on the fresh concrete surface.

**(F) Finishing**

The finished surface of the RCC pavement, when tested with a 10 foot straight edge or crown surface template, shall not vary from the straight edge or template by more than 3/8 inch at any one point. When the surface smoothness is outside the specified surface tolerance, the Design-Build Team shall grind the surface to within the tolerance by use of a self-propelled diamond grinder. Milling of the final surface is not acceptable.

**(G) Joint Construction**

Construct joints to assure continuous bond between new and previously placed lanes. A vertical joint is considered a fresh joint when an adjacent RCC lane is placed within 60 minutes of placing the previous lane. Cold vertical joints are any planned or unplanned construction joints that do not qualify as fresh joints.

Vertical cold joints must be cut full depth 6 inches away from the open edge. Cold joints cut within two hours of placement may be cut with an approved wheel cutter, motor grader or other approved method provided that no significant edge raveling occurs. Cold joints cut after two hours of placement shall be saw cut 1/4 to 1/3 depth of the RCC pavement with the rest removed by hand or mechanical equipment. All excess material from the joint cutting shall be removed.

Prior to placing fresh RCC mixture against a compacted cold vertical joint, the joint shall be cleaned of any loose or foreign material and in a moist condition immediately prior to placement. The joints between RCC pavement and concrete structures shall be treated as cold vertical joints.

Construct all contraction joints within RCC pavement in accordance with the plans and Article 700-11 of the NCDOT Standard Specifications for Roads and Structures. Seal contraction joints in accordance with Article 700-12 (excluding 700-12 (B) Age of Pavement) of the NCDOT Standard Specifications for Roads and Structures.

**(H) Opening to Traffic**

Traffic or other heavy equipment will not be allowed on the RCC concrete pavement until representative concrete test cylinders achieve 2,500 psi. All compressive strength concrete test cylinders shall be made and tested in accordance with ASTM 1435 and AASHTO T22.

No permanent traffic will be allowed on the pavement until construction of the joints, including all sawing, sealing, and curing that is required, has been completed.

**Thickness Acceptance**

The thickness of the pavement will be determined by measurement of cores. The Design-Build Team will provide one core, taken at a random location, from each lot.

The thickness of the RCC pavement shall not deviate from that shown on the plans or as directed by the Engineer by more than minus 0.5 inches. When the measurement of any core is less than the plan thickness by more than 0.5inches, the actual thickness of the pavement in this area will be determined by taking additional cores at not less than 10 foot intervals parallel to the center line in each direction from the affected location until a core is found in each direction which is not deficient by more than 0.5 inches. Areas found deficient in thickness by more than 0.5 inches will be removed full shoulder width and replaced with concrete of the thickness shown on the plans. No overlays shall be accepted.

**Test Section**

At least 7 days before the start of paving operations, construct a test section using the approved concrete mix design. This test pavement will allow the Engineer to evaluate the strength of the RCC material, methods of construction, curing process and surface conditions of the completed test pavement. Provide a minimum test section of 300 feet long. Demonstrate the ability to achieve a smooth, uniform surface, free of tears, ridges, spalls and loose material. Use the same equipment, materials and techniques in the test section that will be used to construct the main RCC pavement.

## STANDARD SPECIAL PROVISION

## AVAILABILITY OF FUNDS – TERMINATION OF CONTRACTS

(05-20-08) Z-2

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

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

Payment will be made on any contract terminated pursuant to the special provision in accordance with Article 108-13(E) of the Standard Special Provision, Division One found elsewhere in this RFP.

This provision applies equally to the NCTA and this project.

***** STANDARD SPECIAL PROVISIONS *****

## NCDOT GENERAL SEED SPECIFICATIONS FOR SEED QUALITY

(11-18-08) Z-3

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

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

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

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

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

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

Seed of Pensacola Bahiagrass shall not contain more than 7% inert matter, Kentucky Bluegrass, Centipede and Fine or Hard Fescue shall not contain more than 5% inert matter whereas a

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

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

FURTHER SPECIFICATIONS FOR EACH SEED GROUP ARE GIVEN BELOW:

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

Sericea Lespedeza
Oats (seeds)

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

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

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

Common or Sweet Sundangrass

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

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

Minimum 70% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 restricted 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 |

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 *****

**ERRATA**

(07-21-09) Z-4

Revise the *Standard Specifications for Roads and Structures July 2006* on all projects as follows:

**Division 1**

- Page 1-1, replace AREA - American Railway Engineering Association with ***American Railway Engineering and Maintenance of Way Association*.**
- Page 1-7, remove **–L-** in middle of page after INVITATION TO BID and before LABORATORY.
- Page 1-25, 102-16(R), move 2nd paragraph to left margin. It is not a part of this subarticle, but part of the entire article.

**Division 2**

- Page 2-9, Subarticle 225-1(C), 1st paragraph, 2nd line, last word, add a "d" to make the word grade become **graded**
- Page 2-15, Subarticle 226-3, 5th paragraph, first line, replace the word *in* with the word ***is***.
- Page 2-23, Subarticle 235-4(B)(9), at the end of the sentence, replace finished greater with finished ***grade***.
- Page 2-28, Article 260-3, First paragraph, second line, remove the word *foot*.

**Division 3**

- Page 3-13, Article 340-4, Second paragraph, change Flowable Backfill to Flowable ***Fill***

**Division 4**

- Page 4-29, Article 420-13(A) Description, change reference from Section 1082 to ***Article 1081-6***.
- Page 4-40, Subarticle 420-17(F) first line, change Subarticle 420-17(B) to ***(B) herein***.
- Page 4-70, 442-13(B) Second sentence, change SSPC Guide 6I to SSPC Guide ***6.***
- Pages 4-72, 4-74, 4-76, at the top of the page, substitute the heading Section 452 with Section ***450*.**
- Page 4-79, at the top of the page, substitute the heading Section 450 with Section ***452***
- Page 4-80, change 452-7 to 452-***6*** at the top of the page.
- Page 4-80, change Pay Item ___Steel Pile Retaining Walls, to ***Sheet*** Pile Retaining Walls.
- Page 4-88, 462-4, Title, Replace last word Measurement with the word ***PAYMENT***

**Division 5**

- Page 5-8, Article 501-15 Measurement and Payment, delete the 4th paragraph that begins The quantity of lime, measured as provided …

- Page 5-14, Article 520-11 Measurement and Payment, first paragraph, second line, delete ***will be***.

**Division 6**

- Page 6-3, Article 600-9, 2nd Paragraph on this page, replace 818-5 with 818-***4***.
- Pages 6-30 and 31, Subarticle 610-3(A)(13) Move 2 paragraphs from the margin to the right under the number (13).
- Page 6-43, Article 610-8, 4th paragraph, remove the first ***the***
- Page 6-44, 2nd full paragraph, 1st sentence, delete the first ***and*** and add ***transverse*** just before cross-slope control.
- Page 6-51, at the top of the page, add ***610-14*** on the same line, and just before the heading MAINTENANCE.
- Page 6-53, Article 620-4 sixth paragraph, second line; the word that should be ***which***.
- Page 6-66, title, Replace EXISTNG with **EXISTING**
- Page 6-66, Article 657-1, Description, first sentence, replace PS/AR (hot-poured rubber asphalt with ***hot applied joint sealer***.
- Page 6-66, Article 657-2, replace PS/AR (Hot-Poured Rubber Asphalt with the following:

| Item | Section |
|---|---|
| ***Hot Applied Joint Sealer*** | ***1028-2*** |

- Page 6-67, at the top of the page, substitute the heading Section 654 with Section ***657.***
- Page 6-67, Article 657-3 Construction Methods, 2nd paragraph, replace PS/AR sealant with ***hot applied joint sealer***.
- Page 6-71, 660-9(B)(1), Replace the first sentence of the first paragraph with the following:

  **Using the quantities shown in *Table 660-1*, apply asphalt material to the existing surface followed by an application of No. 78 M or lightweight aggregate**.

- Page 6-89, Add a period at the end of the last sentence at the bottom of the page.
- Page 6-90, Article 663-5, first paragraph, first sentence, change 50oF to ***50$^o$F;*** third paragraph, fourth sentence change 325oF to ***325$^o$F.***

**Division 7**

- Page 7-12, at the top of the page, substitute the heading Section 710 with Section ***700***.
- Page 7-15, Article 710-9, 4th paragraph, last line, change 710-11(B) to 710-1***0***(B).

**Division 8**

- Page 8-13, Article 808-3, 4th Paragraph, third line, replace the word Eexcavation with the word ***Excavation***
- Page 8-35, Article 848-2, Item: Replace Cncrete with ***Concrete***

**Division 9**

- Page 9-2, add ***901-3*** just before CONSTRUCTION METHODS

**Division 10**

- Page 10-12, near bottom of page add ***(C)*** before Proportioning and Mixing of Modified Compositions, which should be bold type.
- Page 10-28, at the top of the page, substitute Section 100***6*** for 1005.
- Page 10-54, Subarticle 1018-2A), First line, substitute ***(B)*** for II, third line, substitute ***(B)(2)*** for II-b.
- Pages 10-56, 10-58, 10-60 at the top of the page, substitute Section 1018 with Section ***1020.***
- Page 10-84, Table 1042-1, Class 2, Maximum, change from 23r to ***23***.
- Page 10-84, Article 1042-2 Testing, last sentence, replace the word alterations with the word ***cycles***.
- Page 10-100, Table 1056-1, replace on the line for Trapezoidal Tear Strength:

| Type 1 | Type 2 | Type 3 | | Type 4 |
|---|---|---|---|---|
| | | Class A | Class B | Soil Stabilization |
| ***45*** lb | ***75*** lb | -- | -- | ***75*** lb |

- Page 10-116, Subarticle 1070-10, first paragraph, second sentence, add ***or*** just before cold-forged sleeve.
- Pages 10-136 through 10-147, at the top of the page, substitute Section 1074 with Section ***1072***.
- Page 10-157, Article 1077-11, first paragraph, change the reference from Subarticle 420-18(B) to Subarticle 420-***17***(B).
- Page 10-200, Subarticle 1080-14(B), change reference to ASTM D335***9***
- Page 10-211, at the top of the page, substitute Section 1081 with Section ***1082.***
- Page 10-229, add ***1088-6 BLANK*** on the line above 1088-7 TUBULAR MARKERS.
- Page 10-244, add **1089-10** ***BLANK*** and **1089-11** ***BLANK*** on the lines just above 1089-12 FLAGGER.
- Page 10-272, delete Article 1098-6 in its entirety. Renumber Articles 1098-7 through 1098-17 as Articles 1098-6 through 1098-16 consecutively.

**Division 12**

- Page 12-21 Add ***1266-2*** just before the heading MATERIALS.

**Division 14**

- Page 14-33, Article 1413-6, first paragraph, first sentence, first line, replace the word made with the words ***paid for***.

**Division 15**

- Page 15-2 add ***1500-4*** just before the heading WEEKEND, NIGHT AND HOLIDAY WORK.
- Page 15-4, Subarticle 1505-3(A)(2), replace the 2nd line with the following: ***Provide shielding or shoring as required under Section 150 or as required elsewhere in the contract.***
- Page 15-5, add ***1505-6*** on the same line and just before the heading MEASUREMENT AND PAYMENT. (Remove the period after PAYMENT.)
- Page 15-6, Article 1505-6(3), delete *in Section 1175* and replace it with *elsewhere in the contract*.
- Page 15-8, add **1510-4** on the same line and just before the heading MEASUREMENT AND PAYMENT.
- Page 15-10, substitute **BLANK** for CONSTRUCTION REQUIREMENTS on the same line and just before 1515-4.
- Page 15-10, substitute **CONSTRUCTION REQUIREMENTS** for General Requirements
- Page 15-10, Article 1515-4, add ***(D)*** just before the bolded Fire Hydrants.
- Page 15-13, Article 1520-3, 8th paragraph, add ***pipe*** after diameter.
- Page 15-22, add ***1540-3*** on the same line and just before the heading CONSTRUCTION REQUIREMENTS
- Page 15-28, Replace 1550-6 METHOD OF MEASUREMENT with ***MEASUREMENT AND PAYMENT.***

**Division 16**

- Page 16-12, Subarticle 1632-1(C) ¼ Inch hardware cloth, change the minimum width from 24 inches to ***48*** inches.

**Division 17**

- Page 17-19, Subarticle 1725-2 Material, Second paragraph, change Article 1098-7 to 1098-***8***
- Page 17-20, Subarticle 1726-2 Material, Second paragraph, change Article 1098-8 to 1098-**9**

**END**

***** STANDARD SPECIAL PROVISIONS *****

## AWARD OF CONTRACT

(6-28-77) 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".

***** STANDARD SPECIAL PROVISIONS *****

**MINORITY AND FEMALE EMPLOYMENT REQUIREMENTS**

(12-18-07) Z-7

NOTICE OF REQUIREMENTS FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (*EXECUTIVE NUMBER 11246*)

1. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, see as shown on the attached sheet entitled "Employment Goals for Minority and Female Participation".

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its federally involved and nonfederally involved construction.

The Contractor's compliance with the Executive Order and the regulations in *41 CFR Part 60-4* shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in *41 CFR 60-4.3(a)*, and its effort to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project or the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the executive Order and the regulations *in 41 CFR Part 60-4*. Compliance with the goals will be measured against the total work hours performed.

2. As used in this Notice and in the contract resulting from this solicitation, the "covered area" is the county or counties shown on the cover sheet of the proposal form and contract.

# EMPLOYMENT GOALS FOR MINORITY AND FEMALE PARTICIPATION

Economic Areas

***Area 023 29.7%***
Bertie County
Camden County
Chowan County
Gates County
Hertford County
Pasquotank County
Perquimans County

***Area 024 31.7%***
Beaufort County
Carteret County
Craven County
Dare County
Edgecombe County
Green County
Halifax County
Hyde County
Jones County
Lenoir County
Martin County
Nash County
Northampton County
Pamlico County
Pitt County
Tyrrell County
Washington County
Wayne County
Wilson County

***Area 025 23.5%***
Columbus County
Duplin County
Onslow County
Pender County

***Area 026 33.5%***
Bladen County
Hoke County
Richmond County
Robeson County
Sampson County
Scotland County

***Area 027 24.7%***
Chatham County
Franklin County
Granville County
Harnett County
Johnston County
Lee County
Person County
Vance County
Warren County

***Area 028 15.5%***
Alleghany County
Ashe County
Caswell County
Davie County
Montgomery County
Moore County
Rockingham County
Surry County
Watauga County
Wilkes County

***Area 029 15.7%***
Alexander County
Anson County
Burke County
Cabarrus County
Caldwell County
Catawba County
Cleveland County
Iredell County
Lincoln County
Polk County
Rowan County
Rutherford County
Stanly County

***Area 0480 8.5%***
Buncombe County
Madison County

***Area 030 6.3%***
Avery County
Cherokee County
Clay County
Graham County
Haywood County
Henderson County
Jackson County
McDowell County
Macon County
Mitchell County
Swain County
Transylvania County
Yancey County

## SMSA Areas

***Area 5720 26.6%***
Currituck County

***Area 9200 20.7%***
Brunswick County
New Hanover County

***Area 2560 24.2%***
Cumberland County

***Area 6640 22.8%***
Durham County
Orange County
Wake County

***Area 1300 16.2%***
Alamance County

***Area 3120 16.4%***
Davidson County
Forsyth County
Guilford County
Randolph County
Stokes County
Yadkin County

***Area 1520 18.3%***
Gaston County
Mecklenburg County
Union County

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Goals for Female

Participation in Each Trade

(Statewide) 6.9%

# *** STANDARD SPECIAL PROVISIONS ***

## REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONSTRUCTION CONTRACTS (FHWA-1273)


I. General

II. Nondiscrimination

III. Nonsegregated Facilities

IV. Payment of Predetermined Minimum Wage

V. Statements and Payrolls

VI. Record of Materials, Supplies, and Labor

VII. Subletting or Assigning the Contract

VIII. Safety: Accident Prevention

IX. False Statements Concerning Highway Projects

X. Implementation of Clean Air Act and Federal Water Pollution Control Act

XI. Certification Regarding Debarment, Suspension Ineligibility, and Voluntary Exclusion

XII. Certification Regarding Use of Contract Funds for Lobbying


### I. GENERAL

1. These contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.

2. Except as otherwise provided for in each section, the contractor shall insert in each subcontract all of the stipulations contained in these Required Contract Provisions, and further require their inclusion in any lower tier subcontract or purchase order that may in turn be made. The Required Contract Provisions shall not be incorporated by reference in any case. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with these Required Contract Provisions.

3. A breach of any of the stipulations contained in these Required Contract Provisions shall be sufficient grounds for termination of the contract.

4. A breach of the following clauses of the Required Contract Provisions may also be grounds for debarment as provided in 29 CFR 5.12:

   Section I, paragraph 2;

   Section IV, paragraphs 1, 2, 3, 4, and 7;

   Section V, paragraphs 1 and 2a through 2g.

5. Disputes arising out of the labor standards provisions of Section IV (except paragraph 5) and Section V of these Required Contract Provisions shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the U.S. Department of Labor (DOL) as set forth in 29 CFR 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the DOL, or the contractor's employees or their representatives.

6. **Selection of Labor:** During the performance of this contract, the contractor shall not:

   a. discriminate against labor from any other State, possession, or territory of the United States (except for employment preference for Appalachian contracts, when applicable, as specified in Attachment A), or

   b. employ convict labor for any purpose within the limits of the project unless it is labor performed by convicts who are on parole, supervised release, or probation.

### II. NONDISCRIMINATION

(Applicable to all Federal-aid construction contracts and to all related subcontracts of $10,000 or more.)

1. **Equal Employment Opportunity:** Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630 and 41 CFR 60) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The Equal Opportunity Construction Contract Specifications set forth under 41 CFR 60-4.3 and the provisions of the American Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

   a. The contractor will work with the State highway agency (SHA) and the Federal Government in carrying out EEO obligations and in their review of his/her activities under the contract.

b. The contractor will accept as his operating policy the following statement:

> "It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, preapprenticeship, and/or on-the-job training."

2. **EEO Officer:** The contractor will designate and make known to the SHA contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active contractor program of EEO and who must be assigned adequate authority and responsibility to do so.

3. **Dissemination of Policy:** All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

   a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.

   b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

   c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minority group employees.

   d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

   e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. **Recruitment:** When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minority groups in the area from which the project work force would normally be derived.

   a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minority group applicants. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority group applicants may be referred to the contractor for employment consideration.

   b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, he is expected to observe the provisions of that agreement to the extent that the system permits the contractor's compliance with EEO contract provisions. (The DOL has held that where implementation of such agreements have the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Executive Order 11246, as amended.)

   c. The contractor will encourage his present employees to refer minority group applicants for employment. Information and procedures with regard to referring minority group applicants will be discussed with employees.

5. **Personnel Actions:** Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

   a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

   b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

   c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

   d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with his obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of his avenues of appeal.

6. **Training and Promotion:**

   a. The contractor will assist in locating, qualifying, and increasing the skills of minority group and women employees, and applicants for employment.

   b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of

apprenticeship or training. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision.

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of minority group and women employees and will encourage eligible employees to apply for such training and promotion.

7. **Unions:** If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use his/her best efforts to obtain the cooperation of such unions to increase opportunities for minority groups and women within the unions, and to effect referrals by such unions of minority and female employees. Actions by the contractor either directly or through a contractor's association acting as agent will include the procedures set forth below:

a. The contractor will use best efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minority group members and women for membership in the unions and increasing the skills of minority group employees and women so that they may qualify for higher paying employment.

b. The contractor will use best efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the SHA and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of minority and women referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minority group persons and women. (The DOL has held that it shall be no excuse that the union with which the contractor has a collective bargaining agreement providing for exclusive referral failed to refer minority employees.) In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the SHA.

8. **Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:** The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment.

a. The contractor shall notify all potential subcontractors and suppliers of his/her EEO obligations under this contract.

b. Disadvantaged business enterprises (DBE), as defined in 49 CFR 23, shall have equal opportunity to compete for and perform subcontracts which the contractor enters into pursuant to this contract. The contractor will use his best efforts to solicit bids from and to utilize DBE subcontractors or subcontractors with meaningful minority group and female representation among their employees. Contractors shall obtain lists of DBE construction firms from SHA personnel.

c. The contractor will use his best efforts to ensure subcontractor compliance with their EEO obligations.

9. **Records and Reports:** The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following completion of the contract work and shall be available at reasonable times and places for inspection by authorized representatives of the SHA and the FHWA.

a. The records kept by the contractor shall document the following:

1. The number of minority and non-minority group members and women employed in each work classification on the project;

2. The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women;

3. The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minority and female employees; and

4. The progress and efforts being made in securing the services of DBE subcontractors or subcontractors with meaningful minority and female representation among their employees.

b. The contractors will submit an annual report to the SHA each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data.

III. **NONSEGREGATED FACILITIES**

(Applicable to all Federal-aid construction contracts and to all related subcontracts of $10,000 or more.)

a. By submission of this bid, the execution of this contract or subcontract, or the consummation of this material supply agreement or purchase order, as appropriate, the bidder, Federal-aid construction contractor, subcontractor, material supplier, or vendor, as appropriate, certifies that the firm does not maintain or provide for its employees any segregated facilities at any of its establishments, and that the firm does not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. The firm agrees that a breach of this certification is a violation of the EEO provisions of this contract. The firm further certifies that no employee will be denied access to adequate facilities on the basis of sex or disability.

b. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, timeclocks, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive, or are, in fact, segregated on the basis of race, color, religion, national origin, age or disability, because of habit, local custom, or otherwise. The only exception will be for the disabled when the demands for accessibility override (e.g. disabled parking).

c. The contractor agrees that it has obtained or will obtain identical certification from proposed subcontractors or material suppliers prior to award of subcontracts or consummation of material supply agreements of $10,000 or more and that it will retain such certifications in its files.

IV. **PAYMENT OF PREDETERMINED MINIMUM WAGE**

(Applicable to all Federal-aid construction contracts exceeding $2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural minor collectors, which are exempt.)

1. **General:**

a. All mechanics and laborers employed or working upon the site of the work will be paid unconditionally and not less often than once a week and without subsequent deduction or rebate on any account [except such payroll deductions as are permitted by regulations (29 CFR 3) issued by the Secretary of Labor under the Copeland Act (40 U.S.C. 276c)] the full amounts of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment. The payment shall be computed at wage rates not less than those contained in the wage determination of the Secretary of Labor (hereinafter "the wage determination") which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor or its subcontractors and such laborers and mechanics. The wage determination (including any additional classifications and wage rates conformed under paragraph 2 of this Section IV and the DOL poster (WH-1321) or Form FHWA-1495) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers. For the purpose of this Section, contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act (40 U.S.C. 276a) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of Section IV, paragraph 3b, hereof. Also, for the purpose of this Section, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in paragraphs 4 and 5 of this Section IV.

b. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein, provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed.

c. All rulings and interpretations of the Davis-Bacon Act and related acts contained in 29 CFR 1, 3, and 5 are herein incorporated by reference in this contract.

2. **Classification:**

a. The SHA contracting officer shall require that any class of laborers or mechanics employed under the contract, which is not listed in the wage determination, shall be classified in conformance with the wage determination.

b. The contracting officer shall approve an additional classification, wage rate and fringe benefits only when the following criteria have been met:

1. the work to be performed by the additional classification requested is not performed by a classification in the wage determination;

2. the additional classification is utilized in the area by the construction industry;

3. the proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination; and

4. with respect to helpers, when such a classification prevails in the area in which the work is performed.

c. If the contractor or subcontractors, as appropriate, the laborers and mechanics (if known) to be employed in the additional classification or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the DOL, Administrator of the Wage and Hour Division, Employment Standards Administration, Washington, D.C. 20210. The Wage and Hour Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

d. In the event the contractor or subcontractors, as appropriate, the laborers or mechanics to be employed in the additional classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. Said Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary

e. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraph 2c or 2d of this Section IV shall be paid to all workers performing work in the additional classification from the first day on which work is performed in the classification.

3. **Payment of Fringe Benefits:**

a. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor or subcontractors, as appropriate, shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly case equivalent thereof.

b. If the contractor or subcontractor, as appropriate, does not make payments to a trustee or other third person, he/she may consider as a part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

4. **Apprentices and Trainees (Programs of the U.S. DOL) and Helpers:**

a. Apprentices:

1. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the DOL, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau, or if a person is employed in his/her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State apprenticeship agency (where appropriate) to be eligible for probationary employment as an apprentice.

2. The allowable ratio of apprentices to journeyman-level employees on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any employee listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate listed in the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor or subcontractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman-level hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

3. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator for the Wage and Hour Division determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

4. In the event the Bureau of Apprenticeship and Training, or a State apprenticeship agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor or subcontractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the comparable work performed by regular employees until an acceptable program is approved.

b. Trainees:

1. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the DOL, Employment and Training Administration.

2. The ratio of trainees to journeyman-level employees on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

3. Every trainee must be paid at not less than the rate specified in the approved program for his/her level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman-level wage rate on the wage determination which provides for less than full fringe benefits for apprentices, in which case such trainees shall receive the same fringe benefits as apprentices.

4. In the event the Employment and Training Administration withdraws approval of a training program, the contractor or subcontractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Helpers:

Helpers will be permitted to work on a project if the helper classification is specified and defined on the applicable wage determination or is approved pursuant to the conformance procedure set forth in Section IV.2. Any worker listed on a payroll at a helper wage rate, who is not a helper under a approved definition, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed.

5. **Apprentices and Trainees (Programs of the U.S. DOT):**

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

6. **Withholding:**

The SHA shall upon its own action or upon written request of an authorized representative of the DOL withhold, or cause to be withheld, from the contractor or subcontractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements which is held by the same prime contractor, as much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the SHA contracting officer may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

7. **Overtime Requirements:**

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers, mechanics, watchmen, or guards (including apprentices, trainees, and helpers described in paragraphs 4 and 5 above) shall require or permit any laborer, mechanic, watchman, or guard in any workweek in which he/she is employed on such work, to work in excess of 40 hours in such workweek unless such laborer, mechanic, watchman, or guard receives compensation at a rate not less than one-and-one-half times his/her basic rate of pay for all hours worked in excess of 40 hours in such workweek.

8. **Violation:**

Liability for Unpaid Wages; Liquidated Damages: In the event of any violation of the clause set forth in paragraph 7 above, the contractor and any subcontractor responsible thereof shall be liable to the affected employee for his/her unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer, mechanic, watchman, or guard employed in violation of the clause set forth in paragraph 7, in the sum of $10 for each calendar day on which such employee was required or permitted to work in excess of the standard work week of 40 hours without payment of the overtime wages required by the clause set forth in paragraph 7.

9. **Withholding for Unpaid Wages and Liquidated Damages:**

The SHA shall upon its own action or upon written request of any authorized representative of the DOL withhold, or cause to be withheld, from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph 8 above.

V. **STATEMENTS AND PAYROLLS**

(Applicable to all Federal-aid construction contracts exceeding $2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural collectors, which are exempt.)

1. **Compliance with Copeland Regulations (29 CFR 3):**

The contractor shall comply with the Copeland Regulations of the Secretary of Labor which are herein incorporated by reference.

2. **Payrolls and Payroll Records:**

a. Payrolls and basic records relating thereto shall be maintained by the contractor and each subcontractor during the course of the work and preserved for a period of 3 years from the date of completion of the contract for all laborers, mechanics, apprentices, trainees, watchmen, helpers, and guards working at the site of the work.

b. The payroll records shall contain the name, social security number, and address of each such employee; his or her correct classification; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalent thereof the types described in Section 1(b)(2)(B) of the Davis Bacon Act); daily and weekly number of hours worked; deductions made; and actual wages paid. In addition, for Appalachian contracts, the payroll records shall contain a notation indicating whether the employee does, or does not, normally reside in the labor area as defined in Attachment A, paragraph 1. Whenever the Secretary of Labor, pursuant to Section IV, paragraph 3b, has found that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b)(2)(B) of the Davis Bacon Act, the contractor and each subcontractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, that the plan or program

has been communicated in writing to the laborers or mechanics affected, and show the cost anticipated or the actual cost incurred in providing benefits. Contractors or subcontractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprentices and trainees, and ratios and wage rates prescribed in the applicable programs.

c. Each contractor and subcontractor shall furnish, each week in which any contract work is performed, to the SHA resident engineer a payroll of wages paid each of its employees (including apprentices, trainees, and helpers, described in Section IV, paragraphs 4 and 5, and watchmen and guards engaged on work during the preceding weekly payroll period). The payroll submitted shall set out accurately and completely all of the information required to be maintained under paragraph 2b of this Section V. This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal stock number 029-005-0014-1), U.S. Government Printing Office, Washington, D.C. 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors.

d. Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his/her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

1. that the payroll for the payroll period contains the information required to be maintained under paragraph 2b of this Section V and that such information is correct and complete;

2. that such laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in the Regulations, 29 CFR 3;

3. that each laborer or mechanic has been paid not less that the applicable wage rate and fringe benefits or cash equivalent for the classification of worked performed, as specified in the applicable wage determination incorporated into the contract.

e. The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 2d of this Section V.

f. The falsification of any of the above certifications may subject the contractor to civil or criminal prosecution under 18 U.S.C. 1001 and 31 U.S.C. 231.

g. The contractor or subcontractor shall make the records required under paragraph 2b of this Section V available for inspection, copying, or transcription by authorized representatives of the SHA, the FHWA, or the DOL, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the SHA, the FHWA, the DOL, or all may, after written notice to the contractor, sponsor, applicant, or owner, take such actions as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

VI. **RECORD OF MATERIALS, SUPPLIES, AND LABOR THIS SECTION DELETED JUNE 4, 2007.**

VII. **SUBLETTING OR ASSIGNING THE CONTRACT**

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the State. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635).

a. "Its own organization" shall be construed to include only workers employed and paid directly by the prime contractor and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor, assignee, or agent of the prime contractor.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph 1 of Section VII is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the SHA contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the SHA contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the SHA has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

VIII. **SAFETY: ACCIDENT PREVENTION**

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take

any other needed actions as it determines, or as the SHA contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).

IX. **FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS**

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, the following notice shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

**NOTICE TO ALL PERSONNEL ENGAGED ON FEDERAL-AID HIGHWAY PROJECTS**

18 U.S.C. 1020 reads as follows:

*"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or*

*Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or*

*Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;*

*Shall be fined not more that $10,000 or imprisoned not more than 5 years or both."*

X. **IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT**

(Applicable to all Federal-aid construction contracts and to all related subcontracts of $100,000 or more.)

By submission of this bid or the execution of this contract, or subcontract, as appropriate, the bidder, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any facility that is or will be utilized in the performance of this contract, unless such contract is exempt under the Clean Air Act, as amended (42 U.S.C. 1857 et seq., as amended by Pub.L. 91-604), and under the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq., as amended by Pub.L. 92-500), Executive Order 11738, and regulations in implementation thereof (40 CFR 15) is not listed, on the date of contract award, on the U.S. Environmental Protection Agency (EPA) List of Violating Facilities pursuant to 40 CFR 15.20.

2. That the firm agrees to comply and remain in compliance with all the requirements of Section 114 of the Clean Air Act and Section 308 of the Federal Water Pollution Control Act and all regulations and guidelines listed thereunder.

3. That the firm shall promptly notify the SHA of the receipt of any communication from the Director, Office of Federal Activities, EPA, indicating that a facility that is or will be utilized for the contract is under consideration to be listed on the EPA List of Violating Facilities.

4. That the firm agrees to include or cause to be included the requirements of paragraph 1 through 4 of this Section X in every nonexempt subcontract, and further agrees to take such action as the government may direct as a means of enforcing such requirements.

XI. **CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION**

1. **Instructions for Certification - Primary Covered Transactions:**

(Applicable to all Federal-aid contracts - 49 CFR 29)

a. By signing and submitting this proposal, the prospective primary participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause of default.

d. The prospective primary participant shall provide immediate written notice to the department or agency to whom this proposal is submitted if any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the department or agency to which this proposal is submitted for assistance in obtaining a copy of those regulations.

f. The prospective primary participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective primary participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the nonprocurement portion of the "Lists of Parties Excluded From Federal Procurement or Nonprocurement Programs" (Nonprocurement List) which is compiled by the General Services Administration.

i. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph f of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

* * * * *

**Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Primary Covered Transactions**

1. The prospective primary participant certifies to the best of its knowledge and belief, that it and its 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 3-year period preceding this proposal been convicted of or had a civil judgement 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 1b of this certification; and

   d. Have not within a 3-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

2. Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

* * * * *

2. **Instructions for Certification - Lower Tier Covered Transactions:**

(Applicable to all subcontracts, purchase orders and other lower tier transactions of $25,000 or more - 49 CFR 29)

a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "primary covered transaction," "participant," "person," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

* * * * *

**Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Covered Transactions:**

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

* * * * *

XII. **CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING**

(Applicable to all Federal-aid construction contracts and to all related subcontracts which exceed $100,000 - 49 CFR 20)

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

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

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

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

3. The prospective participant also agrees by submitting his or her bid or proposal that he or she shall require that the language of this certification be included in all lower tier subcontracts, which exceed $100,000 and that all such recipients shall certify and disclose accordingly.

**GENERAL DECISION NC20100011 NC11**

Z-12

Date: March 12, 2010

General Decision Number NC20100011 03/12/2010

Superseded General Decision No. NC20080011

State: North Carolina

Construction Type: HIGHWAY

**COUNTIES:**

| | | |
|---|---|---|
| Alamance | Durham | Orange |
| Alexander | Forsyth | Randolph |
| Buncombe | Franklin | Rowan |
| Burke | Gaston | Stokes |
| Cabarrus | Guilford | Union |
| Catawba | Lincoln | Wake |
| Cumberland | Mecklenburg | Yadkin |
| Davidson | New Hanover | |
| Davie | Onslow | |

HIGHWAY CONSTRUCTION PROJECTS (does not include tunnels, building structures in rest area projects, railroad construction, and, bascule, suspension and spandrel arch bridges, bridges designed for commercial navigation, and bridges involving marine construction, and other major bridges).

| Modification Number | Publication Date |
|---|---|
| 0 | 03/12/2010 |

SUNC1990-014 02/12/1990

| | Rates | Fringes |
|---|---|---|
| CARPENTER | 7.63 | |
| CONCRETE FINISHER | 7.52 | |
| ELECTRICIAN | 10.26 | |
| IRONWORKERS (reinforcing) | 9.76 | |
| | | |
| LABORER | | |
| General | 7.25 | |
| Asphalt Lay Down Person | 7.25 | |
| Asphalt Raker | 7.25 | |
| Form Setter (road) | 8.57 | |
| Mason (brick, block, stone) | 7.44 | |
| Pipe Layer | 7.25 | |
| Power Tool Operator | 8.28 | |

| | | |
|---|---|---|
| POWER EQUIPMENT OPERATORS | | |
| Asphalt Distributor | 7.25 | |
| Asphalt Paver | 7.47 | |
| Bulldozer | 7.33 | |
| Bulldozer (utility) | 7.25 | |
| Concrete Curb Machine | 7.25 | |
| Concrete Finishing Machine | 7.85 | |
| Concrete Paver | 7.25 | |
| Crane, Backhoe, Shovel & Dragline (over 1 yd) | 8.16 | |
| Crane, Backhoe, Shovel & Dragline(1 yd and under) | 7.25 | |
| Drill Operator | 7.34 | |
| Grade Checker | 7.25 | |
| Gradeall | 8.38 | |
| Grease Person | 7.25 | |
| Loader | 7.25 | |
| Mechanic | 8.47 | |
| Motor Grader (Fine Grade) | 8.04 | |
| Motor Grader(Rough Grade) | 7.68 | |
| Oiler | 7.25 | |
| Roller (Finisher) | 7.25 | |
| Roller (Rough) | 7.25 | |
| Scraper | 7.25 | |
| Screed Asphalt | 7.25 | |
| Stone Spreader | 7.25 | |
| Stripping Machine Operator | 7.25 | |
| Subgrade Machine | 7.25 | |
| Sweeper | 7.25 | |
| Tractor (Utility) | 7.25 | |

| | | |
|---|---|---|
| TRUCK DRIVERS | | |
| Trucks – Single Rear Axle | 7.25 | |
| Trucks – Multi Rear Axle | 7.25 | |
| Trucks – Heavy Duty | 9.47 | |

WELDERS – Receive rate prescribed for craft performing operation to which welding is incidental.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a)(1)(ii)).

In the listing above, the "SU" designation means that rates listed under that identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U. S. Department of Labor
200 Constitution Avenue, N.W.
Washington, D.C. 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator
(See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, D.C. 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U. S. Department of Labor
200 Constitution Avenue, N.W.
Washington, D.C. 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

# *** STANDARD SPECIAL PROVISIONS ***

# DIVISION ONE OF NCDOT STANDARD SPECIFICATIONS

# GENERAL REQUIREMENTS

## SECTION 101
## DEFINITIONS OF TERMS

### 101-1 GENERAL

Whenever the terms defined in this section are used in the contract, in any of the contract documents, or on the plans, the intended meaning of such terms shall be as defined in this section.

Throughout Division One of the NCDOT 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," the term "State Highway Administrator" is replaced by "North Carolina Turnpike Authority's Chief Engineer" and the phrase "lowest Responsible Bidder" is replaced with "responsible Proposer with the lowest adjusted price." 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.)

Additionally, throughout the NCDOT Standard Specifications, the terms "NCDOT", "Department", or other names as reference to the Department of Transportation, apply equally to the North Carolina Turnpike Authority (NCTA) and the terms "Board", "Board of Transportation", or other names as reference to the North Carolina Board of Transportation apply equally to the Board of the North Carolina Turnpike Authority. The Board of the North Carolina Turnpike Authority is herein referred to as the Authority Board. In addition, the Authority is a division within the Department of Transportation and therefore the term Department is inclusive of the Authority.

### 101-2 ABBREVIATIONS

AAN _____American Association of Nurserymen
AAR _____Association of American Railroads
AASHTO ___American Association of State Highway and Transportation Officials
ACI _____American Concrete Institute
ADT _____Annual Average Daily Traffic
AED _____Associated Equipment Distributors
AGC _____Associated General Contractors of America
AIA _____American Institute of Architects
AISC _____American Institute of Steel Construction
AISI_____American Iron and Steel Institute
ANSI _____American National Standards Institute, Inc.
ARA _____American Railway Association
AREA _____American Railway Engineering Association
ASLA _____American Society of Landscape Architects

ASTM _____American Society for Testing and Materials
ATIS _____Alliance for Telecommunications Industry Solutions
AWG_____American Wire Gauge
AWWA _____American Water Works Association
AWS _____American Welding Society
AWPA_____American Wood Preserver's Association
CALTRANS TEES____California DOT Transportation Electrical Equipment Specifications
CRSI _____Concrete Reinforcing Steel Institute
DHV _____Design Hourly Volume
EEI _____Edison Electric Institute
EIA/TIA ____Electronics Industries Alliance/Telecommunications Industry Association
FHWA_____Federal Highway Administration, U.S. Department of Transportation
FSS _____Federal Specifications and Standards, General Services Administration
FTMS _____Federal Test Method Standard
GS _____General Statutes of North Carolina
IES_____Illuminating Engineering Society
IMSA_____International Municipal Signal Association
ITS_____Intelligent Transportation Systems
LED_____Light Emitting Diode
MIL _____Military Standard
MUTCD ____Manual of Uniform Traffic Control and North Carolina Supplement thereto
NEC_____National Electrical Code
NEMA_____National Electrical Manufacturers Association
NESC _____National Electrical Safety Code
NTPEP _____National Transportation Product Evaluation Program
RMS _____Root Mean Square
RUS CFR ___Rural Utilities Service & Code of Federal Regulations
SCTE_____Society of Cable Telecommunications Engineers
SPIB _____Southern Pine Inspection Bureau
SSPC _____ Society of Protective Coatings
UL _____Underwriters' Laboratories, Inc.

UV_____Ultraviolet

## 101-3 DEFINITIONS

### ACT OF GOD

Events in nature so extraordinary that the history of climate variations and other conditions in the particular locality affords no reasonable warning of them.

### ADDITIONAL WORK

Additional work is that which results from a change or alteration in the contract and for which there are contract unit prices in the original contract or an executed supplemental agreement.

## ADMINISTRATOR

The State Highway Administrator.

## ADVERTISEMENT

The public advertisement inviting Statements of Qualifications for the design and construction of specific projects.

## AMOUNT BID

The amount bid for a particular item of work in a proposal.

## ARTICLE

A primary numbered subdivision of a section of the standard specifications.

## AWARD

The decision of the Board of Transportation to accept the Proposal of the responsible Proposer with the lowest adjusted price for work that is subject to the furnishing of payment and performance bonds, and such other conditions as may be otherwise provided by law, the Instructions to Proposers, the Request for Proposals, and these specifications.

## BASE COURSE

That portion of the pavement structure of planned thickness placed immediately below the pavement or surface course.

## BID (OR PRICE PROPOSAL)

The offer of a Proposer on the Request for Proposals furnished by the North Carolina Turnpike Authority to perform the work and to furnish the labor and materials at the prices quoted.

## BID BOND OR BID DEPOSIT

The security furnished by the Proposer with his Price Proposal as guaranty that he will furnish the required bonds and execute such documents as may be required if his Price Proposal is accepted.

## BIDDER (OR PROPOSER)

An individual, partnership, firm, corporation, LLC or joint venture formally submitting a Price Proposal for the work contemplated.

## BOARD OF TRANSPORTATION

The Board created by the provisions of G.S. 143B-350 for the purpose of formulating policies and priorities for the Department of Transportation, and awarding all highway construction contracts.

## BRIDGE

A structure including supports, erected over a depression or an obstruction such as water, highway, or railway, and having a track or passage way for carrying traffic or other moving loads and having a length measured along the center of the roadway of more than 20 feet between

undercopings of end supports, spring lines of arches, or between extreme ends of openings for multiple reinforced concrete box structures.

**Bridge Length:** The length of a bridge structure is the overall length measured along the line of survey stationing back to back of backwalls of abutments, if present, otherwise end to end of the bridge floor.

**Bridge Width:** The clear width measured at right angles to the longitudinal centerline of the bridge between the bottom of curbs, guard timbers or face of parapets, or in the case of multiple height of curbs, between the bottoms of the lower risers.

## CALENDAR DAY

A day shown on the calendar beginning and ending at midnight.

## CHIEF ENGINEER

The Chief Engineer of the North Carolina Turnpike Authority acting directly or through his duly authorized representatives.

## COMPLETION DATE

That date established as set forth in the contract or as revised by authorized extensions, by which it is required, established as that the work set forth in the contract be satisfactorily completed. When observation periods are required by the Specifications, they are not a part of the work to be completed by the completion date or intermediate contract times stated in the contract.

## CONSTRUCTION EASEMENT

A right owned by the Department of Transportation or the North Carolina Turnpike Authority in a parcel of land owned by a third party outside the highway right of way for the purpose of containing construction that exceeds the right of way.

## CONTRACT DOCUMENTS (OR CONTRACT)

The executed agreement between the Department of Transportation and the successful proposer, covering the performance of the work and the compensation therefor.

The term contract is all inclusive with reference to all written agreements affecting a contractual relationship and all documents referred to therein, and shall specifically include, but not be limited to the Request for Proposals, any addenda thereto, the Technical Proposal subject to the requirements of the other Contract Documents, the Price Proposal, the printed contract form and all exhibits thereto, the contract bonds, the plans and associated special provisions prepared by the Design-Build Team, the standard specifications and all supplemental specifications thereto, the scopes of work, standard special provisions and the project special provisions contained in the Request for Proposals, all Reference Documents, and all executed supplemental agreements, all of which shall constitute one instrument.

## CONTRACT ITEM

A specifically described unit of work for which a unit or lump sum price is provided in the contract. Synonymous with *Pay Item*.

## CONTRACT LUMP SUM PRICE

The amount bid for a lump sum item that has been submitted by the Design-Build Team in his proposal.

## CONTRACT PAYMENT BOND

A bond furnished by the Design-Build Team and the corporate surety securing the payment of those furnishing labor, materials, and supplies for the construction of the project.

## CONTRACT PERFORMANCE BOND

A bond furnished by the Design-Build Team and the corporate surety guaranteeing the performance of the contract.

## CONTRACT TIME

The number of calendar days inclusive between the date of availability and the completion date, said dates being established as set forth in the special provisions, including authorized extensions to the completion date.

## CONTRACT UNIT PRICE

The unit bid price for a unit item that has been submitted by the Design-Build Team in his proposal.

## CONTRACTOR (OR DESIGN-BUILD TEAM)

The successful proposer to whom the contract has been awarded, and who has executed the contract and furnished acceptable contract bonds.

## CULVERT

Any structure not classified as a bridge that provides an opening under the roadway.

## CURRENT CONTROLLING OPERATION OR OPERATIONS

Any operation or operations, as determined by the Engineer, that if delayed would delay the completion of the project.

## DATE OF AVAILABILITY

That date as may be 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.

## DEPARTMENT OR DEPARTMENT OF TRANSPORTATION

A principal department of the North Carolina Executive Branch that performs the functions of planning, design, construction, and maintenance of an integrated statewide transportation system.

### 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 entity that forms the team of the Proposer awarded the Contract and 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.

**DRAINAGE EASEMENT**

A right, owned by the Department of Transportation or the North Carolina Turnpike Authority, in a parcel of land owned by a third party outside the highway right of way, to construct and maintain ditches, channels, or structures for directing the course and flow of water outside the highway right of way.

**EASEMENT**

A property right to use or control real property of another.

**ENGINEER**

The Chief Engineer of the North Carolina Turnpike Authority acting directly or through a duly authorized representative, such representative acting within the scope of particular assigned duties.

**EQUIPMENT**

All machinery and equipment, together with the necessary supplies, tools, and apparatus for upkeep and maintenance, all of which are necessary for the proper construction and acceptable completion of the work.

**EXTRA WORK**

Work found necessary or desirable to complete fully the work as contemplated in the contract for which payment is not provided for by the contract unit or lump sum prices in the original contract. Extra work shall not be work that in the terms of the contract is incidental to work for which there is a contract price or work that payment is included in some other contract unit or lump sum price.

**FINAL ACCEPTANCE DATE**

That date on which all work set forth in the contract and work modified by the Engineer is satisfactorily completed excluding any observation periods not specifically made a part of the work by the specifications or special provisions.

**FINAL ESTIMATE**

The document that contains a final statement of all quantities and total dollar amount for each item of work performed during the life of the contract including any adjustments to those amounts made under the terms of the contract. The final statement will be titled The Final

Estimate and will be the document utilized to document final payment to the Design-Build Team. Receipt of this document by the Design-Build Team will begin the time frame for filing of a verified claim with the Turnpike Authority as provided for in G.S. 136-29 of the General Statutes of North Carolina.

## FINAL ESTIMATE ASSEMBLY

As constructed plans and other project records that establish the final statement of quantities to be paid and document work performed on the project.

## FORCE ACCOUNT NOTICE

A written notice to the Design-Build Team that extra work ordered by the Engineer will be paid for as force account work.

## FORCE ACCOUNT WORK

Work that is paid for in accordance with Article 109-3 or on the basis of the force account formula provided in the contract.

## HIGHWAY

A general term denoting a public way for purposes of vehicular travel, including the entire area within the right of way. Synonymous with Road and Street.

## HOUR

One of the 24 equal parts of a day.

## INSPECTOR

The authorized representative of the Engineer assigned to make a detailed inspection of any or all portions of the work and materials.

## INTERMEDIATE COMPLETION DATE

That date established as set forth in the special provisions or as revised by authorized extensions, by which date it is required that the portion of work set forth in the contract be satisfactorily completed.

## INTERMEDIATE COMPLETION TIME

The time established as set forth in the special provisions or as revised by authorized extensions, by which it is required that the portion of work set forth in the contract be satisfactorily completed.

## INTERMEDIATE CONTRACT TIME (DAYS)

The number of calendar days inclusive between the date of availability and the completion date, said days being established as set forth in the special provisions, or as revised by authorized extensions, by which it is required that a portion of that work set forth in the contract be satisfactorily completed.

## INTERMEDIATE CONTRACT TIME (HOURS)

The number of hours inclusive between the time of availability and the intermediate completion time, said times being established as set forth in the special provisions, including authorized extensions to the intermediate completion time.

## INVERT

The lowest point in the internal cross section of a pipe or other culvert.

## INVITATION TO BID

The notification that Technical Proposals and Price Proposals will be received for the construction of specific projects.

## LABORATORY

The testing laboratory of the Department of Transportation, Turnpike Authority, or any other testing laboratory that may be designated or approved by the Engineer.

## LOCAL TRAFFIC

Traffic that must use the facility under construction in order to reach its destination.

## MAJOR AND MINOR CONTRACT ITEMS

Major contract items are listed as such in the project special provisions. All other original contract items and extra work shall be considered as minor items.

## MATERIALS

Any substances that may be incorporated into the construction of the project.

## MEDIAN

The center section of a divided highway that separates the traffic lanes in one direction from the traffic lanes in the opposite direction.

## MOBILIZATION

The work described in Article 800-1.

## NORTH CAROLINA TURNPIKE AUTHORITY

A public agency of the State established pursuant to Article 6H, Chapter 136 of the North Carolina General Statutes to study, plan, develop, design, establish, purchase, construct, operate and maintain turnpike projects across the State.

## NORTH CAROLINA TURNPIKE AUTHORITY BOARD (AUTHORITY BOARD)

The Board established pursuant to GS 136.89.182 for the purpose of formulating policies and priorities of the North Carolina Turnpike Authority necessary to implement a turnpike program across the State.

## NOTICE TO PROCEED

The notice provided by the Turnpike Authority after which the Design-Build Team is authorized to begin certain preconstruction or construction activities as outlined in the Notice to Proceed. Notice to Proceed is often associated with a pre-determined date and is synonymous with Date of Availability.

## PAVEMENT STRUCTURE

The combination of base and surface courses placed on a subgrade to support the traffic load and distribute it to the roadbed.

## PAY ITEM

Synonymous with Contract Item.

## 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.

(A) Standard Drawings:

Drawings approved for repetitive use, showing details to be used where appropriate. All Standard Drawings approved by the Department or the Turnpike Authority plus subsequent revisions and additions. Standard Drawings are available for purchase from:

Randy A. Garris, PE
State Contract Officer
1591 Mail Service Center
Raleigh, NC 27699-1591

(B) Preliminary Plans:

Drawings furnished by the Department or the Turnpike Authority included along 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) Release for Construction Plans

Those Project Plans that are conveyed to the field for the purpose of construction. These plans are stamped “RFC” by the Design-Build Team once all NCTA comments are addressed to the satisfaction of the NCTA.

(E) 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.

(F) As-Constructed Drawings:

Coordinately correct final drawings prepared by the Design-Build Team, documenting the details and dimensions of the completed work.

## PREBID CONFERENCE

A conference held before Price Proposals are accepted on a project at which representatives of the Turnpike Authority will provide information, and accept and answer questions from interested parties.

### 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.

## PROJECT

The specific section of the highway together with all appurtenances and construction to be performed thereon under the contract.

## PROJECT SPECIAL PROVISIONS

Special provisions peculiar to the project and not otherwise thoroughly or appropriately set forth in the standard specifications or plans.

## PROPOSAL (OR REQUEST FOR PROPOSALS)

The paper document provided by the Turnpike Authority 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.

### PROVIDED MATERIALS

Those documents, engineering data, designs, drawings, etc, conveyed to the Proposers on the Reduced Candidate List during the course of the procurement process to aid the Proposer in the development of their Technical Proposal, Project design, and the construction of the Project.

### REFERENCED DOCUMENTS

Those documents that are referenced within the other Contract Documents that provide additional design and construction requirements or standards that by reference are incorporated into the Contract.

## RIGHT OF WAY

The land area shown on the plans as right of way within which the project is to be constructed.

## ROAD

Synonymous with Highway and Street.

## ROADBED

The graded portion of a highway usually considered as the area between the intersections of top and side slopes, upon which the base course, surface course, shoulders, and medians are constructed.

## ROADSIDE

A general term denoting the area within the limits of the right of way adjoining the outer edge of the roadway. Extensive areas between the roadways of a divided highway may also be considered roadside.

## ROADWAY

The portion of a highway within limits of construction.

## SECTION

A numbered chapter of the standard specifications.

## SHOULDER

The portion of the roadway adjacent to the traveled way for accommodation of stopped vehicles, for emergency use, and for lateral support of base and surface courses.

## SIDEWALK

That portion of the roadway primarily constructed for pedestrian traffic.

## SKEW ANGLE

The angle between the centerline of the project and the centerline of a pipe, culvert, bridge pier, bent, abutment, or other drainage feature, measured to the right of the project centerline facing in the direction of progressing stations.

## SPECIAL PROVISIONS

Project special provisions and standard special provisions taken together as one body of special provisions.

## SPECIFICATIONS

The general term comprising all the directions, provisions, and requirements contained or referred to in the standard specifications, including the supplemental specifications, together with such additional directions, provisions, and requirements that may be added or adopted as special provisions.

## STANDARD SPECIAL PROVISIONS

Special directions or requirements not otherwise thoroughly or appropriately set forth in the standard specifications and that are peculiar to a selected group of projects.

## STANDARD SPECIFICATIONS

The general term comprising all the directions, provisions, and requirements contained or referred to in this book entitled Standard Specifications for Roads and Structures, and in any

subsequent revisions or additions to such book that are issued under the title Supplemental Specifications.

**STATE**

The State of North Carolina.

**STATION**

A station, when used as a term of measurement, will be 100 linear feet measured horizontally. When used as a location, it will be a designated point on the project.

**STREET**

Synonymous with Highway and Road.

**SUBCONTRACTOR**

An individual, partnership, firm, joint venture, L.L.C. or corporation to whom the Design-Build Team, with the written consent of the Engineer, sublets any part of the contract.

**SUBGRADE**

That portion of the roadbed prepared as a foundation for the pavement structure including curb and gutter. On portions of projects that do not include the construction of a base course or pavement, the presence of the subgrade will not be recognized during the life of such contract.

**SUBSTANTIAL COMPLETION**

Completion of that portion of a contract, as defined in the Project Special Provision entitled "Substantial Completion", for which liquidated damages may be specified.

**SUBSTRUCTURE**

All of that part of the structure below the bearings of simple and continuous spans, spans, skew back of arches and tops of footings of rigid frames, together with the backwalls, and wingwalls.

**SUCCESSFUL PROPOSER**

The Proposer awarded a contract.

**SUPERINTENDENT**

The representative of the Design-Build Team authorized to supervise and direct the construction for the Design-Build Team and to receive and fulfill directions from the Engineer.

**SUPERSTRUCTURE**

All of the part of the structure exclusive of the substructure.

**SUPPLEMENTAL AGREEMENT**

A written agreement between the Design-Build Team and the Turnpike Authority or Department covering amendments to the contract.

## SUPPLEMENTAL SPECIFICATIONS

General revisions or additions to this book of standard specifications that are issued under the title of Supplemental Specifications, and that shall be considered as part of the standard specifications, or specifications, regulations, standards, or codes referenced in the contract.

## SURETY

A corporate bonding company furnishing the bid bond or furnishing the contract payment and performance bonds.

## 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 Instructions to Proposers and the Request for Proposals, for the purpose of final selection. The Technical Proposal is also defined to include any supplemental information requested by the NCTA or the Department from a Proposer prior to the opening of Price Proposals.

## TEMPORARY CONSTRUCTION EASEMENT

A temporary right, owned by the Department of Transportation or the Turnpike Authority, in a parcel of land owned by a third party outside the highway right of way, for the use of the Department of Transportation or Turnpike Authority during the construction and that reverts to the third party on completion of construction.

## THROUGH TRAFFIC

Traffic that can reach its destination by a route or routes other than the facility under construction.

## TOTAL AMOUNT BID

Same as total price bid. The total amount bid will be considered to be the correct sum total obtained by adding together the amounts bid for every item in the proposal other than items which are authorized alternates to those items for which an amount bid has been established.

## UNBALANCED BID

A Price Proposal that includes any unbalanced bid price.

## UNBALANCED BID PRICE

A unit or lump sum bid price that does not reflect reasonable actual costs that the proposer anticipates for the performance of the item in question along with a reasonable proportionate share of the proposer's anticipated profit, overhead costs, and other indirect costs.

## UNLIMITED NOTICE TO PROCEED

The Notice to Proceed that authorizes all Work required by the Contract Documents.

## WORK

Work shall mean the furnishing of all labor, materials, equipment, and incidentals necessary or convenient to the successful completion of the project, or any part, portion, or phase thereof, and the carrying out of all duties and obligations imposed by the contract.

## WORKING DRAWINGS

Stress sheets, shop drawings, erection drawings, falsework drawings, cofferdam drawings, catalog cuts, or any other supplementary drawings or similar data that the Design-Build Team is required to submit to the Engineer for review and/or approval.

# SECTION 102
# PROPOSAL REQUIREMENTS AND CONDITIONS

## 102-1 INVITATION TO BID

After the advertisement has been made, an invitation to bid will be mailed 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 Design-Build Proposals will be received for the construction of specific projects. Such invitation will indicate the contract and project identification numbers, length, locations, and descriptions; a general summary of the items 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 prior to the bid opening.

## 102-2 CONTRACTOR PREQUALIFICATION

Contractors desiring to perform work on NCTA projects shall prequalify with the Department of Transportation. Upon prequalification, Contractors will be placed on the Department of Transportation's Prequalified Bidders List and/or the Approved Subcontractors List, depending upon the application submitted. All requirements listed in Article 102-2(A) through Article 102-2(D) apply for working on NCTA projects. However, additional prequalification requirements may be dictated in the Request for Qualifications or Request for Proposals on a project specific basis. Additionally, Contractors may be precluded, with cause, from performing work on NCTA projects regardless of their status on the Department of Transportation's Prequalified Bidders List and/or Approved Subcontractors List.

### (A) BIDDER PREQUALIFICATION

(1) Applicant shall submit a completed NCDOT Bidder Experience Questionnaire along with any additional supporting information requested by the Department, as noted in the Experience Questionnaire package. Additional requirements for prequalification will be set forth in the contract.

(2) Applicant shall demonstrate that he has sufficient ability and experience in related highway construction projects to perform the work specified in NCDOT contracts, including the type and dollar value of previous contracts.

(3) Applicant shall demonstrate a history of successful performance and completion of projects in a timely manner, subject to contract time adjustments.

(4) Applicant shall demonstrate the financial ability to furnish bonds as specified in G.S. 44A-26.

(5) Applicant shall demonstrate sufficient and readily available equipment to perform highway construction contracts in a timely manner.

(6) Applicant shall demonstrate sufficient available experienced personnel to perform highway construction contracts. The identities and qualifications of both management and labor work force shall be provided.

(7) Applicant shall provide names and addresses of persons for whom the firm has performed related work. Responses from the references shall be on Department of Transportation forms and shall be received by the Department prior to evaluating the request for prequalification.

(8) Applicant shall provide any information requested concerning the corporate and operational management structure of the company, the identity of persons or entities owning stock or other equity interest in the company, and the relationship between the applicant and any other company prequalified with the Department or applying for prequalification.

(9) Applicant shall demonstrate, at the time of application for prequalification, the financial capacity to successfully complete projects containing the work types they so designate.

(10) Applicant shall provide further information as may be required to determine that the firm is a responsible bidder.

(11) Applicant shall submit a completed Pre-bid Non-collusion Affidavit and Debarment Certification, in accordance with Article 102-10. These forms can be found on the Department's website.

(12) Applicant shall submit a completed Safety Index Rating Form with the Questionnaire and annually thereafter. Details regarding the Safety Index are discussed later in Article 102-2(C). This form may be obtained by contacting the State Contractual Services Engineer or from the Department's website.

Bidders shall renew annually and requalify every 3 years. See Article 102-2(D) Renewal / Requalification for details.

The Bidder Experience Questionnaire shall be completed in its entirety and signed by an officer of the firm. The officer's signature shall be notarized. In addition to submitting the Experience Questionnaire form as set forth above, the prospective bidder shall submit supporting information in a format of his choosing to address the requirements listed above.

The prospective proposer shall file all required statements and documents with the State Contractual Services Engineer no less than 4 weeks prior to a given letting for their Price Proposal to be considered. A Price Proposal shall not be opened unless all prequalification requirements have been met by the proposer and have been found acceptable by the Engineer.

## (B) SUBCONTRACTOR PREQUALIFICATION

Contractors who have been approved to be placed on the Prequalified Bidders List as noted above may also perform work for the Department as a subcontractor and need not apply further. Subcontractors will not be placed on the Prequalified Bidders List unless they submit through the Prequalification process.

(1) Applicant shall submit a completed NCDOT Subcontractor Experience Questionnaire along with any additional supporting information requested by the Department. Additional requirements for prequalification will be set forth in the contract.

(2) Applicant shall demonstrate sufficient ability and experience in related construction projects to perform the work specified in NCDOT contracts, including the type of previous contracts.

(3) Applicant shall demonstrate sufficient and readily available equipment to perform highway construction contracts in a timely manner.

(4) Applicant shall submit a completed Safety Index Rating Form with the Questionnaire and annually thereafter. Details regarding the Safety Index are discussed later in Subarticle 102-2(C). This form may be obtained by contacting the State Contractual Services Engineer or from the Department's website.

(5) Applicant shall provide further information as may be required.

Subcontractors shall renew annually and requalify every 3 years. See Subarticle 102-2(D) Renewal/Requalification for details.

Prospective subcontractors may request a NCDOT Subcontractor Experience Questionnaire and a Safety Index Rating Form from the State Contractual Services Engineer. The Safety Index Rating Form is included in the Subcontractor Experience Questionnaire and can also be found at the Department's website.

The Subcontractor Experience Questionnaire shall be completed in its entirety. In addition to submitting the Experience Questionnaire as set forth above, the prospective subcontractor shall submit supporting information in a format of their choosing to address the requirements listed above.

The prospective proposer shall file all required statements and documents with the State Contractual Services Engineer no less than 4 weeks prior to beginning work. A subcontractor will not be allowed to begin work until all prequalification requirements have been met by the subcontractor and have been found acceptable by the Engineer.

Upon determination by the Department that all prequalification requirements have been met, the applicant will be assigned a Vender Identification Number. This Number will thereafter be assigned to all applicants for prequalification or requalification which the Department determines are under sufficient common ownership and management control to warrant prequalification as a

single entity. This determination by the Department shall be based on the information submitted with the Experience Questionnaire, annual review of indices, and any other information obtained by the Department.

## (C) SAFETY INDEX

The Department will conduct a review of each firm's Safety Index. To be prequalified, each firm shall maintain a satisfactory safety index. An overall safety index equal to or greater than 60 is considered satisfactory. In addition, an index between 60 and 69 may be considered marginal and may result in an in-depth safety audit of a firm's safety practices. An overall safety index equal to or less than 59 is considered unsatisfactory and will prohibit prequalification of new firms until said firms meet the requirements described below.

A score of 59 or less for requalifying firms will result in disciplinary action as follows. The Engineer may require the Contractor to state in writing the reason(s) for the unsatisfactory rating and produce such supporting data as may be necessary to evaluate the circumstances surrounding the rating. When the Contractor cannot provide justification to raise the unsatisfactory safety index, the Engineer may invoke one or more of the following sanctions:

(1) Removal of the firm from the Prequalified Bidders List and/or the Approved Subcontractors List

(2) Placement of the firm on probation for up to two years

(3) Auditing of the firm's safety practices

(4) Giving a written warning to correct any safety deficiencies

Firms not approved or disqualified to bid or perform subcontract work due to an unsatisfactory safety index will not be approved or reinstated to bid or perform subcontract work until they can provide adequate evidence that all safety deficiencies have been corrected to the satisfaction of the Engineer.

## (D) RENEWAL AND REQUALIFICATION

Renewal of proposers shall occur annually on or before the firm's anniversary, which is based upon the prequalification expiration date. Renewal shall consist of submitting an updated Safety Index, any other required indices, and the non-collusion documents mentioned earlier in Subarticle 102-2(A). Price Proposals of firms who fail to submit these documents by their anniversary date will not be considered until such time as these documents are received and approved by the Engineer. The Engineer may also review performance related issues when considering proposers for renewal.

Renewal of subcontractors shall occur annually on or before the firm's anniversary, which is based upon the prequalification expiration date. Renewal shall consist of submitting an updated Safety Index and any other required indices. Subcontractors who fail to submit these documents by their anniversary date will not be allowed to begin work on any new contracts until these documents are received and approved by the Engineer.

Requalifying of bidders and subcontractors shall occur every 3 years. Those requalifying may request their respective NCDOT Experience Questionnaire form, a Safety Index Rating Form, and any other index rating forms from the State Contractual Services Engineer. Requalifying bidders shall also submit their non-collusion documents as shown in Subarticle 102-2(A). The Safety Index Rating Form is included in the Experience Questionnaire and can be found on the Department's website.

The requalifying contractor shall file all required statements and documents with the State Contractual Services Engineer no less than 4 weeks prior to a given letting for their Price Proposal to be considered. Following the expiration date, a Price Proposal will not be opened unless all requalification requirements have been met by the proposer and have been found acceptable by the Engineer. Also, following the expiration date, a subcontractor may not begin any new work unless all prequalification requirements have been met by the subcontractor and have been found acceptable by the Engineer.

## 102-3 CONTENTS OF INSTRUCTIONS TO PROPOSERS AND RFP

An Instructions to Proposers document and the remainder of the Request for Proposals will be furnished by the Turnpike Authority to the selected proposers from among the respondents to the Request for Qualifications. Each Instructions to Proposers document and 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. The Instructions to Proposers and the remainder of the 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. These documents will set forth the date and time Technical and Price Proposals are to be submitted and will be opened. The Request for Proposals will also include any special provisions or requirements that vary from or are not contained in any preliminary plans 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.

The plans, standard specifications, and other documents designated in the Instructions to Proposers document and the remainder of 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.

Up to three copies of the Instructions to Proposers document and the remainder of the Request for Proposals will be furnished to each prospective Proposer. Additional copies may be purchased for the sum of $25 each. The copy marked with the Proposer's name and prequalification number shall be returned to the Department.

## 102-5 INTERPRETATION OF QUANTITIES IN PROPOSAL

The quantities appearing in the proposal are approximate only and are to be used for the comparison of bids. Payment to the Design-Build Team will be made in accordance with the terms of the contract.

When revisions in the plans are made by the Engineer that affect the quantities shown for lump sum items, adjustment in compensation may be made under the provisions of Article 104-8.

## 102-6 EXAMINATION OF PLANS, SPECIFICATIONS, CONTRACT, AND SITE OF WORK

The Proposer shall examine carefully the site of the work contemplated, the preliminary plans and specifications, the Instructions to Proposers document, and the remainder of the Request for Proposals. The submission of a Technical Proposal and a Price Proposal shall be conclusive evidence that the Proposer has investigated and is satisfied as to the conditions to be encountered; as to the character, quality, and scope of work to be performed; the quantities of materials to be furnished; and as to the conditions and requirements of the proposed contract.

A proposer or Design-Build Team is cautioned to make such independent investigation and examination as he deems necessary to satisfy himself as to conditions to be encountered in the performance of the work and with respect to possible local material sources, the quality and quantity of material available from such property, and the type and extent of processing that may be required in order to produce material conforming to the requirements of the contract.

## 102-7 SUBSURFACE INVESTIGATION REPORT

The Subsurface Investigation and report was made for the purpose of information only.

If a subsurface investigation report is available on this project, a copy may be obtained by the prospective proposers upon request.

The subsurface investigation on which the report is based was made for the purpose of information only. The various field boring logs, rock cores, and soil test data available may be reviewed or inspected in Raleigh at the office of the Geotechnical Unit. Neither the subsurface investigation report nor the field boring logs, rock cores, or soil test data is part of the contract.

General soil and rock strata descriptions and indicated boundaries are based on a geotechnical interpretation of all available subsurface data and may not necessarily reflect the actual subsurface conditions between borings or between sampled strata within the borehole. The laboratory sample data and the in situ (in-place) test data can be relied on only to the degree of reliability inherent in the standard test method. The observed water levels or soil moisture conditions indicated in the subsurface investigations are as recorded at the time of the investigation. These water levels or soil moisture conditions may vary considerably with time according to climatic conditions including temperature, precipitation, and wind, as well as other non-climactic factors.

The Proposer is cautioned that details shown in the subsurface investigation report are preliminary only. The NCTA and the Department do not warrant or guarantee the sufficiency or accuracy of the investigation made, nor the interpretations made or opinions of the NCTA or the Department as to the type of materials and conditions that may be encountered. The Proposer is cautioned to make such independent subsurface investigations, as he deems necessary to satisfy

himself 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 time for any reason resulting from the actual conditions encountered at the site differing from those indicated in the subsurface investigation.

## 102-8 PREPARATION AND SUBMISSION OF PRICE PROPOSALS

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. 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.
6. 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.
7. The Price Proposal shall be properly executed. In order 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 (LLC), it shall be signed by the manager 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 which is part of the signature sheets.

8. The Price Proposal shall not contain any unauthorized additions, deletions, or conditional bids.

9. 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.

10. The Price Proposal shall be accompanied by a bid bond on the form furnished by the Turnpike Authority or by a bid deposit. The bid bond shall be completely and properly executed in accordance with the requirements of Article 102-11. The bid deposit shall be a certified check or cashier check in accordance with Article 102-11.

11. The Price Proposal shall be placed in a sealed envelope and shall be delivered to and received by the Department prior to the time specified in the Instructions to Proposers.

## 102-9 BLANK

## 102-10 NON-COLLUSION AFFIDAVIT AND DEBARMEN CERTIFICATION

**(A) General** Prime contractors and lower tier participants in each transaction involving public funds shall execute a non-collusion certification and debarment certification. Transactions that require certifications from lower tier participants are:

(1) Transactions between a prime contractor and a person, other than for a procurement contract, for goods or services, regardless of type.

(2) Procurement contracts for goods and services, between a prime contractor and a person, regardless of type, expected to equal or exceed the Federal small purchase threshold fixed at 10 U.S.C. 2304(g) [currently twenty-five thousand dollars ($25,000)] under a prime contract.

(3) Procurement contracts for goods or services between a prime contractor and a person, regardless of the amount, under which that person will have a critical influence on or substantive control over the transaction. Such persons include, but are not limited to, bid estimators and contract managers.

The certifications for both the prime contractor and the lower tier participants shall be on a form furnished by the Department of Transportation to comply with Federal Highway Administration requirements, as published in 49 CFR Part 29. The prime contractor is responsible for obtaining the certifications from the lower tier participants and is responsible for keeping them as part of the contract records.

**(B) Non-collusion Affidavit** In compliance with applicable Federal and State laws and regulations, each and every proposer shall furnish the Department with an affidavit certifying that the proposer has not entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in

connection with his Price Proposal on the project. The affidavit shall also conclusively indicate that the proposer intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another Design-Build Team.

**(C) Debarment Certification** In compliance with applicable Federal and State laws and regulations, each and every proposer shall furnish the Department with a debarment certification, stating that he is not debarred, or if he is debarred, an explanation shall be included. The explanation will not necessarily result in denial of participation in a contract. Failure to furnish a certification or an explanation will be grounds for rejection of a Price Proposal. If the prequalified proposer's status changes, he shall immediately submit a new fully executed debarment certification with an explanation of the change.

Failure to have a fully executed non-collusion affidavit and debarment certification on file in the Contractual Services Office prior to submitting Price Proposals will cause those Price Proposals to be non-responsive.

(1) **Paper Bid** Execution of Bid, Noncollusion Affidavit and Debarment Certification forms will be included in the Request for Proposals as part of the signature sheets. Execution of the signature sheets will also constitute execution of the Price Proposal, non-collusion affidavit and the debarment certification. The signature sheets shall be notarized.

## 102-11 BID BOND OR BID DEPOSIT

Each Price Proposal shall be accompanied by a corporate bid bond or a bid deposit of a certified or cashiers check in the amount of at least 5% of the total amount bid for the contract. When a Price Proposal is secured by a bid deposit (certified check or cashiers check), the execution of a bid bond will not be required.

If the proposer has failed to meet all conditions of the bid bond and the Department has not received the amount due under the bid bond, the proposer may be disqualified from further bidding as provided in Article 102-16.

No Price Proposal will be considered or accepted unless accompanied by one of the foregoing securities. The bid bond shall be executed by a Corporate Surety licensed to do business in North Carolina and the certified check or cashiers check shall be drawn on a bank or trust company insured by the Federal Deposit Insurance Corporation and made payable to the *Department of Transportation* in an amount of at least 5% of the total amount bid for the contract. The condition of the bid bond or bid deposit is: the Proposer shall not withdraw within 135 days after the latest submission of the Technical and Price Proposal, and if the Board of Transportation shall award a contract to the Proposer, the Proposer shall within 14 calendar days after the written solicitation of bonds 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; in the event of the failure of the Proposer to give such payment and performance bonds as required, then the amount of the bid bond shall be immediately paid to the Department of Transportation as liquidated damages, or, in the case of a bid deposit, the deposit shall be forfeited to the Department of Transportation.

Withdrawal of a Price Proposal due to a mistake made in the preparation of the Price Proposal, where permitted by Article 103-3, shall not constitute withdrawal of a Price Proposal as cause for payment of the bid bond or forfeiture of the bid deposit.

When a Price Proposal is secured by a bid bond, the bid bond shall be on the form furnished by the Turnpike Authority. The bid bond shall be executed by both the proposer and a Corporate Surety licensed under the laws of North Carolina to write such bonds. The execution by the proposer shall be in the same manner as required by Article 102-8 for the proper execution of the Price Proposal. The execution by the Corporate Surety shall be the same as is provided for by Article 102-8(A)(8)(b), for the execution of the Price Proposal by a corporation. The seal of the Corporate Surety shall be affixed to the bid bond. The bid bond form furnished is for execution of the Corporate Surety by a General Agent or Attorney in Fact. A certified copy of the Power of Attorney shall be attached if the bid bond is executed by a General Agent or Attorney in Fact. The Power of Attorney shall contain a certification that the Power of Attorney is still in full force and effect as of the date of the execution of the bid bond by the General Agent or Attorney in Fact. If the bid bond is executed by the Corporate Surety by the President, Vice President, or Assistant Vice President, and attested to by the Secretary or Assistant Secretary, then the bid bond form furnished shall be modified for such execution, instead of execution by the Attorney in Fact or the General Agent.

## 102-12 DELIVERY OF TECHNICAL AND PRICE PROPOSALS

All Price Proposals shall be placed in a sealed envelope having the name and address of the Proposer, and the statement "Price Proposal for the Design-Build of North Carolina Turnpike Authority Project No. _____ in _____County(ies)" on the outside of the envelope. If delivered by mail, the sealed envelope shall be placed in another sealed envelope and the outer envelope addressed to the State Contract Officer as stated in the Instructions to Proposer. The outer envelope shall also bear the statement "Price Proposal for the Design-Build of North Carolina Turnpike Authority Project No. _____". All Technical Proposals shall be placed in a sealed envelope having the name and address of the Proposer, and the statement "Technical Proposal for the Design-Build of North Carolina Turnpike Authority Project No. _____ in _____County(ies)" on the outside of the envelope. If delivered by mail, the sealed envelope shall be placed in another sealed envelope and the outer envelope addressed to the State Contract Officer as stated in the Instructions to Proposers. The outer envelope shall also bear the statement "Technical Proposal for the Design-Build of North Carolina Turnpike Authority Project No. _____". If delivered in person on or before the due date, the sealed envelope shall be delivered to the office of the State Contract Officer as indicated in the Instructions to Proposers. Price Proposals and Technical Proposals shall be submitted in accordance with the section entitled “Submission of Design-Build Proposal” contained in the Instructions to Proposers.

All Price Proposals and Technical Proposals shall be delivered prior to the time specified in the Instructions to Proposers. Price Proposals and Technical Proposals received after such time will not be accepted and will be returned to the proposer unopened.

## 102-13 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 NCTA Chief Engineer.

## 102-14 RECEIPT AND OPENING OF BIDS

Price Proposals will be opened and read publicly at the time and place indicated in the Instructions to Proposers. The scores of the previously conducted evaluation of the Technical Proposals may also be read publicly in accordance with the procedures outlined in the Instructions to Proposers. Proposers, their authorized agents, and other interested parties are invited to be present.

## 102-15 REJECTION OF BIDS

Any Price Proposal submitted which fails to comply with any of the requirements of Articles 102-8, 102-10 or 102-11, or with the requirements of the project scope and functional 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.

Irregularities due to apparent clerical errors and omissions may be waived in accordance with Article 103-2.

Any Price Proposal including any unit or lump sum bid price that is unbalanced to the potential detriment of the Department will be considered irregular and may be rejected. In the event the Board of Transportation determines it is in the best public interest to accept such irregular Price Proposal, it may award the contract based on such Price Proposal subject to the requirements of Subarticle 109-4(C).

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*. Notwithstanding the 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 Price Proposal opening, regardless of funding sources.

In addition to the above, any Price Proposals for contracts not funded with any Federal funds that are submitted by any proposer who has failed to obtain the appropriate General Contractor's license, as required by Chapter 87 of the General Statutes of North Carolina, shall be considered non-responsive and will not be considered for award.

The right to reject any and all Price Proposals shall be reserved to the Board of Transportation and/or the Secretary of Transportation.

## 102-16 DISQUALIFICATION OF PROPOSERS

Any one of the following causes may be justification for disqualifying a Design-Build Team from further bidding until he has applied for and has been prequalified in accordance with Article 102-2:

**(A)** Unsatisfactory progress in accordance with Article 108-8.

**(B)** Being declared in default in accordance with Article 108-9.

**(C)** Uncompleted contracts which, in the judgment of the Engineer, might hinder or prevent the timely completion of additional work if awarded.

**(D)** Failure to comply with prequalification requirements.

**(E)** The submission of more than one Price Proposal for the same contract by an individual, partnership, joint venture, L.L.C. or corporation prequalified under the same prequalification number.

**(F)** Evidence of collusion among bidders. Each participant in such collusion will be disqualified.

**(G)** Failure to furnish a non-collusion affidavit upon request.

**(H)** Failure to comply with Article 108-6.

**(I)** Failure to comply with a written order of the Engineer as provided in Article 105-1 if in the judgment of the Engineer, such failure is of sufficient magnitude to warrant disqualification.

**(J)** Failure to satisfy the Disadvantaged Business Enterprise requirements of the project special provisions.

**(K)** The Department has not received the amount due under a forfeited bid bond or under the terms of a performance bond.

**(L)** Failure to submit the documents required by Article 109-10 within 120 days after the contract Final Acceptance Date, as defined in Article 101-3.

**(M)** Failure to return overpayments as directed by the Engineer.

**(N)** Failure to maintain a satisfactory safety index as required by Article 102-2.

**(O)** Recruitment of Department or Turnpike Authority employees for employment as prohibited by Article 108-5.

**(P)** False information submitted on any application, statement, certification, reports, records and/or reproduction.

Conviction of any employee of the company, of any applicable state or federal law, may be fully imputed to the business firm with which he is or was associated or by whom he was employed or with the knowledge or approval of the business firm or there after ratified by it.

**(Q)** Being debarred from performing work with other city, state, and federal agencies.

**(R)** Failure to perform guaranty work within the terms of the contract.

Upon a determination that a Design-Build Team or any of its affiliated companies should be disqualified for one or more of the reasons listed above, the Department may, at its discretion, disqualify all entities prequalified under the same Prequalification Number.

A Design-Build Team or Subcontractor may be disqualified, for cause, from bidding on NCTA projects independent of any action taken by the Department of Transportation. Disqualification from any NCTA work as a result of any cause will culminate in a notification of such to the Department of Transportation, and may result in a recommendation for disqualification from the Department of Transportation's Prequalified Bidders List or Approved Subcontractor List.

# SECTION 103

# AWARD AND EXECUTION OF CONTRACT

## 103-1 CONSIDERATION OF PRICE PROPOSALS

After the Price Proposals are opened and read, they will be tabulated. The Price Proposal and score of the Technical Proposal will be made available in accordance with procedures outlined in the Instructions to Proposers. In the event of errors, omissions, or discrepancies in the costs, corrections to the Price Proposal will be made in accordance with the provisions of Article 103-2. Such corrected costs 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 "Instructions to Proposers.

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 Board of Transportation, the best interests of the State will be promoted thereby.

## 103-2 CORRECTION OF BID ERRORS

### (A) Paper Bids

(1) **General**

The provisions of this article shall apply in waiving irregularities and correcting apparent clerical errors and omissions in the unit bid price and the amount bid for bid items.

(2) **Omitted Unit Bid Price--Amount Bid Completed--Quantity Bid on Is One Unit**

In the case of a bid item for which the amount bid is completed, but the unit bid price is omitted and the quantity shown in the proposal for the bid item is only one unit, the unit bid price shall be deemed to be the same as the amount bid for that bid item and shall constitute the contract unit price for that bid item.

(3) **Omitted Unit Bid Price--Amount Bid Completed--Quantity Bid on Is More Than One Unit**

In the case of a bid item for which the amount bid is completed (extension of the unit bid price by the quantity) but the unit bid price is omitted and the quantity shown in the proposal for the bid item is more than one unit, the unit bid price shall be deemed to be the amount derived by dividing the amount bid for that item by the quantity shown in the proposal for that bid item and shall constitute the contract unit price for that bid item.

(4) **Discrepancy in the Unit Bid Price and the Amount Bid**

In the case of a bid item in which there is a discrepancy between the unit bid price and the extension for the bid item (amount bid), the unit bid price shall govern.

As an exception to the above, on bids for contracts not funded with any Federal funds, the extension for the bid item (amount bid) shall govern when the

discrepancy consists of an obvious clerical mistake in the unit bid price consisting of the misplacement of a decimal point. The correction to the unit bid price will be made only when the following two conditions are met:

(a) The corrected unit bid price multiplied by the quantity equals the amount bid for the bid item.

(b) The corrected unit bid price is closer to the average of the engineer's estimate and the individual bids for the contract item than the uncorrected unit bid price.

(5) **Omitted Unit Bid Price and Omitted Amount Bid--Deemed Zero Bid**

The provisions of this subarticle shall apply only to bids for contracts not funded with any Federal funds.

In the case of omission of the unit bid price and the omission of the amount bid for any one item, and also in the case of the omission of the amount bid where a lump sum price is called for, the amount bid and the unit bid price shall be deemed to be zero where the value of the omitted amount bid is 1 percent or less of the total amount bid for the entire project (excluding the omitted item). The value of the omitted amount bid will be derived by determining the average of the engineer's estimate and the individual bids for that contract item.

Where the unit bid price is deemed to be zero as provided in this subarticle, such zero unit bid price shall constitute the contract unit price for the affected bid item.

Where the amount bid for a lump sum bid item is deemed to be zero as provided in this subarticle, such zero amount bid shall constitute the contract lump sum price for that bid item.

This subarticle shall not apply to the bid item for Mobilization.

(6) **Unit bid prices containing more than four (4) decimal places.**

In the case of a Bid Item for which the amount bid contains more than four (4) decimal places for the Unit Bid Price, only the whole number and the first four (4) decimal places shall constitute the Contract Unit Price for that Bid Item.

(7) **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 for the entire project.

(8) **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.

## 103-3 WITHDRAWAL OF PRICE PROPOSALS--MISTAKE

**(A) Criteria for Withdrawal of Price Proposal:**

The Department may allow a proposer submitting a bid pursuant to G.S. 136-28.1 for construction or repair work to withdraw his Price Proposal after the scheduled time of Price Proposal opening upon a determination that:

(1) A mistake was in fact made in the preparation of the Price Proposal.

(2) The mistake in the Price Proposal is of a clerical or mathematical nature and not one of bad judgment, carelessness in inspecting the work site, or in reading the contract.

(3) The mistake is found to be made in good faith and was not deliberate or by reason of gross negligence.

(4) The amount of the error or mistake is equal to or greater than 3 percent of the total amount bid.

(5) The notice of mistake and request for withdrawal of the Price Proposal by reason of the mistake is communicated to the Engineer within 48 hours after the scheduled time of Price Proposal opening. Upon proper notification of a mistake and request for withdrawal of Price Proposal, the proposer shall submit within 48 hours written notice of mistake accompanied by copies of Price Proposal preparation information to the Engineer. The notification of a mistake, request for withdrawal of Price Proposal and copies of Price Proposal preparation information shall be submitted to the NCTA Chief Engineer.

(6) The Turnpike Authority will not be prejudiced or damaged except for the loss of the bid.

**(B) Hearing by the Engineer**

If a proposer files a notice of mistake along with a request to withdraw his Price Proposal, the Engineer will promptly hold a hearing thereon. The Engineer will give to the requesting proposer reasonable notice of the time and place of any such hearing. The proposer may appear at the hearing and present the original working papers, documents, or materials used in the preparation of the Price Proposal sought to be withdrawn, together with other facts and arguments in support of his request to withdraw his Price Proposal. The proposer shall be required to present a written affidavit that the documents presented are the original, unaltered documents used in the preparation of the Price Proposal.

**(C) Action by NCTA Chief Engineer**

A determination may be made by the NCTA Chief Engineer that the proposer meets the criteria for withdrawal of the Price Proposal as set forth in Subarticle 103-3(A) upon presentation of clear and convincing evidence by the proposer. The Engineer will present his findings to the NCTA Chief Engineer for action on the proposer’s request. The Engineer will advise the proposer of the NCTA Chief Engineer’s decision prior to the Board of Transportation's consideration of award.

**(D) Bid Bond**

If a Price Proposal mistake is made and a request to withdraw the Price Proposal is made, the bid bond shall continue in full force and effect until there is a determination by the NCTA Chief Engineer that the conditions in Subarticle 103-3(A) have been met. The effect of the refusal of the Design-Build Team to give payment and performance bonds within 14 calendar days after the notice of award is received by him, if award has been made by the Board of Transportation after consideration and denial of the Design-Build Team's request to withdraw their Price Proposal, shall be governed by the terms and conditions of the bid bond.

## 103-4 AWARD OF CONTRACT

**(A) General**

The Department of Transportation, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Statue. 252) and the Regulations of the Department of Transportation (49 CFR, Part 21), issued pursuant to such act, hereby notifies all proposers that it will affirmatively insure that contracts entered in pursuant to advertisements, if awarded, will be made by the Board of Transportation to the responsible proposer with the lowest adjusted price without discrimination on the grounds of race, color, or national origin. The responsible proposer with the lowest adjusted price will be notified by letter that his Price Proposal has been accepted and that he has been awarded the contract. This letter shall constitute the notice of award. The notice of award, if the award be made, will be issued within the timeframe specified in the RFP after the opening of bids, except that with the consent of the responsible proposer with the lowest adjusted price the decision to award the contract to such proposer 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 responsible proposer with the lowest adjusted price may withdraw his Price Proposal at the expiration of the timeframe specified in the RFP without penalty if no notice of award has been issued.

Award of a contract involving any unbalanced bid price(s) may be made in accordance with the requirements of Article 102-15.

**(B) BLANK**

## 103-5 CANCELLATION OF AWARD

The Board of Transportation reserves the right to rescind the award of any contract at any time before the receipt of the properly executed contract bonds from the successful proposer.

## 103-6 RETURN OF BID BOND OR BID DEPOSIT

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 Department warrants in the equivalent amount of checks that were furnished as a bid deposit will be issued.

Paper bid bonds will be retained by the Department until the contract bonds are furnished by the successful proposer, after which all such bid bonds will be destroyed unless the individual bid bond form contains a note requesting that it be returned to the proposer or the Surety.

## 103-7 CONTRACT BONDS

The successful proposer, within 14 calendar days after written solicitation for bonds is received by him, shall provide the Department of Transportation with a contract payment bond and a contract performance bond each in an amount equal to 100 percent of the amount of the contract. All bonds shall be in conformance with G.S. 44A-33. The corporate surety furnishing the bonds shall be authorized to do business in the State.

## 103-8 EXECUTION OF CONTRACT

As soon as possible following receipt of the properly executed contract bonds, the Department will complete the execution of the contract, retain the original contract, and return one certified copy of the contract to the Design-Build Team.

## 103-9 FAILURE TO FURNISH CONTRACT BONDS

The successful proposer's failure to file acceptable bonds within 14 calendar days after the written solicitation for bonds is received by him shall be just cause for the forfeiture of the bid bond or bid deposit and rescinding the award of the contract. Award may then be made to the responsible proposer with the next lowest adjusted price or the work may be readvertised and constructed under contract or otherwise, as the Board of Transportation or the Secretary of Transportation may decide.

# SECTION 104
# SCOPE OF WORK

## 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. In case the method 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 special, 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.

## 104-2 SUPPLEMENTAL AGREEMENTS

Whenever it is necessary to make amendments to the contract in order to complete satisfactorily the proposed construction and/or to provide authorized time extensions, the Engineer shall have the authority to enter into a supplemental agreement covering such amendments.

Supplemental agreements shall become a part of the contract when executed by the Engineer and an authorized representative of the Design-Build Team. The Design-Build Team shall file with the Engineer a copy of the name or names of his representatives who are authorized to sign supplemental agreements.

## 104-3 ALTERATIONS OF PLANS OR DETAILS OF CONSTRUCTION

The Engineer reserves the right to make, at any time during the progress of the work, such alterations in the contract as may be found necessary or desirable. Under no circumstances will an alteration involve work beyond the termini of the proposed construction except as may be necessary to satisfactorily complete the project. Such alterations shall not invalidate the contract nor release the Surety, and the Design-Build Team agrees to perform the work as altered at his contract unit or lump sum prices the same as if it had been a part of the original contract except as otherwise herein provided.

An adjustment in the affected contract unit or lump sum prices due to alterations in the contract that materially change the character of the work and the cost of performing the work will be made by the Engineer only as provided in this article.

If the Engineer makes an alteration in the contract, which he determines will materially change the character of the work and the cost of performing the work, an adjustment will be made and the contract modified in writing accordingly. The Design-Build Team will be paid for performing the affected work in accordance with Subarticle 104-8(A).

When the Design-Build Team is required to perform work which is, in his opinion, an alteration in the contract which materially changes the character of the work and the cost of performing the work, he shall notify the Engineer in writing prior to performing such work.

The Engineer will investigate and, based upon his determination, one of the following will occur:

**(A)** If the Engineer determines that the affected work is an alteration of contract that materially changes the character of the work and the cost of performing the work, the Design-Build Team will be notified in writing by the Engineer and compensation will be made in accordance with Subarticle 104-8(A).

**(B)** If the Engineer determines that the work is not such an alteration in the contract that materially changes the character of the work and the cost of performing the work, he will notify the Design-Build Team in writing of his determination. If the Design-Build Team, upon receipt of the Engineer's written determination, still intends to file a claim for additional compensation by reason of such alteration, he shall notify the Engineer in writing of such intent prior to beginning any of the alleged altered work and the provisions of Subarticle 104-8(B) shall be strictly adhered to.

No contract adjustment will be allowed under this article for any effects caused on unaltered work.

## 104-4 SUSPENSIONS OF WORK ORDERED BY THE ENGINEER

### (A) Suspensions of the Work Ordered by the Engineer

When the Engineer suspends in writing the performance of all or any portion of the work for a period of time not originally anticipated, customary, or inherent to the construction industry and the Design-Build Team believes that additional compensation for idle equipment and/or labor is justifiably due as a result of such suspension, the Design-Build Team shall notify the Engineer in writing of his intent to file a claim for additional compensation within 7 days after the Engineer suspends the performances of the work and the provisions of Subarticle 104-8 (C) shall be strictly adhered to.

Within 14 calendar days of receipt by the Design-Build Team of the notice to resume work, the Design-Build Team shall submit his claim to the Engineer in writing. Such claim shall set forth the reasons and support for such adjustment in compensation, including cost records, and any other supporting justification in accordance with Subarticle 104-8(C).

**(B) Alleged Suspension**

If the Design-Build Team contends they have been prevented from performing all or any portion of the work for a period of time not originally anticipated, customary, or inherent to the construction industry because of conditions beyond the control of and not the fault of the Design-Build Team, its suppliers, or subcontractors at any tier, and not caused by weather, but the Engineer has not suspended the work in writing, the Design-Build Team shall submit in writing to the Engineer a notice of intent to file a claim for additional compensation by reason of such alleged suspension. No adjustment in compensation will be allowed for idle equipment and/or labor prior to the time of the submission of the written notice of intent to file a claim for additional compensation by reason of such alleged suspension. Upon receipt, the Engineer will evaluate the Design-Build Team's notice of intent to file a claim for additional compensation. If the Engineer agrees with the Design-Build Team's contention, the Engineer will suspend in writing the performance of all or any portion of the work and the requirements of Subarticle 104-8(C) shall be strictly adhered to.

If the Engineer does not agree with the Design-Build Team's contention as described above and determines that no portion of the work should be suspended, he will notify the Design-Build Team in writing of his determination. If the Design-Build Team does not agree with the Engineer's determination, the requirements of Subarticle 104-8(C) shall be strictly adhered to. Within 14 calendar days after the last day of the alleged-suspension, the Design-Build Team shall submit his claim to the Engineer in writing. Such claim shall set forth the reasons and support for such adjustment in compensation, including cost records, and any other supporting justification in accordance with Subarticle 104-8(C).

**(C) Conditions**

No adjustment in compensation will be allowed under Subarticles 104-4(A) and 104-4(B) for any reason whatsoever for each occurrence of idle equipment and/or idle labor which has a duration of twenty-four hours or less.

No adjustment in compensation will be allowed under Subarticles 104-4(A) and 104-4(B) to the extent that performance would have been suspended by any other cause, or for which an adjustment is provided for or excluded under any other term or condition of this contract.

No adjustment in compensation will be allowed under Subarticles 104-4(A) and 104-4(B) for any effects caused on unchanged work. No adjustment in compensation will be allowed under Subarticles 104-4(A) and 104-4(B) except for idle equipment and/or idle labor resulting solely from the suspension of work in writing by the Engineer.

No adjustment in compensation will be allowed under Subarticles 104-4(A) and 104-4(B) where temporary suspensions of the work have been ordered by the Engineer in

accordance with Article 108-7 and the temporary suspensions are a result of the fault or negligence of the Design-Build Team.

## 104-5 OVERRUNS AND UNDERRUNS OF CONTRACT QUANTITIES

### (A) General

The Engineer reserves the right to make at any time during the work such changes in quantities as are necessary to satisfactorily complete the project. Such changes in quantities shall not invalidate the contract nor release the surety, and the Design-Build Team agrees to perform the work as changed. The Engineer will notify the Design-Build Team in writing of the significant changes in the quantities.

The Design-Build Team will be entitled to an adjustment in contract unit prices for increased costs incurred over the original bid prices in performing contract items that overrun or underrun the estimated contract quantities only as provided for in this article.

### (B) Overruns--Increase in Unit Price

If the actual quantity of any major contract item overruns the original bid quantity by more than 15 percent of such original bid quantity, or the actual quantity of any minor contract item overruns the original bid quantity by more than 100 percent of such original bid quantity, an increase in the contract unit price, excluding loss of anticipated profits, may be authorized by the Engineer. Revised contract unit prices pertaining to overruns will be applicable only to that portion of the overrun that is in excess of the percentages stated above.

(1) Whenever it is anticipated that an overrun in a major or minor contract item in excess of that described above will occur, the Design-Build Team may make written request for a revision in contract unit prices. It shall be incumbent upon the Design-Build Team to justify the request for a revision in contract unit prices. After reviewing the Design-Build Team's request, the Engineer will notify the Design-Build Team of his determination as follows:

(a) If the Engineer determines a revision in the contract unit price is justified, and the Engineer and the Design-Build Team are in agreement as to the revision to be made in the contract unit price, a supplemental agreement covering the revised unit price will be consummated prior to performing work on that quantity in excess of the percentage set forth above.

If the Engineer determines a revision in the contract unit price is justified, and the Engineer and the Design-Build Team are not in agreement as to the revision to be made in the contract unit price, the Engineer will issue a force account notice prior to performing work on that quantity in excess of the percentage set forth above.

(b) If the Engineer determines a revision in the contract unit price is not justified he will notify the Design-Build Team of his determination in writing and payments will be made for the work at the contract unit price. Upon completion of the work, the Design-Build Team may request an adjustment in the contract unit price as provided in paragraph 2 below.

(2) Whenever an overrun in a contract item in excess of the percentages previously set forth has occurred and a supplemental agreement establishing an increase in the

contract unit price has not been executed or the Engineer has not issued a force account notice, the Design-Build Team may make written request for a revision in the original contract unit price. Any adjustment in the contract unit prices due to overruns will be made by the Engineer based upon his evaluation and comparison of the Design-Build Team's documented cost records the contract unit prices for those contract items. The Design-Build Team's documented cost records for the work performed on those quantities beyond the percentages stated above shall be kept in accordance with the requirements of Article 109-3. The Design-Build Team's cost records and supporting data shall be complete in every respect and in such form that they can be checked. It shall be incumbent upon the Design-Build Team to satisfy the Engineer of the validity of any request presented by the Design-Build Team for an adjustment in contract unit price. After reviewing the Design-Build Team's request, the Engineer can make such adjustment as he deems warranted based upon his engineering judgment and the payment to the Design-Build Team will be made accordingly.

**(C) Underruns--Increase in Unit Price**

If the actual quantity of any major contract item underruns the original bid quantity by more than 15 percent of such original bid quantity, an increase in the contract unit price, excluding loss of anticipated profit, may be authorized by the Engineer. Revised contract unit prices pertaining to underruns of major contract items will be applicable to the entire quantity of the contract item that underruns. No revision will be made to the contract unit price for any minor contract item that underruns the original bid quantities.

Whenever it is anticipated that an underrun in a major contract item in excess of that described above will occur, the Design-Build Team may make written request for a revision in contract unit price. If the Engineer and the Design-Build Team are in agreement as to the revision to be made in the contract unit price, then a supplemental agreement covering the revised unit price will be entered into. If the Engineer and the Design-Build Team are not in agreement, then after performance of the work, a revised unit price may be determined as described below.

Whenever an underrun in a major contract item in excess of the percentage previously set forth has occurred, and a supplemental agreement establishing an increase in the contract unit price has not been executed, the Design-Build Team may make written request for a revision in the original contract unit price. The Design-Build Team shall submit sufficient documentation and analysis of his costs to satisfy the Engineer of any non-recovered costs included in the item that underran. Any adjustment in contract unit prices due to underruns will be made by the Engineer based upon his evaluation of the Design-Build Team's documentation and analysis showing how changes in contract item cost are attributable to the underrun. An analysis of costs shall be supplemented with the Design-Build Team's documented cost records for work performed on the total quantity of the affected item where the Design-Build Team's request for compensation includes compensation for costs other than recovered fixed costs. The Design-Build Team's cost records shall be complete in every respect and in such form that Engineer can check them. It shall be incumbent upon the Design-Build Team to satisfy the Engineer of the validity of any request presented by the Design-Build Team for adjustment in contract unit price. After reviewing the Design-Build Team's request, the Engineer may make

such adjustment as he deems warranted based upon his engineering judgement and the payment will be made on the final estimate. The total payment including any additional compensation granted by the Engineer due to an underrun in a major contract item shall not exceed the payment that would have been made for the performance of 100 percent of the original contract quantity at the original contract unit price.

In the event of underruns of major items less than 15 percent and underruns of minor items, that involve fabricated materials and that are not considered to be stock items, if fabrication of such material is begun or completed before the Design-Build Team is advised of the reduction in the quantity of the pay item, the Department will reimburse the Design-Build Team for the verified fabrication cost, including the cost of material less salvage value, or it may instruct the Design-Build Team to have the fabricated material delivered to a site designated by the Engineer and make payment for such material in accordance with Article 109-6.

**(D) Overruns and Underruns--Reduction in Unit Price**

Whenever it is anticipated that an overrun or underrun in a major contract item in excess of 15 percent or an overrun in a minor contract item in excess of 100 percent will occur, the Engineer may make written request for a reduction in contract unit price. If the Engineer and the Design-Build Team are in agreement as to the decrease to be made in the contract unit price, a supplemental agreement covering the revised unit price will be consummated prior to beginning work on that quantity in excess of the allowable percentages. If the Engineer and the Design-Build Team are not in agreement as to the decrease to be made, the Design-Build Team will be directed to perform the affected work on a force account basis. Payment for the affected work will be made based upon force account records kept in accordance with Article 109-3 but shall not exceed that payment that would have been made at the contract unit price.

## 104-6 ELIMINATED CONTRACT ITEMS

The Engineer may eliminate any item from the contract, and such action will in no way invalidate the contract. In the event the item of work involves pre-fabricated materials, which are not considered to be stock items, and fabrication of such material is begun or completed before the Design-Build Team is advised of the elimination of the contract item, the Turnpike Authority may reimburse the Design-Build Team for the verified fabrication cost including the cost of materials less salvage value or may instruct the Design-Build Team to have the fabricated material delivered to a site designated by the Engineer and make payment for such material in accordance with Article 109-6.

If the Design-Build Team has partially completed a contract item prior to notification of the elimination of such item, the Turnpike Authority will reimburse the Design-Build Team for the verified actual cost of the partially completed work not to exceed the payment that would have been made at the contract unit or lump sum price for the completed work.

In any event no payment will be made for loss of anticipated profits and no other allowance will be made for eliminated items except as listed above.

## 104-7 EXTRA WORK

The Design-Build Team shall perform extra work whenever it is deemed necessary or desirable to complete fully the work as contemplated. Extra work shall be performed in

accordance with the contract and as directed. No extra work shall be commenced prior to specific authorization for the performance of such extra work being given by the Engineer.

Extra work that is specifically authorized by the Engineer will be paid for in accordance with Subarticle 104-8(A).

When the Design-Build Team is required to perform work which is in his opinion extra work, he shall notify the Engineer in writing prior to performing such work.

The Engineer will investigate and, based upon his determination, one of the following will occur.

**(A)** If the Engineer determines that the affected work is extra work, the Design-Build Team will be notified in writing by the Engineer and compensation will be made in accordance with Subarticle 104-8(A).

**(B)** If the Engineer determines that the work is not extra work, he will notify the Design-Build Team in writing of his determination. If the Design-Build Team upon receipt of the Engineer's written determination intends to file a claim for additional compensation by reason of such work, he shall notify the Engineer in writing of such intent prior to beginning any of the alleged extra work and in conformance with the requirements of Subarticle
104-8(B).

## 104-8 COMPENSATION AND RECORD KEEPING

### (A) Compensation

When the Engineer and Design-Build Team agree that compensation is due under the requirements of Articles 104-3 or 104-7, payment will be made in accordance with one of the following:

(1) When the Engineer and the Design-Build Team agree to the prices to be paid, the agreement will be set forth in a supplemental agreement. If the estimated total cost of the affected work is equal to or less than $25,000.00 and the prices for performing the work have been mutually agreed to, the Design-Build Team may begin work before executing the supplemental agreement. If the estimated total cost of the affected work is more than $25,000.00, the Design-Build Team shall not begin the affected work until the supplemental agreement is executed.

(2) When the Engineer and the Design-Build Team cannot agree to the prices to be paid for the affected work, the Engineer will issue a force account notice prior to the Design-Build Team beginning work. In this instance the affected work shall be performed as directed by the Engineer and paid for in accordance with the requirements of Article 109-3.

### (B) Claim for Additional Compensation

The Design-Build Team's notice of intent to file a claim for additional compensation under the requirements of Articles 104-3 and 104-7 shall be given to the Engineer in writing. The Design-Build Team shall keep accurate and detailed cost records in accordance with the requirements of Article 109-3. The Design-Build Team's cost records and supporting data shall be complete in every respect and in such form that they may be checked by the Engineer. The Design-Build Team's cost records and supporting

data shall clearly indicate the cost of performing the work in dispute and shall separate the cost of any work for which payment has been made. The Design-Build Team's cost records shall be kept up to date and the Engineer shall be given the opportunity to review the methods by which the records are being maintained. The cost records shall be prepared on a weekly basis for each occurrence for which notice of intent to file a claim has been given and submitted to the Engineer within 7 days after the end of a given weekly period.

If the Design-Build Team chooses to pursue the claim after the disputed work is complete, he shall submit a written claim to the Engineer for an adjustment in compensation based upon his cost records within 120 calendar days after completion of the disputed work. This claim shall summarize previously submitted cost records and clearly describe the Design-Build Team's justification for an adjustment in compensation under the terms of the contract. The claim shall be accompanied by a certification from an officer of the company or person authorized to execute supplemental agreements, stating that the claim is truthful and accurate.

Upon receipt, the Engineer will review the Design-Build Team's request and supporting documentation and notify the Design-Build Team if the request is complete with all necessary supporting documentation and cost records.

If the Engineer determines that the work covered by the claim is in fact compensable under the terms of the contract, an adjustment in compensation will be made based upon the documentation presented and his engineering judgment. The adjustment will be made on the next partial pay estimate and reflected on the final estimate. The compensation allowed shall be limited to the amount that would be paid if the work were performed in accordance with Article 109-3.

If the Engineer determines that the work covered by the claim is not compensable under the terms of the contract, the claim will be denied.

The Engineer will notify the Design-Build Team of his determination whether or not an adjustment of the contract is warranted within 120 calendar days after receipt of the complete request, all necessary supporting justification, and cost records.

The failure on the part of the Design-Build Team to perform any of the following shall be a bar to recovery under the requirements of Articles 104-3 or 104-7:

(1) The failure to notify the Engineer in writing prior to performing the work in dispute that he intends to file a claim.

(2) The failure of the Design-Build Team to keep records in accordance with the requirements of Article 109-3.

(3) The failure of the Design-Build Team to give the Engineer the opportunity to monitor the methods by which records are being maintained.

(4) The failure of the Design-Build Team to submit additional documentation requested by the Engineer provided documentation requested is available within the Design-Build Team's records.

(5) The failure of the Design-Build Team to submit cost records on a weekly basis.

(6) The failure of the Design-Build Team to submit the written request for an adjustment in compensation with cost records and supporting information within 120 calendar days of completion of the affected work.

**(C) Compensation**

The Design-Build Team's notice of intent to file a claim for additional compensation under the requirements of Subarticle 104-4(A) shall be given to the Engineer in writing within 7 days after the Engineer suspends the performance of the work. For an alleged suspension, the Design-Build Team's notice of intent to file a claim for additional compensation under the requirements of Subarticle 104-4(B) shall be given to the Engineer in writing. The Design-Build Team shall keep accurate and detailed records of the alleged idle equipment and alleged idle labor. The Design-Build Team's cost records, supporting data, and supporting information shall be complete in every respect and in such form that they may be checked by the Engineer. The Design-Build Team's cost records, supporting data, and supporting information for equipment idled due to the suspension or alleged suspension shall specifically identify each individual piece of equipment, its involvement in the work, its location on the project, the requested rental rate and justification as to why the equipment cannot be absorbed into unaffected work on the project during the period of suspension or alleged suspension. The Design-Build Team's cost records, supporting data, and supporting information for idle labor shall include the specific employees, classification, dates and hours idled, hourly rate of pay, their involvement in the project, and justification as to why they cannot be absorbed into the unaffected work on the project or other projects during the period of suspension or alleged suspension. The Design-Build Team's cost records, supporting data, and supporting information shall be kept up-to-date and the Engineer shall be given the opportunity to review the methods by which the records, data, and information are being maintained. The cost records, supporting data, and supporting information shall be prepared on a weekly basis for each occurrence for which notice of intent to file a claim has been given and submitted to the Engineer within 7 days after the end of a given weekly period.

If the Design-Build Team chooses to pursue the claim after the suspension or alleged suspension period has ended, he shall submit a written claim to the Engineer for an adjustment in compensation based upon his cost records due to idle equipment and/or idle labor within 14 calendar days of receipt of the notice to resume work or within 14 calendar days of expiration of the alleged suspension period. This request shall summarize previously submitted cost records and clearly describe the Design-Build Team's justification for an adjustment in compensation under the terms of the contract.

Upon receipt, the Engineer will evaluate the Design-Build Team's request. If the Engineer agrees that the cost of the work directly associated with the suspension or alleged suspension has increased as a result of such suspension or alleged suspension and the suspension or alleged suspension was caused by conditions beyond the control of and not the fault of the Design-Build Team, its suppliers, or subcontractors at any approved tier, and not caused by weather, the Engineer will make an adjustment, excluding profit, and modify the contract in writing accordingly. The Design-Build Team will be paid for the verified actual cost of the idle equipment and idle labor. The compensation allowed shall be limited to the equipment, labor, bond, insurance, and tax costs, excluding profits, computed in accordance with Article 109-3.

If the Engineer determines that the suspensions of the work by the Engineer or alleged suspensions do not warrant an adjustment in compensation, he will notify the Design-Build Team in writing of his determination.

The Engineer will notify the Design-Build Team of his determination of whether or not an adjustment in compensation is warranted within 120 calendar days after receipt of the complete request, all necessary supporting justification, and cost records.

The failure on the part of the Design-Build Team to perform any of the following shall be a bar to recovery under the requirements of Article 104-4:

(1) The failure to notify the Engineer in writing within 7 days after the Engineer suspends in writing the performance of all or any portion of the work.

(2) The failure to notify the Engineer in writing that he intends to file a claim by reason of alleged suspension.

(3) The failure of the Design-Build Team to keep records in accordance with the details of Article 109-3.

(4) The failure of the Design-Build Team to give the Engineer the opportunity to monitor the methods by which records are being maintained.

(5) The failure of the Design-Build Team to submit additional documentation requested by the Engineer provided documentation requested is available within the Design-Build Team's records.

(6) The failure of the Design-Build Team to submit cost records on a weekly basis.

(7) The failure of the Design-Build Team to submit the written request for an adjustment in compensation with cost records, supporting data, and supporting information within 14 calendar days of receipt of the notice to resume work.

(7) The failure of the Design-Build Team to submit the written request for an adjustment in compensation with cost records, supporting data, and supporting information within 14 calendar days after the last day of the period during which the Design-Build Team contends he has been prevented from performing all or any portion of the work for an unreasonable period of time (not originally anticipated, customary, or inherent to the construction industry) because of conditions beyond the control of and not the fault of the Design-Build Team, its suppliers, or subcontractors at any approved tier, and not caused by weather.

**(D) Notification of Determination**

The failure on the part of the Engineer to notify the Design-Build Team of his determination on the requested adjustment in compensation within 120 calendar days after receipt of the complete request, all supporting justification, and cost records will result in payment of interest on any monies determined to be due from the requested adjustment in compensation. Interest, at the average rate earned by the State Treasurer on the investment within the State's Short Term Investment Fund during the month preceding the date interest becomes payable, will be paid the Design-Build Team on the next partial pay estimate and reflected on the final estimate for the period beginning on the 121st day after receipt of the complete request, all supporting justification, and cost records, and extending to the date the Engineer makes his determination on the disputed work.

If the Design-Build Team fails to receive such adjustment in compensation for the disputed work as he claims to be entitled to under the terms of the contract, the Design-Build Team may resubmit the written request for an adjustment in compensation to the Engineer as a part of the final claim after the project is complete. The Design-Build Team will only be allowed to submit the request for an adjustment in compensation one time during the construction of the project.

**(E) Coordination with CPM**

If the Design-Build Team requests additional compensation in accordance with Articles 104-3, 104-7, and this Article, a fragmentary logic diagram (fragnet) shall be prepared and submitted with such request. A fragnet is defined as the sequence of new activities that are proposed to be added to the current schedule to represent the alleged cost and potential time impact(s). The fragnet shall be developed with sufficient detail to clearly depict the alleged change to the current schedule of record

The Design-Build Team shall prepare the fragnet depicting all activities and costs associated with the request for additional compensation. The fragnet shall identify all predecessor and successor activities, any changes in durations of existing activities and any activities added to or deleted from the current schedule or record as a direct result of the request for additional compensation.

If the request for additional compensation is agreeable to the NCTA, the NCTA will evaluate the provided fragnet within current schedule of record as follows:

(1) The Design-Build Team shall provide the fragnet, supporting information and narrative describing how the fragnet is incorporated (predecessors and successors) into the schedule referenced below.

(2) The Design-Build Team shall update the current schedule of record to the anticipated supplemental agreement execution date and provide this schedule to the NCTA for review.

(3) The Design-Build Team shall provide a separate updated schedule, as defined in item 2 above, with the fragnet inserted. (4) The revised Scheduled Completion Date will be evaluated by the NCTA; and

(5) if the associated time difference in the above Scheduled Completion Dates ( items 2 and 3 above) results in a time extension, such extensionwill be provided within the supplemental agreement. If project float is created by the work, it will be encompassed within the modified and updated schedule of record. Both the Design-Build Team and the NCTA will have access to this float as detailed in Article 108-2.

## 104-9 DISPOSITION OF SURPLUS PROPERTY

All property that is surplus to the needs of the project will remain or become the property of the Design-Build Team, unless otherwise stated in the contract, with the following exceptions:

**(A)** Materials that are the property of utility companies providing service to buildings that are to be demolished or removed in accordance with Sections 210 and 215.

**(B)** Materials resulting from the removal of existing pavement in accordance with Section 250 that are to be stockpiled for the use of the Department or the Turnpike Authority.

**(C)** Materials resulting from the removal of existing structures in accordance with Section 402 where the contract indicates that the material will remain the property of the Department or the Turnpike Authority.

**(D)** Aggregate base course where the contract requires that this material become the property of the Department or the Turnpike Authority.

**(E)** Left over materials for which the Turnpike Authority has reimbursed the Design-Build Team as provided in Article 109-6 and

**(F)** Materials that have been furnished by the Department or the Turnpike Authority for use on the project.

Property shall include but not be limited to materials furnished by the Design-Build Team, the Department, or the Turnpike Authority for either temporary or permanent use on the project, salvaged materials which were part of the existing facility on the date of availability for the project, and all implements, machinery, equipment, tools, supplies, laboratories, field offices, and watercraft which are necessary for the satisfactory completion of the project.

All property that is the property of the Design-Build Team shall be removed from the project by the Design-Build Team prior to final acceptance.

## 104-10 MAINTENANCE OF THE PROJECT

The Design-Build Team shall maintain the project from the date of beginning physical construction on that section until the project is finally accepted. All guardrail/guiderail within the project limits shall be included in this maintenance. This 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. 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 and guiderail is repaired or replaced as a result of maintaining the project in accordance with this Article, such repair or replacement shall be performed within 7 consecutive calendar days of such inspection report.

The Design-Build Team shall maintain all existing drainage facilities, except where the work consists of resurfacing only, such that they are in the same condition upon acceptance of the project as they were when the project was made available to the Design-Build Team.

In the event that the Design-Build Team's work is suspended for any reason, the Design-Build Team shall maintain the work covered by the contract, as provided herein.

When a portion of the project is accepted as provided in Article 105-17, immediately after such acceptance the Design-Build Team will not be required to maintain the accepted portions. Should latent defects be discovered or become evident in an accepted portion of the project, such defective work shall be repaired or replaced at no cost to the Turnpike Authority.

Where an observation period(s) is required that extends beyond the final acceptance date, the Design-Build Team shall perform any work required by the observation period until satisfactory completion of the observation period. With the exception of the maintenance of guardrail/guiderail, the Design-Build Team will not be directly compensated for any maintenance operations necessary as this work will be considered incidental to the work covered by the various contract items. The provisions of Article 104-7, Extra Work, and Article 104-8, Compensation and Record Keeping will apply to authorized maintenance of guardrail/guiderail. Performance of weekly inspections of guardrail/guiderail, and the damage reports required as described above, will be considered to be an incidental part of the work being paid for by the various contract items.

**Page 1-41, 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.

## 104-11 FINAL CLEANING UP

Before acceptance of the project, the highway, borrow sources, waste areas, and all ground occupied by the Design-Build Team within the project limits in connection with the work shall be cleaned of all rubbish, excess materials, temporary structures, and equipment; and all parts of the work shall be left in an acceptable condition.

The Design-Build Team will not be directly compensated for the work of final cleaning up, as this work will be considered incidental to the work covered by the various contract items.

## 104-12 VALUE ENGINEERING PROPOSAL

This value engineering specification is to provide an incentive to the Design-Build Team to initiate, develop, and present to the Turnpike Authority for consideration, any cost reduction proposals conceived by him involving changes in the contract. This specification does not apply unless the proposal submitted is specifically identified by the Design-Build Team as being presented for consideration as a Value Engineering Proposal. Submittals that propose material substitutions of permanent features such as changes from rigid to flexible or flexible to rigid pavements, concrete to steel or steel to concrete bridges will not be considered acceptable Value Engineering Proposals. Depending on complexity of evaluation and implementations, Value Engineering Proposals that provide for a total savings prior to distribution of less than ten thousand dollars ($10,000) will not be generally considered.

Value Engineering Proposals contemplated are those that would result in a net savings to the Turnpike Authority by providing a decrease in the total cost of construction or reduce the construction time without increasing the cost to construct the project. The effects the Value Engineering Proposal may have on the following items, but not limited to these items, will be considered by the Turnpike Authority when evaluating the proposal: (1) Service Life; (2) Safety; (3) Reliability; (4) Economy of Operation; (5) Ease of Maintenance; (6) Desired Aesthetics; (7) Design; (8) Standardized Features; and (9) Environmental Impact.

The Turnpike Authority reserves the right to reject the proposal or deduct from the savings identified in the proposal to compensate for any adverse effects to these items which may result from implementation of the proposal.

The Turnpike Authority reserves the right to reject at its discretion any Value Engineering Proposal submitted which would require additional right of way. Substitution of another design alternate, which is detailed in the contract plans, for the one on which the Design-Build Team bid, will not be allowed. Plan errors which are identified by the Design-Build Team and which result in a cost reduction will not qualify for submittal as a Value Engineering Proposal. Pending execution of a formal supplemental agreement, implementing an approved Value Engineering Proposal, the Design-Build Team shall remain obligated to perform in accordance with the terms of the existing contract. No time extension will be granted due to the time required to review a Value Engineering Proposal.

The Design-Build Team is encouraged to include this specification in contracts with subcontractors. The Design-Build Team shall encourage submissions of Value Engineering Proposals from subcontractors, however, it is not mandatory that the Design-Build Team accepts or transmits to the Turnpike Authority, Value Engineering Proposals proposed by his subcontractors. The Design-Build Team may choose any arrangement for the subcontractor value engineering payments, provided that these payments shall not reduce the Turnpike Authority's share of the savings resulting from the Value Engineering Proposal.

Should the Design-Build Team desire a preliminary review of a possible Value Engineering Proposal, prior to expending considerable time and expense in full development, a copy of the preliminary proposal shall be submitted to the Engineer and the NCDOT Value Engineering Office. The submittal shall state Preliminary Value Engineering Proposal Review Request and shall contain sufficient drawings, cost estimates and written information that can be clearly understood and interpreted. Also, include the identity of any Private Engineering Firms proposed by the Design-Build Team to prepare designs or revisions to designs. The Turnpike Authority will review the preliminary submittal only to the extent necessary to determine if it has possible merit as a Value Engineering Proposal. This review does not obligate the Turnpike Authority to approve the final proposal should a preliminary review indicate the proposal has possible merit. The Turnpike Authority is under no obligation to consider any Value Engineering Proposal (Preliminary or Final) that is submitted.

A copy of the Final Value Engineering Proposal shall be submitted by the Design-Build Team to the Engineer and the NCDOT Value Engineering Office. The proposal shall contain, as a minimum, the following:

**(A)** A statement that the request for the modification is being made as a Value Engineering Proposal.

**(B)** A description of the difference between the existing contract requirements and the proposed modifications, with the comparative advantages and disadvantages of each.

**(C)** If applicable, a complete drawing of the details covering the proposed modifications and supporting design computations shall be included in the final submittal. The preparation of new designs or drawings shall be accomplished and sealed by a Professional Engineer licensed in the State of North Carolina. Further, the Turnpike Authority may require a review, and possibly the redesign, be accomplished by the project's original designer, or an approved equal. The Turnpike Authority may contract with private engineering firms, when needed, for reviews requested by the Turnpike Authority. The Design-Build Team

shall contract with the original project designer, or an approved equal, when required by the Turnpike Authority, for any design work needed to completely and accurately prepare contract drawings. The Turnpike Authority may waive the requirements to have the preparation of contract drawings accomplished by a Professional Engineer or the project's original design based on the extent, detail, and complexity of the design needed to implement the value engineering proposal.

**(D)** An itemized list of the contract requirements that would be modified and a recommendation of how to make each modification.

**(E)** A detailed estimate of the cost of performing the work under the proposed modification.

**(F)** A statement of the time by which approval of the Value Engineering Proposal shall be issued by the Turnpike Authority to obtain the total estimate cost reduction during the remainder of the contract, noting any effect on the contract completion or delivery schedule.

To facilitate the preparation of revisions to contract drawings, the Design-Build Team may purchase reproducible copies of drawings for his use through the Department's Value Engineering Office. The preparation of new design drawings by or for the Design-Build Team shall be coordinated with the Turnpike Authority and the NCDOT Value Engineering Office. The Design-Build Team shall provide, at no charge to the Turnpike Authority, one set of reproducible drawings of the approved design needed to implement the value engineering proposal.

The Engineer will be the sole judge of the acceptability of a Value Engineering Proposal requested in accordance with these requirements and of the estimated net savings resulting from the approval of all or any part of the proposal. The Design-Build Team has the right to withdraw, in whole or in part, any Value Engineering Proposal not accepted by the Turnpike Authority within the period to be specified in the proposal per Item (F) of the preceding paragraph.

If a Value Engineering Proposal is approved, the necessary changes will be effected by Supplemental Agreement. Included as a part of the Supplemental Agreement will be requirements for price adjustment giving the Design-Build Team 50 percent of the net savings to the project resulting from the modifications.

The Turnpike Authority reserves the right to include in the Supplemental Agreement any conditions it deems appropriate for consideration, approval, and implementation of the proposal. Acceptance of the Supplemental Agreement by the Design-Build Team shall constitute acceptance of such conditions.

The final net savings to be distributed will be the difference in cost between the existing contract cost for the involved unit bid items and actual final cost occurring as a result of the modification. Only those unit bid items directly affected by the Supplemental Agreement will be considered in making the final determination of net savings. In determining the estimate net savings, the Turnpike Authority reserves the right to disregard the contract prices if, in the judgement of the Turnpike Authority, such prices do not represent a fair measure of the value of the work to be performed or to be deleted. Subsequent change documents affecting the modified unit bid items but not related to the Value Engineering Proposal will be excluded from such determination. The Turnpike Authority's review and administrative costs for value engineering proposals will be borne by the Turnpike Authority. The Design-Build Team's costs for designs and/or revisions to designs and the preparation of design drawings will be borne by the Design-

Build Team. The costs to either party will not be considered in determining the net savings obtained by implementing the value engineering proposal. The Design-Build Team's portion of the net savings shall constitute full compensation to him for effecting all changes pursuant to the agreement. The net savings will be prorated, 50 percent for the Design-Build Team and 50 percent for the Turnpike Authority, for all accepted Value Engineering Proposals.

Upon execution of the Supplemental Agreement, the Turnpike Authority and the Department will thereafter have the right to use, duplicate or disclose in whole or in part any data necessary for utilization of the modification on other projects without obligation or compensation of any kind to the Design-Build Team. Restrictions or conditions imposed by the Design-Build Team for use of the proposal on other projects shall not be valid.

Except as may be otherwise precluded by this specification, the Design-Build Team may submit a previously approved value engineering proposal on another project.

Unless and until a Supplemental Agreement is executed and issued by the Turnpike Authority, the Design-Build Team shall remain obligated to perform the work in accordance with the terms of the existing contract.

Acceptance of the modification and its implementation will not modify the completion date of the contract unless specifically provided for in the Supplemental Agreement.

The Design-Build Team shall not be entitled to additional compensation under Section 104 for alterations in the plans or in the details of construction pursuant to the Value Engineering Proposal.

The Turnpike Authority will not be liable to the Design-Build Team for failure to accept or act upon any Value Engineering Proposal nor for any delays to the work attributable to any such proposal.

The Turnpike Authority reserves the right to negotiate desired changes with the Design-Build Team under the requirements of the contract even though the changes are the result of a Value Engineering Proposal submitted on another contract. In this instance the savings will be prorated in accordance with the terms of the negotiated agreement.

# SECTION 105
# CONTROL OF WORK

## 105-1 AUTHORITY OF THE ENGINEER

The Engineer will decide all questions which may arise as to the quality and acceptability of materials furnished and work performed and as to the rate of progress of the work; all questions which may arise as to the interpretation of the contract; and all questions as to the acceptable fulfillment of the contract on the part of the Design-Build Team. His decision shall be final and he shall have executive authority to enforce and make effective such decisions and orders as the Design-Build Team fails to carry out promptly.

The Engineer shall have the authority to issue any written order to the Design-Build Team which he considers necessary to the prosecution of the work, and shall have executive authority to enforce such written orders as the Design-Build Team fails to carry out promptly. Failure on the part of the Design-Build Team to comply with any written order issued by the Engineer may be justification for disqualifying the Design-Build Team from further bidding on Department projects in accordance with Article 102-16.

## 105-2 PLANS AND WORKING DRAWINGS

The 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.

## 105-3 CONFORMITY WITH PLANS AND SPECIFICATIONS

All work performed and all materials furnished shall be in reasonably close conformity with the lines, grades, cross sections, dimensions, and material requirements, including tolerances, shown in the contract.

In the event the Engineer finds the materials or the finished product in which the materials are used not within reasonably close conformity with the contract but that reasonably acceptable work has been produced, he will then make a determination if the work is to be accepted and remain in place. If the Engineer determines that the work is to be accepted, he will have the authority to make such adjustment in contract price as he deems warranted based upon his engineering judgment and the final estimate will be paid accordingly.

In the event the Engineer finds the materials or the finished product in which the materials are used or the work performed are not in reasonably close conformity with the contract and have resulted in an inferior or unsatisfactory product, the work or materials shall be removed and replaced or otherwise corrected by the Design-Build Team at no cost to the Turnpike Authority.

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.

## 105-4 COORDINATION OF PLANS, SPECIFICATIONS, SUPPLEMENTAL SPECIFICATIONS, AND SPECIAL PROVISIONS

The Request for Proposals, all Plans, the Standard Specifications, 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 intended to be complementary and to describe and provide for a complete work.

In case of discrepancy or conflict, the order in which they govern shall be as follows:

(A) Request for Proposals

(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 of Transportation or North Carolina Turnpike Authority, 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.

## 105-5 COOPERATION BY DESIGN-BUILD TEAM

The Design-Build Team shall cooperate with the Engineer, his inspectors, and other contractors in every way possible, and shall give the work the constant attention necessary to facilitate the progress and satisfactory performance thereof. The Design-Build Team shall notify the Engineer in writing at least 7 calendar days prior to beginning work on the project. He shall notify the Engineer at least 1 calendar day in advance when work is to be suspended and at least 2 calendar days in advance when work is to be resumed.

The Design-Build Team shall keep available on the project site a copy of the contract assembly at all times.

## 105-6 SUPERVISION BY DESIGN-BUILD TEAM

### (A) On Site Personnel

At all times that work is actually being performed, the Design-Build Team shall have present on the project one competent individual who has been authorized to act in a supervisory capacity over all work on the project including work subcontracted. The individual who has been so authorized shall be experienced in the type of work being performed and is to be fully capable of managing, directing, and coordinating the work, of reading and thoroughly understanding the contract, and of receiving and carrying out directions from the Engineer or his authorized representatives. He shall be an employee of the Design-Build Team, unless otherwise approved by the Engineer.

### (B) On Call Personnel

At all times during the life of the project the Design-Build Team shall provide one permanent employee who shall have the authority and capability for the overall responsibility of the project and who shall be personally available at the site of work within 24 hours notice. Such employee shall be fully authorized to conduct all business with the subcontractors, to negotiate and execute all supplemental agreements, and to execute the orders or directions of the Engineer.

**(C) Exceptions**

If the Design-Build Team elects to have the employee described under (B) above constantly available in person on the project, then the presence of this employee will be considered as also meeting the requirements of (A) above. However, whenever such employee is absent from the project then an authorized individual meeting the requirements of (A) above shall be present on the project.

## 105-7 COOPERATION BETWEEN CONTRACTORS

The Turnpike Authority and the Department reserve the right at any time to contract for and perform other or additional work on or near the work covered by the contract.

When separate or additional contracts are let within the limits of any one project, each the Design-Build Team shall conduct his work so as not to interfere with or hinder the progress or completion of the work being performed by other contractors. Contractors working within the limits of the same project shall cooperate with each other.

Each Design-Build Team shall conduct his operations in such a manner as to avoid damaging any work being performed by others or which has been completed by others.

When a project is let under more than one contract, it shall be the responsibility of the Design-Build Teams to complete the various phases of the project in accordance with the time limits specified such that the total contracts will be completed by the completion date. All work within the Design-Build Team's schedule, which is a direct predecessor to the work of other contracts (contractors, Design-Build Teams), shall be clearly identified and so that each party can assess it's own work in relation to the entire project.

Failure of the Design-Build Team to complete the various phases of work within the time limits set forth in the construction schedule shall be just cause for removing the contractor(s) from the Department's list of qualified bidders. A contractor disqualified from bidding by reason of this provision will not be reinstated until such time as his progress is in accordance with the latest approved construction schedule or until the project is completed and accepted, whichever occurs first.

The Turnpike Authority and the Department will under no circumstances be liable for any claim for additional compensation due to acts of one contractor holding up the work of another.

The Department and the Turnpike Authority will under no circumstances be liable for any damages experienced by the Design-Build Team as a result of the presence and operations of other contractors working within the limits of the same project.

## 105-8 COOPERATION WITH UTILITY OWNERS

Prior to the beginning of construction, the Turnpike Authority will notify all utility owners known to have facilities affected by the construction of the project and will make arrangements for the necessary adjustments of all affected public or private utility facilities. The utility adjustments may be made either before or after the beginning of construction of the project. The adjustments will be made by the utility owner or his representative, or by the Design-Build Team when such adjustments are part of the work covered by his contract.

Unless otherwise stipulated in the RFP, the Design-Build Team shall use an independent utility locating service to locate utilities. The Design-Build Team shall use special care working in, around and near all existing utilities that are encountered during construction, protecting them where necessary so that they will give uninterrupted service.

The Design-Build Team shall cooperate with the utility owner, and/or the owner's representative in the adjustment or placement of utility facilities when such adjustment or placement is made necessary by the construction of the project or has been authorized by the Turnpike Authority.

In the event that utility services are interrupted by the Design-Build Team, the Design-Build Team shall promptly notify the owners and shall cooperate with the owners and/or the owner's representative in the restoration of service in the shortest time possible.

Existing fire hydrants shall be kept accessible to fire departments at all times.

Prior to submitting his Price Proposal, the Design-Build Team shall make his own determination as to the nature and extent of the utility facilities, including proposed adjustments, new facilities, or temporary work to be performed by the utility owner or his representative; and as to whether or not any utility work is planned by the owner in conjunction with the project construction. The Design-Build Team shall consider in his Price Proposal all of the permanent and temporary utility facilities in their present or relocated positions, whether or not specifically shown on the plans or covered in the project special provisions. It will be the Design-Build Team's responsibility to anticipate any additional costs to him resulting from such utility work and to reflect these costs in his Price Proposal for the various items in the contract.

No additional compensation except as provided for in Article 104-4 will be allowed for delays, inconvenience, or damage sustained by the Design-Build Team due to any interference from said utility facilities or the operation of moving them and any such delay, inconvenience, or damage except as provided for in Article 104-4 shall not constitute a basis for a claim for additional compensation.

Where changes to utility facilities are to be made solely for the convenience of the Design-Build Team, it shall be the Design-Build Team's responsibility to arrange for such changes and the Design-Build Team shall bear all costs of such changes.

## 105-9 CONSTRUCTION STAKES, LINES, AND GRADES

The Design-Build Team shall be responsible for any surveying, construction staking and layout required in the performance of the work. He will be responsible for the accuracy of lines, slopes, grades and other engineering work which he provides under this contract. Unless otherwise specified in the Request for Proposals, no measurement or direct payment will be made for this work. The cost shall be considered as included in other contract items.

## 105-10 AUTHORITY AND DUTIES OF THE INSPECTOR

Inspectors employed by the Turnpike Authority are authorized to inspect all work performed and materials furnished. Such inspection may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. The inspector is not authorized to alter or waive the requirements of the contract. The inspector is not authorized to issue instructions contrary to the contract, or to act as foreman for the Design-Build Team; however, he has the authority to reject work or materials until any questions at issue can be referred to and decided by the Engineer. The inspector is not authorized to make any final acceptance of the work.

## 105-11 INSPECTION OF WORK

All materials and each part or detail of the work shall be subject to inspection by the Engineer. The Design-Build Team shall allow and provide a reasonable access to all parts of the work to the Engineer or his authorized representative. The Design-Build Team shall also furnish such information and assistance as is required to make a complete and detailed inspection. Such access shall meet the approval of the Engineer.

The presence of the Engineer or inspector at the work site shall in no way lessen the Design-Build Team's responsibility for conformity with the contract. Should the Engineer or Inspector, prior to or during construction, fail to point out or reject materials or work that does not conform with the contract, whether from lack of discovery or for any other reason, it shall in no way prevent later rejection or corrections to the unsatisfactory materials or work when discovered. The Design-Build Team shall have no claim for losses suffered due to any necessary removals or repairs resulting from the unsatisfactory work.

If the Engineer requests it, the Design-Build Team, at any time before acceptance of the work, shall remove or uncover such portions of the finished work as may be directed. After examination, the Design-Build Team shall restore said portions of the work to the standard required by the specifications. The Design-Build Team shall keep cost records of the work performed and if the uncovered work is found to be acceptable, the Turnpike Authority will pay the Design-Build Team on a force account basis in accordance with Article 109-3 for the cost of uncovering, or removing, and the replacing of the covering or making good of the parts removed; but should the work so exposed or examined prove unacceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed, shall be at no cost to the Turnpike Authority.

When any other unit of government or political subdivision is to pay a portion of the cost of the work covered by the contract, its respective representatives shall have the right to inspect the work. When work is to be performed on the right of way of any railroad corporation or in proximity to other public utilities, the representatives of the railroad corporation and/or the public utilities shall have the right to inspect the work. Such inspection shall in no sense make any unit of government or political subdivision or any railroad corporation or public utility a party to the contract, and shall in no way interfere with the rights of either party thereunder.

## 105-12 UNAUTHORIZED WORK

No work shall be performed without established lines and grades except as otherwise permitted by the Engineer. Work performed contrary to the instructions of the Engineer or contrary to any approvals granted by the Engineer will be considered as unauthorized and may not be paid for under the requirements of the contract. Work performed beyond the lines shown on the plans or as given, except as herein specified, or any extra work performed without authority will be considered as unauthorized and may not be paid for under the requirements of the contract. Any of the above work so performed may be ordered removed, replaced, or repaired at no cost to the Turnpike Authority.

Upon failure on the part of the Design-Build Team to comply promptly with any order of the Engineer made under the provisions of this article, the Engineer will have the authority to cause such unauthorized work to be removed and/or adjusted to conform to the requirements of the contract and to deduct the cost of removal and/or adjustment from any monies due or to become due the Design-Build Team.

## 105-13 LIMITATIONS OF OPERATIONS

At any time when, in the opinion of the Engineer, the Design-Build Team has obstructed, closed, or is conducting operations on a greater portion of the work than is necessary for the prosecution of the work so as to constitute a hazard to the general public or impair the function of the facility being constructed where traffic shall be maintained, the Engineer may require the Design-Build Team to suspend such unnecessary operations or closures and to finish the portions on which work is in progress before starting work on additional portions of the work.

## 105-14 NIGHT WORK

Whenever the Design-Build Team's operations are being conducted at night, the Design-Build Team shall provide such artificial lighting as may be necessary to provide for safe and proper construction and to provide for adequate inspection of the work as described in Section 1413.

## 105-15 RESTRICTION OF LOAD LIMITS

The Design-Build Team shall comply with all legal load restrictions in hauling equipment and materials on roads under the jurisdiction of the Department or the Turnpike Authority.

The Department has the right to place load limit restrictions on the load a Design-Build Team may haul on any road or bridge in the vicinity of his contract. The Design-Build Team, prior to bidding on a project, will be responsible for making his own investigations to determine the possibility of load limit restrictions being placed on any of the highways he plans to use for hauling purposes. The Design-Build Team shall not be entitled to an extension of time or to compensation for any costs, inconvenience, delay, or any other adversity to the Design-Build Team as the result of any reduction by the Department in load limit, or as the result of a refusal by the Department to raise load limits as hereinafter provided or under any other conditions, and any such reduction in load limit or refusal to raise load limits shall not constitute a basis for a claim for additional compensation.

Wherever load limit restrictions below the statutory legal load limit have been posted on any roads and/or bridges on the project or within the vicinity of the project, the Department may remove the load limit restrictions from such roads and/or bridges upon written request from the Design-Build Team; and the Design-Build Team thereafter will be allowed to haul up to the statutory legal limits over such roads and/or bridges, provided the Design-Build Team enters into an agreement with the Department providing for:

**(A)** Maintenance by the Design-Build Team of such roads in a condition satisfactory to the Engineer during the haul period.

**(B)** Repair by the Design-Build Team of all damages to such roads after haul is completed to place them in a condition as good as they were prior to removal of the load limits.

**(C)** Furnishing bond by the Design-Build Team in an amount determined by the Engineer for the roads. Furnishing a bond for the roads does not entitle the Design-Build Team to exceed the posted load limits of any bridge.

**(D)** Assumption by the Design-Build Team of all costs of strengthening any bridges that may be necessary in order to safely haul loads up to statutory legal limits. The Department will, upon request by the Design-Build Team, make a determination as to the method and extent of strengthening required for the bridges and will advise the Design-Build Team as to the amount of work to be done or an estimate of the charges for the work if performed

by Department forces. When Department forces perform the work, the Design-Build Team shall reimburse the Department in the amount of the actual charges for said work. When Design-Build Team's forces perform the work, it shall be done in accordance with plans approved by the Engineer and under his inspection.

**(E)** Indemnification of the Department and the Turnpike Authority against any and all claims from third persons arising out of or resulting from the hauling operation or the maintenance, or lack of maintenance, of haul roads. Haul roads shall be maintained not only for the Design-Build Team's hauling operations, but also for the use of the general public.

Equipment operated on proposed bridges shall comply with the following load restrictions.

Maximum axle load (lbs.) ..... 36,000
Maximum axle load on tandem axles (lbs.) ..... 30,000
Maximum gross load (lbs.) ..... 90,000

The Design-Build Team shall keep the bridge floor clean to reduce impact forces and place approved temporary guides on the bridge floor to position the wheel loads as nearly as possible over the bridge girders. Only one earth-moving vehicle shall be on a bridge at any time. Upon completion of hauling over each bridge, the Design-Build Team shall clean the bridge floor, curbs and rails.

Regulations pertaining to size and weight will not apply to equipment used on the project provided the vehicles involved are not operated on pavement, completed base course, or structures.

## 105-16 FAILURE TO MAINTAIN THE PROJECT OR PERFORM EROSION CONTROL WORK

Failure on the part of the Design-Build Team to comply with the requirements of Article 104-10 or to perform erosion control work as directed will result in the Engineer notifying the Design-Build Team to comply with these Specifications. In the event that the Design-Build Team fails to begin such remedial action or fails to begin erosion control work within 24 hours after receipt of such notice with adequate forces and equipment, the Engineer may proceed to have the work performed with other forces. No payment will be made to the Design-Build Team for work performed by others. Any costs incurred by the Turnpike Authority or the Department for work performed by others as provided above in excess of the costs that would have been incurred had the work been performed by the Design-Build Team will be deducted from monies due the Design-Build Team on his contract.

## 105-17 INSPECTION AND ACCEPTANCE

Upon apparent completion of the entire project, the Engineer will inspect the project for final acceptance. If all construction provided for and contemplated by the contract is found to be satisfactorily completed, the project will be accepted. The acceptance of projects in their entirety will not be altered except as listed below:

**(A)** When any continuous project is equal to or in excess of 5 miles in length, the Turnpike Authority will accept the project in 2 increments with the first increment equaling at least 50 percent of the total length of the project.

**(B)** When it is considered to be in the best interest of the Turnpike Authority, other increments or parts of projects may be considered for acceptance.

**(C)** When the contract contains an intermediate completion date requiring the completion of a portion of the work in its entirety, such portion of the work may be accepted if requested in writing by the Design-Build Team.

**(D)** Bridge decks and rails that have been constructed or rehabilitated at such time as when they are open to public traffic.

**(E)** Permanent sign panels, including hardware and retroreflective sheeting, that are required prior to the final acceptance of the project by the Traffic Control Plans or by the Engineer when the roadway where the signs are located is open to public traffic.

Acceptance of any increment or part of a project shall not operate to waive the assessment of all or any portion of liquidated damages assessable under the terms of the contract.

When the inspection discloses any work, in whole or in part, as being unsatisfactory or incomplete, the Engineer will advise the Design-Build Team of such unsatisfactory or incomplete work, and the Design-Build Team shall immediately correct, repair, or complete such work. The project will not be accepted and the Design-Build Team shall be responsible for the maintenance of the project and maintenance of traffic until all of the recommendations made at the time of the inspection have been satisfactorily completed.

The Engineer will notify the Design-Build Team in writing that the project has been accepted as soon as practicable after the completion of the project. When an observation period(s) is required that extends beyond the final acceptance date, the satisfactory completion of the observation period(s) shall be covered by the contract bonds.

# SECTION 106
# CONTROL OF MATERIAL

## 106-1 GENERAL REQUIREMENTS

### (A) GENERAL

The materials used on the work shall meet all requirements of the contract and shall be subject to inspection, test, or rejection by the Engineer at any time. Materials used in the work shall be new or recycled as permitted by the Specifications.

It is the Turnpike Authority’s intent to expand the use of recovered materials in its construction programs. The Design-Build Team is encouraged to find innovative and alternative ways for beneficial use of recyclable materials that are currently a part of the solid waste stream and that contribute to problems of declining space in landfills.

The Design-Build Team shall make his own determination of the various kinds and quantities of materials that are necessary for the acceptable performance and timely completion of the work. It will be the Design-Build Team's responsibility to obtain materials that will meet the requirements of the contract. The Design-Build Team shall be responsible for the acceptability of all materials used in the work and for the timely delivery of materials to the project so that adequate time will be available for the safe and proper performance of the work.

In order to facilitate testing by the Department and the Turnpike Authority, the Design-Build Team shall furnish a complete statement of the origin of all materials to be used in the construction of the work, together with samples when required. The statement of origin shall be furnished to the Engineer sufficiently in advance of any shipment and/or fabrication of materials so that arrangements can be made for proper inspection.

The Design-Build Team shall furnish a material safety data sheet with all paints and hazardous chemicals proposed for use on the project. The material safety data sheet shall be in accordance with the North Carolina Hazard Communication Standard (13 NCAC 7CF.0101.(a)(99)).

The Design-Build Team shall provide access, means, and assistance in the verification of all testing equipment, scales, measures, and other devices operated by him in connection with the testing of the materials.

If the Design-Build Team desires or is required to furnish materials from local deposits, other than those, if any, described in the contract he shall assume full responsibility for the sampling of the sources and the acceptability of the material in accordance with these specifications. He shall furnish without charge such preliminary samples as may be required; except that, if requested in writing, the Engineer may allow Turnpike Authority or Department forces to take samples as requested by the Design-Build Team. In the latter case, the Design-Build Team shall reimburse the Turnpike Authority or Department for the total expense of the sampling as determined by the Engineer. Tests will be made and reports rendered, but it is understood that such tests shall in no way be construed as a guarantee of acceptance of any material that may be delivered later for incorporation in the work. The Design-Build Team shall assume full responsibility for the production of uniform and satisfactory materials from such local deposits, and shall indemnify and save harmless the Department and Turnpike Authority from any and all claims for loss or damages resulting from the opening and operation thereof, or from the failure of the deposit after development to produce materials acceptable to the Engineer, in either quality or quantity.

## (B) DOMESTIC STEEL

All steel and iron products which are permanently incorporated into this project shall be produced in the United States except minimal amounts of foreign steel and iron products may be used provided the combined project cost of the bid items involved does not exceed 0.1 percent of the total amount bid for the entire project or $2,500.00, whichever is greater. This minimal amount of foreign produced steel and iron products permitted for use is not applicable to fasteners. Domestically produced fasteners are required for this project.

All steel and iron products furnished as domestic products shall be melted, cast, formed, shaped, drawn, extruded, forged, fabricated, produced, or otherwise processed and manufactured in the United States. Raw materials including pig iron and processed pelletized and reduced iron ore used in manufacturing domestic steel products may be imported; however, all manufacturing processes to produce the products, including coatings, shall occur in the United States.

Before each steel or iron product is incorporated into this project or included for partial payment on a monthly estimate, the Design-Build Team shall furnish the Engineer a notarized certification certifying that the product conforms to the above. The Engineer will forward a copy of each certification to the Engineer.

Each purchase order issued by the Design-Build Team or a subcontractor for steel and iron products to be permanently incorporated into this project shall contain in bold print a statement advising the supplier that all manufacturing processes to produce the steel or iron shall have occurred in the United States. The Design-Build Team and all affected subcontractors shall maintain a separate file for steel products permanently incorporated into this project so that verification of the Design-Build Team's efforts to purchase domestic steel and iron products can readily be verified by an authorized representative of the Turnpike Authority or the Federal Highway Administration.

## 106-2 SAMPLES, TESTS, AND CITED SPECIFICATIONS

All tests will be made in accordance with the most recent standard or interim methods of the AASHTO in force on the date of advertisement. Should no AASHTO method of test exist for a material, the most recent standard or tentative method of ASTM or other methods adopted by the Department will be used.

All reference made to a specification published by AASHTO, ASTM, or any other organization other than the Department or the Turnpike Authority, which does not indicate the date of publication, will be understood to mean the specification current on the date of advertisement for the project. When a more current specification is published during the life of the project, and when it is mutually agreed by the Design-Build Team and the Engineer and such agreement is documented by a supplemental agreement, the Turnpike Authority may accept materials meeting the requirements of the latest publication.

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 not less 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.

## 106-3 DESIGN-BUILD TEAM FURNISHED CERTIFICATION

The Design-Build Team shall furnish the material certifications obtained from the producer, supplier, or an approved independent testing laboratory for the following types of materials, unless otherwise directed by the Engineer.

**(A)** Materials required to meet criteria documented by tests that are normally performed during the production process.

**(B)** Materials that are required to meet specifications other than those published by AASHTO, ASTM, the Division of Highways, or the Turnpike Authority.

**(C)** Materials produced at locations that are not within routine travel distance for Department or Turnpike Authority representatives.

**(D)** Materials required to meet criteria documented by tests involving special equipment not readily available to Department or Turnpike Authority representatives.

**(E)** Any other special material when so directed by the Engineer.

**(F)** Material certifications of one of the following types shall be furnished for pre-tested materials. The specific type of material certification for each material shall be in accordance with the schedule maintained by the NCDOT Materials and Tests Unit. Copies of this schedule may be obtained from the NCDOT Materials and Tests Unit.

**Type 1 - Certified Mill Test Report**

A certified mill test report shall be a certified report of tests conducted by the manufacturer on samples taken from the same heat or lot number as the material actually shipped to the project. The report shall identify the heat or lot number.

**Type 2 - Typical Certified Mill Test Report**

A typical certified mill test report shall be a certified report of tests conducted by the manufacturer on samples taken from a lot which is typical of the material actually shipped to the project, but which may or may not be from the lot shipped.

**Type 3 - Manufacturer's Certification**

A manufacturer's certification shall be a certified statement that the material actually shipped to the project was manufactured by production processes which are periodically and routinely inspected to assure conformance to specification requirements.

**Type 4 - Certified Test Reports**

A certified test report shall be a certified report of test conducted by an approved independent testing laboratory on samples taken from same heat or lot number as the material actually shipped to the project. The report shall identify the heat or lot number.

**Type 5 - Typical Certified Test Reports**

A certified test report shall be a certified report of tests conducted by an approved independent testing laboratory on samples taken from a lot which is typical of the material actually shipped to the project, but which may or may not be from the lot shipped.

**Type 6 - Supplier's Certification**

A supplier's certification is a signed statement by the supplier that the material described in the certification is of the specification grade required and that the supplier has on hand Type 1, Type 2, or Type 3 material certifications to cover the material which is included in the Type 6 supplier's certification.

**Type 7 - Design-Build Team's Certification**

Design-Build Team's certification is a signed statement by a Design-Build Team that the used material described in the certification meets the requirements of the current specifications to the best of the Design-Build Team's knowledge and that the Design-Build Team had in his possession at the time of purchase a Type 1, 2, or 3 materials certification to cover the material which is included in the Type 7 Design-Build Team's Certification.

## 106-4 DELIVERY AND HANDLING OF MATERIALS

All materials shall be handled carefully and in such manner as to preserve their quality and fitness for the work. Materials damaged during delivery or handling shall not be used without approval of the Engineer.

## 106-5 STORAGE OF MATERIALS

Materials shall be stored so as to insure the preservation of their quality and fitness for the work. Stored materials, which may have been approved before storage, shall be subject to inspection at any time, and shall meet the requirements of the specifications at the time they are put into use. Stored materials shall be so located as to facilitate their inspection. Subject to the approval of the Engineer, that portion of the right of way not required for public travel may be used for storage purposes and for the Design-Build Team's plant and equipment, but any additional space required therefor shall be provided by the Design-Build Team at no expense to the Department or Turnpike Authority. All storage sites located within the right of way shall be restored to their original condition by the Design-Build Team at no expense to the Department or Turnpike Authority, except where the materials stored are or are to become the property of the Department or the Turnpike Authority.

## 106-6 INSPECTION AT SOURCE

The Engineer may undertake the inspection of materials at the source of supply. Where approved by the Engineer, the results of tests performed by private laboratories, producers, or manufacturer's laboratories may be used in determining compliance of a material or product with the contract.

The Engineer assumes no obligation to inspect materials at the source of supply and such inspection will be undertaken only upon condition that:

**(A)** The cooperation and assistance of the Design-Build Team and the producer with whom he has contracted for materials is assured.

**(B)** The representative of the Engineer will have full entry at all times to such parts of the plant as may concern the manufacture or production of the materials.

**(C)** Laboratory facilities shall be provided when required by the Engineer.

Where the Department and Turnpike Authority agree to inspect or test materials during their production or at the source of supply, the Design-Build Team shall bear the cost of testing performed on materials ordered by him but not incorporated into the project. 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.

The Department and the Turnpike Authority reserve the right to retest all materials which have been tested and accepted at the source of supply after the same have been delivered, and to reject all materials which, when retested, do not meet the requirements of the specifications.

## 106-7 SCALES AND PUBLIC WEIGHMASTER

When material is to be paid for on a ton basis, the Design-Build Team shall furnish platform scales or other weighing devices which have been certified by the N. C. Department of Agriculture. If the platform scales or other weighing devices are located outside of North Carolina, they shall have been certified by the Department of Agriculture within the particular state. The scales may be constructed and operated to provide automatic weighing, recording, and printing of tickets for the load being weighed.

The Turnpike Authority may deny or withhold any portion of payment for any load of materials weighed if in relation to such load of materials, the Design-Build Team falsifies any weighing certification information or otherwise fails to comply with the requirements contained in this contract.

All scales shall be operated by a public weighmaster licensed in accordance with *Chapter 81A of the General Statutes of North Carolina*. A certified weight certificate shall be issued by a North Carolina public weighmaster for each load. The certificate shall be in the form of a ticket furnished by the Design-Build Team and shall contain the following information:

(A) Turnpike Authority contract number

(B) Date

(C) Time issued, if for bituminous plant mix or portland cement stabilized base course mixed in a central plant

(D) Type of material

(E) Gross weight

(F) Tare weight

(G) Net weight of material

(H) Quarry or plant location

(I) Division of Highways' Job Mix Formula Number, if ticket is for asphalt plant mix

(J) Division of Highways' Asphalt Plant Certification Number, if ticket is for asphalt plant mix

(K) Truck number

(L) Design-Build Team's name

(M) Public weighmaster's stamp or number

(N) Public weighmaster's signature or initials

When certified weighing devices other than platform scales are to be used, the gross weight and tare weight will not be required.

The Engineer may direct the Design-Build Team to re-weigh the contents of any truck load that is to be delivered to the work on approved platform scales at no cost to the Turnpike Authority.

When tractor and trailer units are to be utilized in hauling material to be weighed, the platform scales shall be of sufficient length so as to accommodate the entire unit or the tractor shall be disconnected and the trailer and its contents weighed as a separate unit.

## 106-8 DEPARTMENT FURNISHED MATERIAL

The Design-Build Team shall furnish all materials necessary to complete the work, except those materials specified in the contract to be furnished by the Turnpike Authority. Payment at the contract price for the item which includes the use of Turnpike Authority furnished material will be full compensation for all costs of handling and placing such materials after they are delivered or made available to the Design-Build Team.

The Design-Build Team will be held responsible for all material furnished to him, and deductions will be made from any money due him to make good any shortage and deficiencies from any cause whatsoever and for any damage which may occur after Turnpike Authority furnished material has been made available.

## 106-9 DEFECTIVE MATERIAL

All materials which are not in reasonably close conformity to the requirements of the specifications shall be considered as defective and such materials, whether in place or not, shall be rejected and are to be removed from the site of the work unless otherwise permitted by the Engineer in accordance with Article 105-3. No rejected material, the defects of which may have been substantially corrected, may be used until approval has been given by the Engineer.

## 106-10 DENSITY DETERMINATION BY NUCLEAR METHODS

**Application:**

The Engineer may, at his option, use nuclear methods as described in Article 520-9 and 610-10 to determine the density of selected pavement materials. The use of nuclear methods will include the establishment of the required density through the use of control strips constructed from materials actually being used on the project, and the determination of the density being obtained in test sections located throughout the project.

# SECTION 107
# LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

## 107-1 LAWS TO BE OBSERVED

The Design-Build Team shall remain fully informed of all Federal and State laws, all local laws, ordinances, and regulations, and all orders and decrees of bodies or tribunals having any jurisdiction or authority which may in any manner affect those engaged or employed in the work or which in any way affect the conduct of the work. He shall at all times observe and comply with all such laws, ordinances, regulations, orders, and decrees; and shall indemnify and hold harmless the Authority Board, Turnpike Authority, NCDOT Board of Transportation and the Department of Transportation and their agents and employees from any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, by the Design-Build Team or by his agents and employees.

Comply with all Federal, State and local regulations when performing building removal and/or asbestos removal and disposal. Any fines resulting from violations of any regulation are the sole responsibility of the Design-Build Team and the Design-Build Team agrees to indemnify and hold harmless the Department and the Turnpike Authority against any assessment of such fines.

## 107-2 ASSIGNMENT OF CLAIMS VOID

In accordance with G.S. 143B-426.40A, the Turnpike Authority will not recognize any assignment of claims by any Design-Build Team against the Turnpike Authority.

## 107-3 PERMITS AND LICENSES

The Design-Build Team shall procure all permits and licenses except as otherwise specified; pay all charges, fees, and taxes; and give all notices necessary and incident to the due and lawful prosecution of the work.

For asphalt plants and concrete batch plants located on Department or Turnpike Authority rights-of-way, apply for and obtain all environmental permits and licenses, including stormwater permits, for plants prior to placement within the project limits or elsewhere on Department or Turnpike Authority rights-of-way. Use proven Best Management Practices and equip all plants with such pollution control equipment and devices as is necessary to meet all applicable local, State and Federal pollution requirements. Conduct compliance monitoring and report findings to each applicable environmental regulatory agency according to their required frequency.

## 107-4 PATENTED DEVICES, MATERIALS, AND PROCESSES

If the Design-Build Team employs any design, device, material, or process covered by letters of patent or copyright, he shall provide for such use by suitable legal agreement with the patentee or owner. The Design-Build Team and his surety shall indemnify and save harmless the Department and the Turnpike Authority from any and all claims for infringement by reason of the use of such patented design, device, material, process, trademark, or copyright, and shall indemnify and save harmless the Department and Turnpike Authority from any costs, expenses, and damages which it may be obligated to pay at any time during the prosecution or after the completion of the work by reason of any infringement.

## 107-5 ENCROACHMENT ON RIGHT OF WAY

Any individual, firm, or corporation wishing to encroach on highway right of way shall secure a written permit from the Department or the Turnpike Authority. The Design-Build Team is not authorized to allow any individual, firm, or corporation to perform any work within the limits of the project unless such work has been authorized in writing by the Engineer.

When so directed by the Engineer, the Design-Build Team shall make any repairs necessary due to such encroachments and such work will be paid for as extra work.

## 107-6 FEDERAL PARTICIPATION

When the United States Government pays all or any portion of the cost of the work, the Federal laws authorizing such participation and the rules and regulations made pursuant to such laws shall be observed by the Design-Build Team. The work will be subject to the inspection of the representative of such Federal agencies as are created for the administration of these laws. The Design-Build Team shall have no right to make the Federal Government a party to any court

action solely by reason of its participation in the cost of the work or by reason of its inspection of the work.

## 107-7 SANITARY PROVISIONS

Provide and maintain in a neat, sanitary condition such accommodations for the use of employees as may be necessary to comply with the requirements of the State and local Board of Health, or of other bodies or tribunals having Control and manage disposal of sanitary waste such that no adverse impacts occur to water quality.

## 107-8 PUBLIC CONVENIENCE AND SAFETY

The Design-Build Team shall at all times so conduct his work as to insure the least possible obstruction to traffic. The safety and convenience of the general public and the residents along the highway, and the protection of persons and property, shall be provided for by the Design-Build Team as specified in Section 150.

## 107-9 COORDINATION WITH RAILWAY

All work to be performed by the Design-Build Team on railway right of way shall be performed in accordance with the contract and in a manner satisfactory to the railway company, and shall be performed at such times and in such manner as not to unnecessarily interfere with the movement of traffic upon the track of the railway company. The Design-Build Team shall use all care and precautions in order to avoid accidents, damage, or unnecessary delays or interference with the railway company's traffic or other property. The Design-Build Team shall carry such railroad protective insurance and public liability and property damage insurance as may be stipulated in the contract.

When the Design-Build Team is required by the contract to transport materials or equipment across the tracks of any railway or to perform work on railway right of way, the Design-Build Team shall obtain any necessary written authority from the railway company for the establishment of a railway crossing or for the performance of work on railway right of way.

In case the Design-Build Team elects or finds it necessary to transport materials or equipment across the tracks of any railway at any point where a crossing is not required by the contract or at any point other than an existing public crossing, he shall obtain specific written authority from the railway company for the establishment of a private railway crossing and shall bear all costs in connection with such crossing, including installation, drainage, maintenance, any necessary insurance, watchman service, flagging protection, and removal of such private railway crossing.

## 107-10 WORK IN, OVER, OR ADJACENT TO NAVIGABLE WATERS

All work in or over navigable waters shall be in accordance with conditions contained in the permit obtained by the Turnpike Authority from the authority granting the permit. These conditions will be included in the contract. The work shall be performed in such manner so as not to interfere with navigation of the waterway unless approval therefor is obtained from the authority granting the permit.

The Design-Build Team shall prepare drawings necessary to obtain any addenda which may be required for his operations which are not included in the Turnpike Authority’s permit. He shall coordinate their submission with the Engineer.

## 107-11 USE OF EXPLOSIVES

When the use of explosives is necessary for the prosecution of the work, the Design-Build Team shall exercise the utmost care not to endanger life or property. The Design-Build Team shall be responsible for any and all damage or injury to persons or property resulting from the use of explosives. Such responsibility shall include, but shall in no way be limited to all damages arising from all forms of trespass to adjacent property as a result of blasting by the Design-Build Team. The Design-Build Team will not be held responsible for damage to adjacent landowner's wells or springs provided the Design-Build Team has used reasonable care and has taken reasonable precautions to prevent such damage.

All explosives shall be stored in a secure manner, in compliance with all laws, and all such storage places shall be marked clearly *DANGEROUS EXPLOSIVES*.

The Design-Build Team shall notify each public utility company having facilities in close proximity to the site of the work of his intention to use explosives. This notice shall be given sufficiently in advance to enable the utility companies to take whatever steps they may consider necessary to protect their property from injury. The Design-Build Team shall also give the Engineer, all occupants of adjacent property, and all other contractors working in or near the project notice of his intention to use explosives. Motorists shall be notified in accordance with Article 1101-10.

The Design-Build Team shall submit a blasting plan to the Engineer within 24 hours after each shot. The blasting plan shall contain the full details of the drilling and blasting patterns unless otherwise approved by the Engineer, and shall contain the following information:

(A) station limits of shot,

(B) plan of drill hole pattern, blast hole spacing, blast hole diameters and free face,

(C) initiation sequence of blastholes including delay timers and delay system,

(D) manufacturers' data sheet for all explosives, primers, and initiators employed,

(E) loading diagram showing type and amount of explosives, primers, initiators, and location and depth of stemming.

The blasting plan submitted is for quality control and record keeping purposes. Review by the Engineer shall not relieve the Design-Build Team of his responsibilities as provided in Article 107-12.

## 107-12 PROTECTION AND RESTORATION OF PROPERTY

The Design-Build Team shall be responsible for the protection from his activities of all public and private property on and adjacent to the work and shall use every reasonable precaution necessary to prevent damage or injury thereto. He shall use suitable precautions to prevent damage to pipes, conduits, and other underground structures, and to poles, wires, cables, and other overhead structures.

The Design-Build Team shall protect carefully from disturbance or damage all land monuments and property markers until the Engineer has witnessed or otherwise referenced their location and shall not remove them until directed.

The Design-Build Team shall be responsible for the removal, preservation, and resetting of all mailboxes disturbed by the construction operations. The mailboxes and their supports, when

reset, shall be left in as good a condition as they were before removal. The Design-Build Team will not be required to furnish new material except as required to repair damage resulting from construction operations.

The Design-Build Team will be held responsible for all damage or injury to property of any character resulting from any act, omission, negligence, or misconduct in the prosecution of the work. When any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, negligence, or misconduct in the execution of the work, he shall either restore at his own expense such property to a condition similar or equal to that existing before such damage or injury was done, or shall make good such damage or injury in a manner acceptable to the owner of the damaged property and to the Turnpike Authority. In case of failure on the part of the Design-Build Team to restore such property or make good such damage or injury the Turnpike Authority may at the Design-Build Team's expense repair, rebuild, or otherwise restore such property in such manner, as the Engineer may consider necessary.

## 107-13 CONTROL OF EROSION, SILTATION, AND POLLUTION

### (A) General

The Design-Build Team shall take whatever measures are necessary to minimize soil erosion and siltation, water pollution, and air pollution caused by his operations. The Design-Build Team shall also comply with the applicable regulations of all legally constituted authorities relating to pollution prevention and control. The Design-Build Team shall keep himself fully informed of all such regulations that in any way affect the conduct of the work, and shall at all times observe and comply with all such regulations. In the event of conflict between such regulations and the requirements of the specifications, the more restrictive requirements shall apply.

The Engineer will limit the area over which clearing and grubbing, excavation, borrow, and embankment operations are performed whenever the Design-Build Team's operations do not make effective use of construction practices and temporary measures which will minimize erosion, or whenever construction operations have not been coordinated to effectively minimize erosion, or whenever permanent erosion control features are not being completed as soon as permitted by construction operations.

Following completion of any construction phase or operation, on any graded slope or any area greater than one acre, the Design-Build Team shall provide ground cover sufficient to restrain erosion within 21 calendar days or within a time period specified by the Sedimentation and Pollution Control Act. The ground cover shall be either temporary or permanent and the type specified in the contract.

### (B) Erosion and Siltation Control

The Design-Build Team shall exercise every reasonable precaution throughout the life of the project to prevent the eroding of soil and the silting of rivers, streams, lakes, reservoirs, other water impoundments, ground surfaces, or other property.

Prior to suspension of operations on the project or any portion thereof, the Design-Build Team shall take all necessary measures to protect the construction area, including but not limited to borrow sources, soil type base course sources, and waste areas, from erosion during the period of suspension.

Unless otherwise approved in writing by the Engineer, construction operations in rivers, streams, and water impoundments shall be restricted to those areas where channel changes are shown on the plans and to those areas which must be entered for the construction or removal of temporary or permanent structures.

Excavated materials shall not be deposited, nor shall earth dikes or other temporary earth structures be constructed, in rivers, streams, or impoundments. As an exception to the above, confined earth materials will be permitted when approved in writing by the Engineer.

Frequent fording of live streams with construction equipment will not be permitted; therefore, temporary bridges or other structures shall be used wherever frequent stream crossings are necessary. Unless otherwise approved in writing by the Engineer, mechanized equipment shall not be operated in live streams except as may be necessary to construct channel changes and to construct or remove temporary or permanent structures.

**(C) Coordination of Erosion Control Operations**

Temporary and permanent erosion control measures shall be provided as shown on the plans or as directed by the Engineer. All permanent erosion control work shall be incorporated into the project at the earliest practicable time. Temporary erosion control measures shall be coordinated with permanent erosion control measures and all other work on the project to assure economical, effective, and continuous erosion control throughout the construction and post construction period and to minimize siltation of rivers, streams, lakes, reservoirs, other water impoundments, ground surfaces, or other property.

Temporary erosion control measures shall include but not be limited to the use of temporary berms, dikes, dams, drainage ditches, silt basins, silt ditches, slope drains, structures, vegetation, mulches, mats, netting, gravel, or any other methods or devices that are necessary. Temporary erosion control measures may include work outside the right of way or construction limits where such work is necessary as a result of construction such as borrow operations, haul roads, plant sites, equipment storage sites, and disposal of waste or debris. The Design-Build Team shall be liable for all damages to public or private property caused by silting or slides originating in waste areas furnished by the Design-Build Team.

Materials for temporary erosion control measures shall have been approved by the Engineer before being used or shall be as directed by the Engineer.

The Design-Build Team shall acceptably maintain erosion control measures installed.

**(D) Water and Air Pollution**

Exercise every reasonable precaution throughout the life of the project to prevent pollution of ground waters and surface waters, such as rivers, streams, and water impoundments. Do not discharge onto the ground or surface waters any pollutants such as chemicals, raw sewage, fuels, lubricants, coolants, hydraulic fluids, bitumens, and any other petroleum products. Operate and maintain equipment on site in a manner as to prevent the potential or actual pollution of surface or ground waters of the State. Dispose of spent fluids in accordance with applicable State and Federal disposal regulations. Immediately clean up any spilled fluids to the extent practicable and dispose of properly.

Manage, control and dispose of litter on site such that no adverse impacts to water quality occur.

Comply with all State or local air pollution regulations throughout the life of the project.

**(E) Dust Control**

The Design-Build Team shall control dust throughout the life of the project within the project area and at all other areas affected by the construction of the project, including, but not specifically limited to, unpaved secondary roads, haul roads, access roads, disposal sites, borrow and material sources, and production sites. Dust control shall not be considered effective where the amount of dust creates a potential or actual unsafe condition, public nuisance, or condition endangering the value, utility, or appearance of any property.

The Design-Build Team will not be directly compensated for any dust control measures necessary, as this work will be considered incidental to the work covered by the various contract items.

**(F) Application of Specifications**

The requirements of this article shall apply to all construction operations. Further references and detailed requirements concerning erosion, siltation, and pollution prevention and control are given in other sections of the Specifications as supplements to the general requirements of this article.

**(G) Sanctions**

In the event that temporary erosion and pollution control measures become necessary due to the Design-Build Team's negligence, carelessness, or failure to incorporate permanent erosion control measures into the project at the earliest practicable time, such measures shall be performed by the Design-Build Team as directed by the Engineer at no cost to the Turnpike Authority. If the Design-Build Team fails to perform such measures as directed, the Engineer may have the work performed in accordance with Article 105-16.

Failure of the Design-Build Team to fulfill any of the requirements of this article may result in the Engineer ordering the stopping of construction operations in accordance with Article 108-7 until such failure has been corrected. Such suspension of operations will not justify an extension of contract time.

Failure on the part of the Design-Build Team to perform the necessary measures to control erosion, siltation, and pollution will result in the Engineer notifying the Design-Build Team to take such measures. In the event that the Design-Build Team fails to perform such measures within 24 hours after receipt of such notice with adequate forces and equipment, the Engineer may suspend the work as provided above, or may proceed to have such measures performed with other forces and equipment, or both. No payment will be made to the Design-Build Team for the performance of this work and the cost of such work so performed will be deducted from monies due the Design-Build Team on his contract.

## 107-14 PROTECTION OF PUBLIC LANDS

In the execution of any work within or adjacent to any State or National forest, park, or other public lands, the Design-Build Team shall comply with all regulations of all authorities having jurisdiction over such forest, park, or lands, governing the protection of public lands and the carrying out of work within public lands, and shall observe all sanitary laws and regulations with respect to the performance of work in public lands. He shall keep the areas in an orderly condition, properly dispose of all refuse, and obtain permits for the construction and maintenance of all construction camps, stores, warehouses, residences, latrines, cesspools, septic tanks, and other structures in accordance with the requirements of the appropriate authorities.

The Design-Build Team shall take all reasonable precaution to prevent and suppress forest fires and shall require his employees and subcontractors, both independently and at the request of forest officials, to do all reasonable within their power to prevent and suppress and to assist in preventing and suppressing forest fires and to make every possible effort to notify a forest official at the earliest possible moment of the location and extent of any fire seen by them.

The Design-Build Team shall obtain any construction permits that may be required for his operations, which are not a part of the project, in accordance with the requirements of the regulations of the appropriate authorities.

## 107-15 RESPONSIBILITY FOR DAMAGE CLAIMS

The Design-Build Team shall indemnify and save harmless the Turnpike Authority Board and the NCDOT Board of Transportation and members and the Department of Transportation and Turnpike Authority and their officers, agents, and employees from all suits, actions, or claims of any character brought for any injury or damages received or sustained, or alleged to have been received or sustained, by any person, persons, or property by reason of any act of the Design-Build Team, subcontractor, its agents or employees, in the performance of the contract. The Design-Build Team's liability to save harmless and indemnify shall include, but not by way of limitation, the following:

**(A)** damages or claims for the failure of the Design-Build Team to safeguard the work;

**(B)** damages or claims by reason of the failure of the Design-Build Team to erect adequate barricades and post adequate warnings to the public of such barricades;

**(C)** any damage or claims caused through the Design-Build Team's use of defective materials or by the performance of defective work;

**(D)** any claims by reason of the Design-Build Team's infringement of patent, trademark, or copyright;

**(E)** any amounts paid by the Turnpike Authority by reason of the Design-Build Team's failure to comply with or for violations of laws, ordinances, orders, or decrees;

**(F)** any damages or claims caused by blasting operations of the Design-Build Team with or without proof of negligence on the part of the Design-Build Team;

**(G)** damages or claims caused by the failure of the Design-Build Team to protect private or public property pursuant to Article 107-12, including damages to public and private property caused by silting and slides from waste areas furnished by the Design-Build Team, without proof of negligence;

**(H)** damages caused by the failure of the Design-Build Team to control erosion in accordance with the contract.

In addition to any remedy authorized by law, the Turnpike Authority shall have a right to retain from monies due the Design-Build Team, as the Turnpike Authority considers necessary until final disposition has been made of the following suits or claims:

(1) For all claims against the Department involving claims or damages that are the Design-Build Team's responsibility under Section 107. The Design-Build Team and the Surety shall remain responsible until such suits or claims against the Department have been settled and until the the Department has been indemnified and saved harmless.

(2) In case of claims by the third parties against the Design-Build Team involving tort liability for which the Turnpike Authority or Department might be held liable for as a taking of property, or as a tort before the Industrial Commission. However, monies due the Design-Build Team will not be retained provided the Design-Build Team produces satisfactory evidence to the Turnpike Authority that he is adequately protected from such tort liability by public liability and property damage insurance. In all other cases involving claims or suits by third parties against the Design-Build Team, amounts due the Design-Build Team will not be withheld provided that the consent of the Surety is furnished and the Surety guarantees payment of any amounts for which the Design-Build Team may be determined to be legally liable.

(3) In cases of damage to property of the Turnpike Authority, such amounts necessary to pay for such damage.

In cases where claims are made or suits filed against employees, agents, or officers of the Turnpike Authority or the Department of Transportation or members of Authority Board or the Board of Transportation, the Turnpike Authority may retain from monies due the Design-Build Team sufficient to indemnify such employee, agent, or officer of the Turnpike Authority or the Department of Transportation or member of the Authority Board or Board of Transportation for any amounts which they may be held liable for but for which the Design-Build Team is responsible under the requirements of Section 107. In the event that there is not sufficient retainage or the final estimate is paid, the Turnpike Authority may collect from the Design-Build Team or its Surety amounts sufficient to indemnify such employee, agent, or officer of the Turnpike Authority or the Department of Transportation or member of the Authority Board or Board of Transportation for such damages incurred.

## 107-16 LIABILITY INSURANCE

When required by the contract, the Design-Build Team shall carry insurance of the kinds and in the amounts specified therein in addition to any other forms of insurance or bonds required under the terms of the contract, or any other insurance carried by the Design-Build Team.

## 107-17 OPENING SECTIONS OF PROJECT TO TRAFFIC

If it is determined by the Engineer that the Design-Build Team will not complete the work by the completion date, intermediate completion date, or intermediate completion time, the Engineer may notify the Design-Build Team in writing that upon expiration of contract time or intermediate contract time the project or any portion thereof will be open to traffic. On such sections that are opened, the Design-Build Team shall conduct the remainder of his operations so

as to cause the least obstruction to traffic. The Design-Build Team shall not be relieved of his liability or responsibility, shall not receive any additional compensation due to the added cost of the work, nor shall he receive any extension of the completion date, intermediate completion date, or intermediate completion time, by reason of such openings.

## 107-18 DESIGN-BUILD TEAM'S RESPONSIBILITY FOR WORK

Until final acceptance of the work by the Engineer, as evidenced in writing, the Design-Build Team shall have the charge and care thereof and shall take every precaution against injury or damage to any part thereof by the action of the elements, or from any other cause, whether arising from the execution or from the nonexecution of the work. The Design-Build Team shall rebuild, repair, restore, and make good all injuries or damages to any portion of the work occasioned by any of the above causes before final acceptance and shall bear the expense thereof, except as provided in other sections of the Specifications. The Turnpike Authority will reimburse the Design-Build Team for the repair of the work due to actions of the elements of such exceptional nature as to be contractually classified as Acts of God.

In case of suspension of work from any cause whatever, the Design-Build Team shall be responsible for all materials, and shall properly store them, if necessary, and shall provide suitable drainage of the roadway and erect necessary temporary structures at no cost to the Department.

## 107-19 FURNISHING RIGHT OF WAY

The responsibility for coordinating the securing of all necessary rights of way is as outlined in the Request for Proposals.

## 107-20 PERSONAL LIABILITY OF PUBLIC OFFICIALS

Employees, agents, officers, and members of the Authority Board, NCDOT Board of Transportation, Turnpike Authority or the Department of Transportation shall not be held personally liable for any damages connected with the work, it being specifically understood in all such matters that they act solely as agents and representatives of the Authority Board, NCDOT Board of Transportation, Turnpike Authority or the Department of Transportation.

## 107-21 WAIVER OF LEGAL RIGHTS BY THE TURNPIKE AUTHORITY

Upon completion of the work, the Turnpike Authority will expeditiously make an inspection and notify the Design-Build Team of acceptance. Such final acceptance and processing of the final estimate, however, shall not preclude or stop the Turnpike Authority from correcting any measurement, estimate, or certificate made before or after completion of the work, nor shall the Turnpike Authority be precluded or esteemed from recovering from the Design-Build Team or his Surety, or both, such overpayment as it may sustain, or by failure on the part of the Design-Build Team to fulfill his obligations under the contract. A waiver on the part of the Turnpike Authority of any breach of any part of the contract shall not be held to be a waiver of any other or subsequent breach.

The Design-Build Team, without prejudice to the terms of the contract, shall be liable to the Turnpike Authority for latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the Turnpike Authority's rights under any warranty or guaranty.

## 107-22 SAFETY AND ACCIDENT PROTECTION

The Design-Build Team shall comply with all applicable Federal, State, and local laws, ordinances, and regulations governing safety, health, and sanitation, and shall provide all safeguards, safety devices, and protective equipment, and shall take any other needed actions, on his own responsibility that are reasonably necessary to protect the life and health of employees on the job and the safety of the public, and to protect property in connection with the performance of the work covered by the contract.

All Design-Build Teams' personnel, all subcontractors and their personnel, and any material suppliers and their personnel shall wear a reflective vest or outer garment conforming to the requirements of MUTCD at all times while on the project.

## 107-23 WAGES AND CONDITIONS OF EMPLOYMENT

The Design-Build Team's attention is directed to the provisions and requirements of any and all public statutes that regulate hours or conditions of employment on public work. Such provisions and requirements that are appropriate, in accordance with the intent of the particular law, act, or statute, will be applicable to all work performed by the Design-Build Team with his own organization and with the assistance of workmen under his immediate superintendence, and to all work performed by subcontract. It shall be the responsibility of the Design-Build Team to ascertain the appropriate application of such provisions and requirements to the work.

In addition to the general requirements of the various regulations referred to above, certain additional regulations and restrictions may be imposed that are peculiar to the particular work under the contract. In such cases, these regulations and restrictions will be included in the contract for the particular project involved.

For projects that are financed wholly or in part with Federal funds, the minimum wage rates to be paid to all mechanics and laborers employed on the project will be determined by the U.S. Secretary of Labor. A schedule of such wage rates will be inserted in the proposal for such projects. The Design-Build Team shall provide at the job site at no cost to the Turnpike Authority a weatherproof bulletin board covered with glass or rigid transparent plastic and shall display thereon at all times legible copies of such schedule of wage rates and of the wage rate information poster that will be furnished to him. The bulletin board shall be located in a conspicuous place easily accessible to all employees.

In the event that changes should occur in any of the regulations referred to in this article, or in any application thereof to the work under contract, no additional compensation will be allowed the Design-Build Team as a result of such changes.

## 107-24 LIABILITY TO THIRD PARTIES

It is not intended by any of the provisions of any part of these specifications to make the public or any member thereof a third party beneficiary hereunder, or to authorize anyone who is not a party to a contract entered into pursuant to these specifications to maintain a suit for personal injury or property damage otherwise than as authorized and provided by law.

## 107-25 RIGHT OF THE DESIGN-BUILD TEAM TO FILE VERIFIED CLAIM

If the Design-Build Team fails to receive such settlement as he claims to be entitled to under the terms and provisions of the contract, the Design-Build Team may submit a written and verified claim for such amounts he deems himself or his subcontractor(s) entitled to under the terms and provisions of the contract provided he has complied with the applicable provisions of the contract including, but not limited to, giving written notice of intent to file a claim, keeping and submission of cost records, and the initial submission of a written claim within the specified time period. The claim shall be submitted to the NCTA Chief Engineer within 60 days from the time the Design-Build Team receives the final estimate as defined by Section 101 and shall be submitted in accordance with G.S. 136-29.

## 107-26 HAZARDOUS, CONTAMINATED, AND/OR TOXIC MATERIAL

When 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, such operations shall be discontinued in the vicinity of the abnormal condition and the Engineer shall be notified immediately. Upon notification by the Design-Build Team, the Engineer will investigate the work and, if necessary, suspend the work in accordance with Article 108-7. The presence of barrels; old or abandoned underground storage tanks, and discolored earth, metal, wood, etc.; visible fumes; abnormal odors; excessively hot earth; smoke; or anything else that appears abnormal may be indicators of hazardous, contaminated, and/or toxic materials and shall be treated with extraordinary caution as they are evidence of abnormal conditions.

The Design-Build Team's operations shall not resume until so directed by the Engineer.

Disposition of the hazardous, contaminated, and/or toxic material will be made in accordance with the requirements and regulations of the Department of Human Resources and the Department of Environment, Health & Natural Resources. Where the Design-Build Team performs work necessary to dispose of hazardous, contaminated, and/or toxic material, payment will be made at the unit prices for pay items included in the contract which are applicable to such work or, where the contract does not include such pay items, payment will be made as provided in Article 104-7 for extra work. Where the contract does not include pay items for the work necessary to dispose of hazardous, contaminated, and/or toxic material, the Engineer may have the work performed by others.

## 107-27 FINES AND LEVIES AGAINST THE TURNPIKE AUTHORITY OR DEPARTMENT

In the event there are fines or charges levied against the Turnpike Authority or Department, actions taken by the Turnpike Authority or Department, or remediation required by the Turnpike Authority or Department due to the Design-Build Team’s negligence, carelessness or failure, due to violations charged to the Design-Build Team, or due to the Design-Build Team’s failure to conform to the Specifications, monies will be deducted from monies to be paid to the Design-Build Team on this project.

# SECTION 108
# PROSECUTION AND PROGRESS

## 108-1 GENERAL

It is the intent of these Specifications that the Design-Build Team shall commence work on the date of availability shown in the contract or as soon thereafter as practicable, except that when required by permits included in the proposal, that work in jurisdictional waters and wetlands shall not begin until a meeting is held between the Department, Regulatory Agencies, and the Design-Build Team. The Design-Build Team shall not begin work prior to the date of availability without written approval of the Engineer. If such approval is given, the Turnpike Authority will assume no responsibility for any delays caused prior to the date of availability by any reason whatsoever, and such delays, if any, will not constitute a valid reason for extending the completion date. The Design-Build Team shall not commence work prior to execution of the contract by both the Department of Transportation and the Design-Build Team.

The Design-Build Team shall pursue the work diligently with workmen in sufficient numbers, abilities, and supervision, and with equipment, materials, and methods of construction as may be required to complete the work described in the contract or as may be amended, by the completion date.

## 108-2 COST-LOADED CRITICAL PATH METHOD PROJECT SCHEDULE

### A. General Requirements

The Design-Build Team shall create a Cost-Loaded Critical Path Method Project Schedule (CPM). The Design-Build Team shall include in the CPM, the work of subcontractors, vendors, suppliers, utilities, railroads, permitting agencies, NCDOT, NCTA, and all other parties associated with the Project. Failure by the Design-Build Team to include any element of its Work or the work of others required for completion of the Project will not excuse the Design-Build Team from completing the Project by the Contract Completion Date(s). The Design-Build Team shall assign a dollar value to each activity in the CPM. The Design-Build Team shall use the CPM to prepare its payment applications in accordance with Article 109-4 of the Standard Special Provisions, Division One, found elsewhere in this RFP. The Design-Build Team shall provide adequate time in the schedule for all parties involved with the Project to complete their Work, including inspections, procurement activities and testing. The Design-Build Team's plan, as presented in the CPM, shall adhere to all Contract requirements.

The Engineer's acceptance of any schedule does not relieve the Design-Build Team of responsibility for the accuracy or feasibility of the schedule, does not modify the contract, will not be construed as an endorsement or validation of the Design-Build Team's plan, and does not guarantee that the Project can be performed or completed as scheduled. The Engineer's acceptance of the Design-Build Team's schedules in no way attests to the validity of the assumptions, logic constraints, dependency, relationships, resource allocations, resource availability, manpower and equipment, or any other aspect of the means and methods of performing the Work. The Design-Build Team is and shall remain solely responsible for the scheduling, planning, and execution of the Work in order to meet the Project Milestones, the Intermediate Contract Times, and the Contract Completion Date(s).

NCTA will only reimburse costs for delays as identified in Article 104-4 of the Standard Special Provisions, Division One. Except for cost identified in Article 104-4, NCTA will not be responsible for additional or unabsorbed overhead costs resulting from delays, regardless of whether or not the delays were excusable.

Although the Design-Build Team may plan to achieve Substantial Completion or Final Completion early, in no event will the Design-Build Team be entitled to any additional compensation related to the inability to complete work in advance of the applicable contract deadline.

The Design-Build Team will not be permitted to utilize a resource leveled schedule for the purposes of payment, determining expected start and finish dates, or the longest path of the schedule. Rather, the longest path and expected start and finish dates will be determined by logic, durations, and calendars.

**Materials –** The Design-Build Team shall produce every schedule referenced in this Provision and/or submitted to the Engineer on a computer using software and files that are compatible with the most recent version of Primavera.

**Definitions** – The following definitions apply solely to the terms used in this provision. The following definitions do not modify in any way the definitions provided elsewhere in the Contract Documents.

**Activity** – A discrete, identifiable task or event that takes time, has definable start and stop dates, furthers the Work's progress, and can be used to plan, schedule, and monitor a project.

**Activity Calendar** – A set of days assigned to an activity on which work associated with the activity may be scheduled.

**Activity Code** – Additional information assigned to an activity for purposes of grouping or filtering related activities. Common codes include phase, area, responsibility, subcontractor, type of work, and sub phase.

**Activity ID** – A unique, alphanumeric, identification code assigned to an activity.

**Actual Dates** – Actual Starts and Actual Finishes of activities in the schedule.

**Actual Finish** – The date when the work represented by a specific activity in the schedule was actually finished.

**Actual Start** – The date when the work represented by a specific activity in the schedule was actually started.

**Activity Network Diagram** – A graphic representation of a CPM schedule that shows the relationships among activities.

**Bar Chart** – A graphic representation of a schedule without relationships. A timescale appears along the horizontal axis.

**Baseline Schedule** – The first accepted CPM schedule showing the accepted plan to complete the entire Project.

**CPM of Record** – The most recent CPM schedule accepted by the Engineer.

**Calendar Day** – A day shown on the calendar beginning and ending at midnight.

**Constraint** – A restriction imposed in a schedule, which fixes a value that would otherwise be calculated within the schedule. Examples of values that can be fixed by a constraint include float, start date, end date, and completion date.

**Contract Time** – The number of calendar days inclusive between the Notice to Proceed and the Contract Completion Date.

**Contract Value** – The Contract Lump Sum Price and any additional dollar value added through Supplemental Agreement(s).

**Controlling Activity** – The first incomplete activity on the Critical Path. This term is considered synonymous with "Controlling Operation."

**Critical Delay** – A delay to an activity on the critical path that extends the Scheduled Completion Date.

**Critical Path** – The longest path of activities that determines the scheduled completion date of the Project. Activities on the critical path are critical activities.

**Data Date** – The earliest possible date identified in a schedule from which remaining activities can proceed.

**Early Finish** – The earliest date an activity can finish based on its duration and its predecessors.

**Early Start** – The earliest date an activity can start based on its predecessors.

**Final Schedule** – The last monthly update CPM schedule containing actual start and finish dates for every activity.

**Free Float** – The amount of time an activity can be delayed and not delay a successor.

**Lag** – An offset of time from the predecessor to the successor. Lag is a numerical value that is not assigned a description or activity number.

**Late Finish** – The latest date an activity can finish based on its successors without causing a delay to the Scheduled Completion Date of the Project.

**Late Start** – The latest date an activity can start based on its successors and duration without causing a delay to the Scheduled Completion Date of the Project.

**Logic** – Plural or singular reference to the predecessor and successor relationships between activities in the schedule.

**Milestone** – An activity with no duration that is typically used to represent the beginning or end of the project or an interim phase. Includes, but is not limited to, Intermediate Completion Dates and the Contract Completion Date.

**Progress Schedule** – A CPM schedule produced by incorporating the Project's actual progress into the CPM of Record for purposes of reviewing payment applications prior to any major schedule revisions.

**Open End** – The condition that exists when an activity has either no predecessor or no successor, or when an activity's only predecessor relationship is a finish-to-finish or only successor relationship is a start-to-start.

**Original Duration** – The original estimate of time, expressed in workdays, required to perform an activity.

**Preceeding Work –** Work that must be preformed prior to work being preformed on the same project by other Contractors or Design-Build Teams and under separate contract with the NCTA.

**Predecessor** – An activity that is defined by schedule logic to precede another activity.

**Preferential Logic** – A predecessor or successor relationship that is not based on the minimum requirements for construction. For example, working from North to South versus working from South to North when contract has no restriction either way.

**Punch Work –** Minor corrective work typically performed at the end of construction that is necessary to bring the Project into full compliance with the requirements of the Contract.

**Relationship** – Interdependence between two activities. Relationships link an activity to predecessors and successors.

**Remaining Duration** – The estimated time, expressed in workdays, required to complete an activity.

**Revised Schedule** – A Schedule of Record with Schedule Revisions.

**Scheduled Completion Date** – The completion date forecast by the CPM schedule. The schedule may also forecast Intermediate Completion Dates for Milestones, Phases, or other portions of the Project.

**Schedule Revision(s) –** A change in the method of calculation, relationships, sequence, or original duration of activities in the schedule; or a change in the remaining duration of a work activity that is not caused by the actual progress of the activity. Revisions can be considered either Major or Minor as noted in Article 108-2 Section F.

**Successor** – An activity that is defined by schedule logic to succeed another activity.

**Total Float** – The amount of time an activity can be delayed and not delay the Scheduled Completion Date.

## B. Design-Build Team's Scheduling Representative

The Design-Build Team shall propose to NCTA a person to serve as the Schedule Representative responsible for developing, updating, and revising the Design-Build Team's CPM. The Design-Build Team shall propose a Schedule Representative with at least 500 hours of scheduling experience, and at least one year of project management experience including responsibility for the project's budget. The Schedule Representative may also serve as the project manager, so long as all the requirements of this Provision can still be met. The proposed Schedule Representative's qualifications shall be submitted with the Technical Proposals for NCTA evaluation. The Engineer may reject a Scheduling Representative that does not meet the minimum requirements of this Provision. In such case, the Design-Team must designate another individual meeting the minimum requirements for a Scheduling Representative prior to the acceptance of the Initial CPM.

The Design-Build Team shall authorize the Schedule Representative to certify schedules, answer schedule-related questions, and propose revisions to the schedule as necessary to present a current and reliable plan of construction. The Schedule Representative shall be authorized to speak on behalf of the Design-Build Team in matters related to scheduling and budgeting of the Work. The Schedule Representative shall attend all scheduling and progress meetings,

including, but not limited to, the Design-Build Team's schedule meetings with subcontractors, vendors, utility companies, or other government agencies. The Design-Build Team shall employ the Schedule Representative on a full time basis. The Design-Build Team shall assign the Schedule Representative exclusively to this Project, and the Scheduling Representative shall be physically present on site to execute the duties outlined in this Provision.

If the accepted Schedule Representative is no longer assigned to the Project, the Design-Build Team shall submit a new Schedule Representative for the Engineer's review within 14 days of receiving notice of the Schedule Representative's departure.

## C. Interim Schedule

In addition to Section 800 of the Standard Specifications, the Design-Build Team may submit electronically to NCTA a cost-loaded Interim Critical Path Method Project Schedule (Interim Schedule). The Interim Schedule shall be submitted electronically to the NCTA within 7 days of Notice to Proceed. The NCTA will use the Interim Schedule to monitor the progress of the Project and process the Design-Build Team's payment applications for up to 90 days from the Notice to Proceed. The use of an Interim Schedule in lieu of an Initial Cost-Loaded Critical Path Method schedule is optional.

The Interim Schedule shall meet the following requirements:

1) The Interim Schedule will start with an activity identified as "Notice to Proceed." The Design-Build Team shall constrain "Notice to Proceed" to start on the expected date of the Notice to Proceed.
2) The last activity in the Interim Schedule will be identified as "Project Completion." The Design-Build Team shall plan the other activities in the schedule so that the late finish date of "Project Completion" is calculated to occur on the Contract Completion Date.
3) The Design-Build Team shall identify all major components of Work in the Interim Schedule as activities. For the Interim Schedule, the Design-Build Team may present large components of the Work, such as "construction of the Project," as a single activity in the schedule, so long as the Interim schedule meets the other requirements of this Provision.

   The Design-Build Team shall identify the following for each activity in the Interim Schedule.

   a) A unique alphanumeric activity ID
   b) A description of the work associated with each activity ID
   c) A duration
      i) The Design-Build Team shall limit activities expected to start in the first 90 days to a maximum of 20 workdays duration. The Design-Build Team shall subdivide activities expected to take longer than 20 days so as to provide more detail and to meet this requirement. Any duration provided by NCTA, utilities, or other government agencies will be exempt from this requirement.
      ii) The Design-Build Team may assign any realistic durations for activities expected to start more than 90-days after Notice to Proceed.
   d) Predecessors
   e) Successors
   f) Value of the Work
      i) The Design-Build Team shall assign an accurate dollar value to each activity expected to start within 90 days of Notice to Proceed based on estimated costs plus

associated profit and overhead. The profit and overhead assigned by the Design-Build Team to the individual activities starting in the first 90 days shall be equal to or less than the mark-up applied to the Work when establishing the Contract Lump Sum Price.

ii) The Design-Build Team shall limit the value of an activity to $500,000 for activities expected to start in the first 90 days. The Design-Build team shall subdivide activities starting in the first 90 days and with anticipated values over $500,000 into 2 or more activities to meet this requirement.

iii) The Design-Build Team shall assign a dollar value to each activity in the Interim Schedule.

iv) Activities may be assigned a value of zero dollars, as appropriate.

v) The total value of all activities in the Interim Schedule shall be equal to the Contract Lump Sum Price.

vi) Any activities that are incidental will have a value of zero dollars.

4) The Design-Build Team shall assign each activity in the Interim Schedule at least one predecessor and one successor, except the first activity and the last activity in the schedule.

5) The Design-Build Team shall use scheduling software to calculate the following data for each activity in the schedule:

   a) Early Start
   b) Early Finish
   c) Late Start
   d) Late Finish
   e) Total Float

6) The Design-Build Team is not required to submit a written Narrative with the Interim Schedule. However, NCTA will accept and review written narratives as part of its technical assessment of the Design-Build Team's plan of construction. The Design-Build Team's written narrative should explain the planned sequence of work, the critical path, proposed phasing of the Project, and any other scheduling assumptions made by the Design-Build Team.

The Engineer may choose to reject the Interim Schedule if it does not conform to the requirements of this Provision. If the Engineer rejects the Interim Schedule, the Project will be administered as if no Interim Schedule had been submitted.

## D. Initial Cost-Loaded Critical Path Method Schedule (ICPM)

Within 30 days of Notice to Proceed, the Design-Build Team shall submit electronically to the Engineer an initial Cost-Loaded Critical Path Method Project Schedule (ICPM) meeting the requirements of this Provision and using industry-accepted CPM scheduling practices as identified in the AGC's Construction Planning and Scheduling book, Second Edition. Within 21 days of the receipt of the Design Build Team's Initial Schedule, the Engineer will complete the review of the ICPM. If the Engineer decides it is warranted, the Engineer will convene a joint review conference at which the Engineer and the Design-Build Team will make any necessary corrections or adjustments to the ICPM. If a revision is necessary either from the Engineer's Review or the joint review conference, the Design-Build Team shall submit a revised ICPM

electronically within 7 days of such joint review conference and the Engineer will review the revised ICPM within 7 days of re-submittal. The Design Build Team and the Engineer will repeat this process until an acceptable ICPM is established.

Once the ICPM has been accepted, it becomes the baseline schedule for the Project and the first CPM of Record for the Project. If an Interim Schedule was submitted and accepted by the Engineer, the accepted ICPM replaces the Interim Schedule for all purposes, including payment.

The Design-Build Team shall submit an ICPM that meets the following requirements.

1) The first activity in the schedule is "Notice to Proceed." The Design-Build Team shall constrain this activity to start on the date of the Notice to Proceed. Except as otherwise indicated in this Provision or agreed in writing by the Engineer, the Design-Build Team shall not use constraints. If at any time the Engineer approves the use of a constraint, the Design-Build Team shall provide written documentation of such to the NCTA.
2) The Last Activity in the Schedule shall be identified as "Project Completion." The Design-Build Team shall plan the other activities in the schedule so that the expected finish of "Project Completion" is calculated to occur on the Contact Completion Date.
3) The Design-Build Team shall plan its Work to meet all time-related requirements of the Contract. This includes but is not limited to: submittal review times, Milestones, Intermediate Contract Times, phasing requirements, and the date of Substantial Completion. The Design-Build Team shall include activities, within their CPM schedule, which represent reasonable durations for construction impacts or operations created by the Toll Integration Contractor performing their operations concurrently with the Design-Build Team's Work.
4) The Design-Build Team shall include within the ICPM work activites that must be preformed prior to work being preformed on the same project by other Contractors or Design-Build Teams and under separate contract with the NCTA (Preceeding Work). Each activity that is considered Preceeding Work shall have an responsibility code assigned.
5) The Design-Build Team shall identify all the components of the Work and the work of others on the Project as activities in the ICPM. If the Engineer cannot identify an item of the Work as an activity or as part of an activity in the schedule, then that item of the Work will be considered incidental.
6) The Design-Build Team shall designate the following for each activity in the ICPM.
   a) A unique alpha numeric activity ID
   b) A description of the work associated with each activity ID
   c) A duration
      i) The Design-Build Team shall limit construction activities to a maximum of 20 workdays duration. The Design-Build Team shall subdivide activities expected to take longer than 20 days so as to provide more detail and to meet this requirement. If for any reason this requirement cannot be achieved, the Design-Build Team shall provide a written request to the Engineer, explaining the reasoning for the need to have a duration over 20 workdays. Upon approval, the Design-Build Team shall forward the request to the NCTA. Any duration provided by NCTA, utilities, or other government agencies shall be exempt from this requirement. Waiting times for plant growth cure times, material procurement, and other activities assigned a zero dollar value and no assignment of responsibility are also exempt from this requirement.

ii) The Design-Build Team shall limit design activities to the required design submittal intervals or a maximum of 90 days, whichever is shorter. The Design-Build Team shall subdivide activities expected to take longer so as to provide more detail.

iii) All activities with a dollar value greater than zero shall have a duration assigned to it, even if the duration is equal to zero.

d) Predecessors – Each activity except for "Notice to Proceed" shall have at least one predecessor.

e) Successors – Each activity except for "Final Completion" shall have at least one successor.

f) Activity Calendar – The Activity Calendar shall clearly identify the days when work could be performed on the activity and the days when work cannot be performed on the activity, in addition to the amount of hours per day for a given workweek.

g) Activity Code – Each activity in the schedule shall be assigned an activity code for the following categories:

i) Area of the Project

ii) Structure within the Area of the Project

iii) Phase of the Project

iv) Division of Work

v) Work Type

vi) Responsibility for the Work

(1) The Design-Build Team shall identify the entity responsible to perform each activity in the schedule. Examples might include a particular subcontractor, NCTA, the Design-Build Team, a design consultant, a utility company, etc.

(2) If more than one entity is performing a particular activity, then the activity code shall identify both entities.

(3) When the ICPM is submitted, the Design-Build Team shall provide a list to the Engineer of each activity code that assigns responsibility to entities that are not under the control of the Design-Build Team.

vii) Categories and Groupings

(1) The Design-Build Team shall assign different categories for items in separate Divisions within the NCDOT Standard Specifications for Roads and Structures and at least one type of work shall be classified as punch work.

(2) The Design-Build Team shall choose a method of identifying the type of work that shall clearly communicate to the Engineer the nature of the work being performed.

(3) Each activity shall have an activity code assigned to it representing the Area of the Project, Structure, Phase, Division, Worktype, and Responsibility in order for the schedule to be filtered by activity code.

h) Value of the Work

i) The Design-Build Team shall assign an accurate dollar value to each activity based on a reasonable assignment of the value of that work when compared to the overall work being performed on the Project.

ii) The Design-Build Team shall not assign a dollar value to an activity less than the estimated cost to perform that work.

iii) The Design-Build Team shall not assign a dollar value to the work being performed by NCTA or other third parties.

iv) Activities scheduled to occur early in the Project shall be assigned the same or lesser value than similar activities scheduled to occur later in the Project, unless otherwise approved.

v) The Design-Build Team shall limit the value of an activity to $500,000. The Design-Build team shall subdivide activities with anticipated values over $500,000 into 2 or more activities to meet this requirement. Mobilization, some design activities, and materials procurement activities are exempt from this $500,000 requirement.

vi) The Design-Build Team shall assign activities in the schedule representing tasks incidental to the performance of the Work a value of zero dollars.

vii) Activities may be assigned a value of zero dollars when appropriate. Examples include the work of others, or tasks performed by subcontractors for which the contractor has no cost.

viii) Each Activity in the Schedule shall be cost loaded so that the sum of the budgeted total costs for each activity equals to the Total Contract Value. The budgeted total costs for each activity shall not change once the ICPM is approved as the First Schedule of Record, unless authorized in writing by NCTA.

ix) Any work performed that is not identified in the schedule will have a value of zero dollars.

x) Any activities that are incidental will have a value of zero dollars.

xi) The Design-Build Team shall be limited to five percent of the total amount bid for the entire Project for "Mobilization" as detailed in Section 800 of the Project Special Provisions.

xii) The Design-Build Team shall assign at least one-half of one percent of the total amount bid for the entire Project to the activity or activities representing punch work.

xiii) All costs assigned to activities will be evaluated on a linear basis with regard to payment unless a payment curve is provided and approved. Such curves shall be agreed to in the baseline schedule and will not change unless authorized in writing by NCTA.

7) The Design-Build Team shall assign each activity in the ICPM at least one predecessor and one successor, except the first activity, "Notice to Proceed," and the last activity, "Project Completion."

8) The Design-Build Team shall not use start-to-finish relationships to connect predecessor and successor activities.

9) The Design-Build-Team shall limit the use of start-to-start and finish-to-finish relationships to connect predecessor and successor activities. The Schedule Representative shall explain to the Engineer why a start-to-start or finish-to-finish relationship was used upon the Engineer's request. This information shall also be forwarded to the NCTA.

10) The Design-Build Team shall produce a schedule that does not contain open-ended activities, except for the first and last activity in the schedule.

11) The Design Team shall not use negative lags in the schedule. The Design-Build Team shall limit the use of lags in the schedule and shall not use a lag greater than 5 days. The Schedule Representative shall explain to the Engineer why a lag was used. This information shall also be forwarded to the NCTA.

12) The Design-Build Team shall use the scheduling software to calculate the following data for each activity in the schedule:
    a) Early Start
    b) Early Finish
    c) Late Start
    d) Late Finish
    e) Total Float
    f) Free Float
13) The longest path shall be dictated by schedule logic and durations, not by the leveling of resources or cost information.
14) The Design-Build Team shall be required to submit a written narrative with the ICPM. The Design-Build Team shall explain in its written narrative the planned sequence of the Work, the critical path, proposed phasing for the Project, the activity calendars, maintenance of traffic, milestone dates, labor and equipment resources, and the estimated payouts by month and by phase. In addition, the Design-Build Team shall explain in its written narrative how it has provided for procurement of materials, weather, permitting requirements, environmental requirements, coordination with other contractors, coordination with local municipalities, coordination with Toll Integration Contractor, coordination with NCTA's right of way Agent, work to be performed in whole or in part by NCTA or other government agencies, work to be performed by the utility companies, and any other scheduling assumptions made by the Design-Build Team.

The Engineer will review the ICPM submitted by the Design-Build Team for compliance with the requirements of the Contract. The Engineer may reject the ICPM if it does not adhere to the requirements of the Contract. The Engineer may reject the ICPM if it makes unreasonable demands on the NCTA or third parties on the Project without their written acknowledgement or agreement to such demands or requirements. Examples of unreasonable demands might include the simultaneous review of numerous submittals, short durations for utilities to perform work, shutting down adjacent roadways, or limiting access to private land owners. The Engineer may reject a schedule that over-utilizes start-to-start and finish-to-finish relationships to connect predecessor and successor activities if, in the opinion of the Engineer, the use of these logic relationships obscures the relationships between activities. The Engineer may reject a schedule that over-utilizes lags, if in the opinion of the Engineer, lags are being used to replace necessary activities or obscuring how one activity relates to the next.

The Engineer will also review the values assigned to the activities in the ICPM for balance. The Engineer may reject the ICPM if the dollar value assigned to any specific activity exceeds the Engineer's estimate by more than 40% or $100,000. The Engineer may reject the ICPM if, in the opinion of the Engineer, the values assigned to activities expected to be completed early in the Project exceed the value assigned to the same or similar activities expected to finish late in the Project, without explanation.

The Design-Build Team is responsible for the timely preparation of an ICPM that fully complies with the requirements of this Provision and the Contract. The Engineer may take action under Articles 108-7 and 108-9 of the Standard Special Provision, Division One if the Design-Build Team has not prepared an acceptable ICPM within 180 days from the Notice to Proceed.

## E. Schedule Updates

As the basis of its payment application request and as a requirement of this Provision, the Design-Build Team shall submit electronically to the Engineer a regular update to the CPM of Record using accepted scheduling practices. The Engineer will determine the frequency and date of the Schedule Updates – not to exceed two updates per month and to occur at least once within any 35 day period. The Design-Build Team shall continue to provide the Engineer schedule updates until the final schedule is approved with 100% completion of all activities and all the Work on the Project. The Design-Build Team shall submit a Schedule Update within 7 days of its data date. The NCTA shall review the payment application and provide a response to the DBT within 7 calendar days of the submission. Upon the Engineer's acceptance, the Schedule Update will become the new CPM of Record, replacing the previous CPM of Record, and will be considered used from its data date until the data date of the next schedule accepted by the Engineer.

The Design-Build Team shall incorporate the following information into the previous CPM of record and submit this as its schedule update:

1) An updated data date
2) The actual start of any activity that started prior to the data date of the Schedule Update
3) The actual finish of any activity that finished prior to the data date of the Schedule Update
4) The new remaining duration of any activity that began, but did not finish prior to the data date of the schedule update.
5) The percent complete for every activity in the schedule. The Design-Build Team shall use both activity percent complete and resource percent complete for activities representing the purchase of materials, and shall identify the resource percent complete of activities representing the purchase of materials for undelivered; delivered or fabricated; or installed material as 0%, 95% or 100% complete, respectively.
6) The Design-Build Team shall use the scheduling software to calculate the following data for each of the remaining activities in the Schedule Update:
   a) Early Start
   b) Early Finish
   c) Late Start
   d) Late Finish
   e) Total Float
   f) Free Float

The Design-Build Team shall provide a schedule update narrative as part of the Schedule Update, in addition to any of the other requirements identified in Article 109-4 of the Standard Special Provision, Division One for partial payment requests. The Design-Build Team shall include in the schedule update narrative a description of the Work performed during the update period; the status of any outstanding permits; the current critical path; any delays or disruptions experienced during the update period to Intermediate Contract Dates, Substantial Completion, and/or Final Completion; any change in planned manpower or equipment; any foreseeable delays or disruptions; and any "Minor Revisions" made during the update period that have previously been accepted by the Engineer. A discussion of delays in the Schedule Update's narrative shall

not constitute a written request for additional time or notice of intent to file a claim as required by the Contract.

The Design-Build Team shall not incorporate any revisions into a Schedule Update unless the revisions are minor and have been previously accepted by the Engineer. Any documentation regarding the Minor Revisions shall be submitted to the NCTA. The schedule update narrative shall include documentation of any revisions previously verbally approved by the Engineer.

If the Design-Build Team chooses to revise the CPM of Record, the revised schedule shall be submitted separately from the progressed schedule. The revised schedule shall have the same data date as the most recent Schedule of Record and reflect the progress achieved up to that point in time.

The Engineer may reject a Schedule Update that incorporates revisions that were not previously accepted by the Engineer, may reject a schedule update that includes actual dates on or after the data date, and may reject a Schedule Update that records incomplete or incorrect information on the progress of the Work.

**F. Revisions to the CPM of Record**

The Design-Build Team may revise the CPM of Record. A revision to the CPM of record is defined as one or more of the following:

1) A change in the original duration of an activity
2) An increase in the remaining duration of an activity
3) A change in the logic of the schedule
4) A change to any actual date previously recorded and provided to the Engineer
5) The deletion or addition of an activity
6) A change to, addition of, or deletion of a constraint
7) A change to, addition of, or deletion of an activity code
8) A change to an activity description
9) A change to the dollar value assigned to an activity
10) Any other change other than updating progress or recording actual dates.

A minor revision is defined as a revision that does not affect the critical path of the Work on the Project, does not affect work activities that may soon become critical, does not significantly affect third parties, does not significantly affect NCTA, and does not increase or lower the dollar values assigned to the activities in the schedule. For minor revisions, the Schedule Representative shall contact the Engineer and explain the revision. If the Engineer determines that the revision is minor, the Engineer can verbally accept the revision. The Design-Build Team shall incorporate revisions verbally accepted by the Engineer into the next Schedule Update. The Engineer's determination as to whether a revision is minor or major shall be final.

All revisions that are not minor revisions are major revisions. For major revisions, the Design-Build team shall submit to the Engineer a revised CPM that meets all the requirements of the ICPM and is updated to reflect current progress. The Design-Build Team shall submit any revised CPM within 7 days of its data date unless otherwise agreed by the Engineer. The Design-Build Team shall include a narrative with the revised CPM describing <u>each</u> revision and the reason for <u>each</u> revision. Every revision that was made to the revised schedule shall be listed in the narrative. The Design-Build Team shall also include in the narrative any foreseeable

problems that may need to be overcome when implementing the revision. A discussion of delays and potential delays in the revised CPM's narrative shall not constitute a written request for additional time or satisfy any requirement for written notice to file a claim as required by the Contract.

If the Design-Build Team is re-allocating the dollar values assigned to activities, it shall include for the Engineer's review a list of the activities affected by the revision, a list of any new activities added or deleted, and the difference in dollar value assigned to each activity. For changed Work where the dollar value is disputed, the Design-Build Team shall assign dollar values to its work activities as directed by the Engineer, but shall include the designation "D-C" at the beginning of the activity's description for each activity affected by the change. For changes settled through a Supplemental Agreement, the Design-Build Team shall assign the agreed dollar amount among the new or existing activities, and shall include the designation SA# (where # represents the number of the Supplemental Agreement) at the beginning of the activity's description for each activity affected by the change.

Within 7 days or submittal, the Engineer shall accept or reject proposed revision(s). Upon the Engineer's acceptance, the revised CPM will become the CPM of Record, and will be used from its data date until the data date of the next schedule accepted by the Engineer.

NCTA will not pay additional costs for revisions to the CPM regardless of what condition or change prompted the revision(s). The cost to create, revise, and update the CPM is an administrative requirement included as part of the Contract Lump Sum Price. The Design-Build Team shall allocate sufficient resources to timely administer the schedule as required.

The Engineer will accept revisions that appear to accurately reflect the Design-Build Team's current plan for completing the Work on the Project. The Engineer may accept a revised CPM that indicates the Project is currently expected to finish earlier or later than required by the Contract. However, the Engineer's acceptance of the Design-Build Teams' schedules does not relieve the Design-Build Team from its obligations to perform under the terms of the contract including completion of the Work within the contract time; or as granting, rejecting, or in any way acting on the Design-Build Team's requests for adjustment to the date for completion of the Work.

The Engineer may reject any revision that does not, in the opinion of the Engineer, accurately reflect the Design-Build Team's current plan of construction; the Engineer may reject any revision that requires additional or revised actions on the part of third parties or NCTA; the Engineer may reject a revision that changes the dollar value assigned to an activity, unless the Design-Build Team has correctly allocated this amount into new activities for additional detail; the Engineer may reject any revision that materially alters the projected payout of the Project; and the Engineer may reject any revised CPM submitted more than 7 days after its data date unless the Engineer had previously agreed to waive this requirement.

### G. Use of the CPM of Record to Assess Project Delays

If the Design-Build Team submits a written request for an extension to the contract time in accordance with Article 108-10 of the Project Special Provisions, the Engineer will rely upon the CPM of Record in effect at the time the delay is recognized or occurs, whichever is sooner, to

assess the effects of changes and revisions or other potential causes of delay to the Scheduled Completion Date.

For purposes of calculating and withholding anticipated liquidated damages as identified in Articles 108-8 and 109-4, the Engineer will rely on the Scheduled Completion Date identified in the CPM of Record.

## 108-3 PRECONSTRUCTION AND PREDESIGN 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 10 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 information, purchase orders, and/or invoices to the Turnpike Authority.

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 Turnpike Authority 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.

## 108-4 CONSTRUCTION CONFERENCES

After work on the project has begun, construction conferences shall be held periodically. The construction conferences are to be scheduled at times that are mutually agreeable to both the project superintendent and the Engineer. It shall be the superintendent's responsibility to attend the conferences. The Design-Build Team shall record the proceedings of these conferences and distribute the final minutes of the conferences to all attendees within 10 calendar days of the conference.

## 108-5 CHARACTER OF WORKMEN, METHODS, AND EQUIPMENT

The Design-Build Team shall at all times employ sufficient labor and equipment for prosecuting the several classes of work to full completion in the manner and time required by these specifications.

The Design-Build Team shall not recruit Department or Turnpike Authority employees for employment. Additionally, Turnpike Authority or Department employees who elect to become employed by a Design-Build Team may not perform any function on a project with which they have been involved during employment with the Department or Turnpike Authority without written consent of the State. Any person employed by the Design-Build Team and assigned to a project who has previously been involved in the project as a Department or Turnpike Authority employee shall be, at the written direction of the Engineer, removed from the project. An exception to these terms may be granted when recommended by the Secretary and approved by the Board of Transportation or Turnpike Authority Board.

Failure of the Design-Build Team to comply may be justification for disqualifying the Design-Build Team from further bidding in accordance with the requirements of Article 102-16 and shall be grounds for termination of this contract.

No person shall be employed by the Design-Build Team or by any subcontractor who has been determined by the Engineer to have engaged in fraudulent activities in connection with any work for the Turnpike Authority or the Department of Transportation.

Any person employed by the Design-Build Team or by any subcontractor who, in the opinion of the Engineer, does not perform his work in a proper and skillful manner or is disrespectful, intemperate, or disorderly or who has been determined by the Engineer to have engaged in fraudulent activities in connection with any work for the Turnpike Authority or the Department of Transportation shall be, at the written request of the Engineer, removed forthwith by the Design-Build Team or subcontractor employing such person, and shall not be employed again in any portion of the work without the approval of the Engineer.

Should the Design-Build Team fail to remove such person(s) as required above, the Engineer may suspend the work in accordance with the requirements of Article 108-7.

All equipment which is proposed to be used on the work is to be of sufficient size and in such mechanical condition as to meet the requirements of the work and to produce a satisfactory quality of work. Equipment used on any portion of the project shall be such that no injury to the roadway, adjacent property, or other highways will result from its use. The Engineer may order in writing the removal and replacement of any unsatisfactory equipment.

When the methods and equipment to be used by the Design-Build Team in accomplishing the construction are not prescribed in the contract, the Design-Build Team is free to use any methods or equipment that he demonstrates to the satisfaction of the Engineer will accomplish the contract work in conformity with the requirements of the contract.

When the contract specifies that the construction be performed by the use of certain methods and equipment, such methods and equipment shall be used unless others are approved by the Engineer. If the Design-Build Team desires to use a method or type of equipment other than those specified in the contract, he may request approval from the Engineer to do so. The request shall be in writing and shall include a full description of the methods and equipment proposed to be used and an explanation of the reasons for desiring to make the change. If approval is given it will be on the condition that the Design-Build Team will be fully responsible for producing construction work in conformity with contract requirements. If, after trial use of the substituted methods or equipment, the Engineer determines that the work produced does not meet contract requirements, the Design-Build Team shall discontinue the use of the substitute method or equipment and shall complete the remaining construction with the specified methods and equipment. The Design-Build Team shall remove the unsatisfactory work and replace it with work of specified quality, or take such other corrective action as the Engineer may direct. No change will be made in basis of payment for the construction items involved or in the completion date as a result of authorizing a change in methods or equipment under these provisions.

## 108-6 SUBLETTING OF CONTRACT

The Design-Build Team shall not sublet, sell, transfer, assign, or otherwise dispose of the contract or any portion thereof; or of his right, title, or interest therein; without written consent of the Engineer. In case such consent is given, the sublet work shall be performed by the subcontractor unless otherwise approved in writing by the Engineer. Failure of the Design-Build Team to comply with these Specifications will be just cause for the work to be considered unauthorized in accordance with Article 105-12. A firm that has been disqualified due to its failure to maintain satisfactory progress under the requirements of Article 108-8 will not be approved as a subcontractor until the firm demonstrates the ability to perform the work in a satisfactory manner. When directed by the Engineer, the Design-Build Team shall submit a certified copy of the actual subcontract agreement executed between the Design-Build Team and

subcontractor prior to written consent being issued by the Engineer. In case such consent is given, the Design-Build Team will be permitted to sublet a portion thereof, but shall perform with his own organization, work amounting to not less than 30 percent of the total original contract amount, except:

**(A)** Any items designated in the contract as *specialty items* may be performed by subcontract and the cost of any such special items so performed by subcontract will be deducted from the total amount bid before computing the amount of work required to be performed by the Design-Build Team with his own organization, and

**(B)** Any other items sublet to Disadvantaged Business Enterprise (DBE), Minority Business (MB) or Women's Business (WB), up to the value of the contract DBE, MB or WB goal, will be deducted from the total amount bid before computing the amount of work required to be performed by the Design-Build Team with his own organization.

In any event, the Design-Build Team shall perform with his own organization work amounting to not less than 25% of the difference between the total amount bid and the value of specialty items that have been sublet.

Extra work performed in accordance with Article 104-7 will not be considered in the computation of work required to be performed by the Design-Build Team.

An assignment by operations of law or assignment for the benefit of creditors, or the bankruptcy of the Design-Build Team, shall not vest any right in this contract in the Trustee in bankruptcy, the Design-Build Team's creditors, or the agent of the creditors.

A subcontractor shall not sublet, sell, transfer, assign, or otherwise dispose of his contract with a Design-Build Team or any portion thereof; or of his right, title, or interest therein; without written consent of the Engineer. When directed by the Engineer, the Design-Build Team shall submit a certified copy of the actual subcontract agreement executed between the subcontractor and the second tier subcontractor. In the event of an assignment by operations of law or the bankruptcy of the subcontractor, the Design-Build Team shall have the right, power, and authority, in its discretion, without violating the contract or releasing the Surety, to terminate the subcontract. An assignment by operations of law or assignment for the benefit of creditors or the bankruptcy of the subcontractor shall not vest any right in this contract in the Trustee in bankruptcy, nor the subcontractor's creditors or agents of the creditors.

Neither the Design-Build Team, nor any subcontractor, shall enter into any written or oral equipment lease or rental agreement, materials purchase agreement, and/or labor agreement that circumvents the requirements of this article.

If the Design-Build Team or a subcontractor enter into a lease or rental agreement for equipment based upon payment for a unit of work, such agreement will be considered subletting of the contract unless the lease or rental agreement is with a commercial equipment company, manufacturer, and/or commercial leasing agency and such firm has been approved by the Engineer. An equipment lease or rental agreement that is based upon unit prices per unit of time will not be considered subletting of the contract.

The approval of any subcontract will not release the Design-Build Team of his liability under the contract and bonds, nor will the subcontractor or the second tier subcontractor have any claim against the Department by reason of the approval of the subcontract. The NCTA Chief Engineer will review and consider subcontractor claims for additional time or compensation provided such

claims are submitted by the Design-Build Team in accordance with Article 107-25 and General Statute 136-29.

Failure of the Design-Build Team to comply with any of the requirements of this article may be justification for disqualifying the Design-Build Team from further bidding in accordance with the requirements of Article 102-16.

## 108-7 TEMPORARY SUSPENSION OF THE WORK

The Engineer will have the authority to suspend the work wholly or in part by written order for such periods, as he may deem necessary for any of the following reasons:

**(A)** Conditions considered unfavorable for the suitable prosecution of the work, or

**(B)** The Design-Build Team's failure to correct conditions unsafe for workmen or the general public, or

**(C)** The Design-Build Team has not carried out orders given to him by the Engineer, or

**(D)** The Design-Build Team's failure to perform any provisions of the contract.

No extension of the completion date will be allowed for the above suspensions except as may be provided for in Article 108-10.

## 108-8 FAILURE TO MAINTAIN SATISFACTORY PROGRESS

The Engineer shall utilize the Cost-Loaded Critical Path Method Project Schedule to evaluate the Design-Build Team’s progress at the time each partial pay request and schedule update is submitted. The Design-Build Team’s progress shall be considered behind if, according to the CPM Schedule of Record, the Scheduled Completion Date exceeds the Contract Completion Date. For purposes of calculating and withholding anticipated liquidated damages as identified in Article 109-4, the Engineer will rely on the Scheduled Completion Date identified in the CPM of Record.

The Design-Build Team’s progress will be considered unsatisfactory if the CPM of Record, Scheduled Completion Date falls behind the Contract Completion Date by more than 5% of the Contract Time and anticipated liquidated damages shall be withheld immediately.

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).

When the Design-Build Team cannot satisfactorily justify the unsatisfactory progress, the Engineer may invoke one or more of the following sanctions:

1. Remove the Design-Build Team and individual managing firms of the Design-Build Team and/or prequalified design firms from consideration for future NCTA projects.
2. Notify the Department of Transportation of such action and possibly make recommendation to the Department of Transportation that the Design-Build Team and individual managing firms of the Design-Build Team and/or prequalified design firms be removed from the Department of Transportation’s Prequalified Bidders List, Approved Subcontractors List, and/or the Prequalified List of Private Consulting Firms.

When any of the above sanctions have been invoked, they shall remain in effect until rescinded by the Engineer.

## 108-9 DEFAULT OF CONTRACT

### (A) Declaration of Default

The Department shall have the right to declare default of the contract for breach by the Design-Build Team of any material term or condition of the contract. Material breach by the Design-Build Team shall include, but specifically shall not be limited to failure to begin work under the contract within the time specified; failure to provide workmen, equipment, or materials adequate to perform the work in conformity with the contract by the completion date; unsatisfactory performance of the work; refusal or failure to replace defective work; failure to maintain satisfactory work progress; failure to comply with equal employment opportunity contract requirements; insolvency or bankruptcy, or any act of insolvency or bankruptcy; failure to satisfy any final judgment within 10 calendar days after entry thereof; and making an assignment for benefit of creditors.

### (B) Sanctions

In the event of a breach of the contract by the Design-Build Team, the Department shall have the right, power, and authority, in its sole discretion, without violating the contract or releasing the surety: to assume full control of the prosecution of the contract in the place and stead of the Design-Build Team in directing Design-Build Team's agents, employees, and subcontractors in the performance of the work and in utilizing all materials, tools, machinery, equipment, and structures located on the project; to perform the work or any part thereof with Turnpike Authority personnel and equipment or to utilize any or all materials and equipment located on the project that are suitable and acceptable; to relet the work upon such terms and conditions as the Department shall deem appropriate; to employ any other methods that it may determine are required for completion of the contract in an acceptable manner; and to withhold any sums due the Design-Build Team under the contract without penalty or interest until the work is completed and accepted by the Turnpike Authority.

### (C) Notice

Before invoking any of the sanctions provided for herein, the Department will give the Design-Build Team at least 7 calendar days written notice with a copy to the Surety, that will set forth the breach of contract involved and the sanctions to be imposed. The Department, in its discretion, may grant the Design-Build Team time in excess of 7 calendar days within which to comply with the contract and the time allowed will be set forth in writing. If the Department determines during such period that the Design-Build Team is not proceeding satisfactorily to compliance, it may impose the sanctions after 24 hours notice to the Design-Build Team. If the Turnpike Department determines that the Design-Build Team is not in compliance at the end of the time allowed, it may immediately impose any of the sanctions set forth herein and will advise the Design-Build Team, in writing, with a copy to the Surety of the sanctions imposed.

**(D) Payment**

After declaration of default has been made final, the Design-Build Team will be entitled to receive payment for work satisfactorily completed or portions of work satisfactorily completed, less any sums that may be due the Turnpike Authority from the Design-Build Team but in no event shall payment exceed the contract unit or lump sum price for such work. The Turnpike Authority, at its election, may retain the sum due the Design-Build Team, or any portion thereof, without interest or penalty, until the contract work is completed; or it may make payment to the Design-Build Team upon declaration of default for work satisfactorily completed to the date that notice of default is received by the Design-Build Team. The Design-Build Team may be required by the Engineer, however, to carry to a stage of completion satisfactory to the Engineer any work in progress, the value of which otherwise would be lost by immediate cessation of work. Payment for such work will be made upon the basis hereinafter set out.

In the event that the Design-Build Team's employees, equipment, or materials are used in prosecution of the work, or any part thereof, after default is declared, payment to the Design-Build Team may be by contract unit or lump sum prices for the work performed, or, if the Engineer determines that such prices do not represent the value of the work performed, payment for the type of work or services performed will be made on a force account basis, as set forth in Article 109-3, less any sums that may be due the Turnpike Authority; but in no event shall payment exceed the contract unit or lump sum price for such work or services. Determination of the method of payment shall be in the sole discretion of the Engineer, and he will advise the Design-Build Team, in writing, of his determination with reference to the specific type of work or service to be performed.

If all costs and expenses incurred by the Department arising out of the breach and imposition of sanctions, together with the total cost to the Department of securing the performance of the work set forth in the contract, exceed the sum that would have been payable under the contract, the Design-Build Team and the Surety shall be liable to the Department for such excess and shall pay such amount to the Department.

**(E) Power of Engineer**

The Engineer will exercise the powers and discretion vested in him by the contract in carrying out the terms of this article. He will have full power and authority to carry out any orders, directives, or resolutions issued by the Department in connection with a declaration of default. In the event that the Department fails to specify the sanctions to be imposed, the notice to be given, or the method of completing the work, the Engineer, may, in his discretion, impose such sanctions, give such notice, and select such methods of completing the work, as are authorized by this article; and such actions shall have the same effect and validity as if taken pursuant to an express order, directive, or resolution of the Department.

**(F) Obligation of Design-Build Team and Surety**

No term or terms of this article and no action taken pursuant hereto by the Turnpike Authority or Department, their agents, or employees, will be construed to release or discharge the Design-Build Team or the Surety upon the obligation set forth in the contract bonds, and the Design-Build Team and the Surety shall remain bound thereon unto the Department until the work set forth in the contract has been completed and

accepted by the Turnpike Authority and all obligations of the Design-Build Team and the Surety arising under the contract and contract bond have been discharged.

**(G) Provision Not Exclusive**

The provisions shall be in addition to, and not in place of, any other provisions relating to default, breach of contract, and sanctions to be imposed in connection therewith appearing in the contract.

## 108-10 CONTRACT TIME; INTERMEDIATE CONTRACT TIME

**(A) General**

The contract time will be as defined in Section 101. No extensions to the completion date will be authorized except as allowed by this article. No modifications in the date of availability will be made for any reason whatsoever.

Intermediate contract time, as defined in Section 101 will be that as allowed in the contract to complete a part, portion, or phase of the total work covered in the contract. Intermediate completion dates and intermediate completion times set forth in the contract may be extended on the same basis as completion dates and as described in this article.

When the liquidated damages stipulated in the contract are to be on an hourly basis, extensions as described in this article will be considered on an hourly basis.

The Engineer will rely upon the CPM of Record in effect at the time the delay is recognized or occurs, whichever is earlier, to assess the effects of changes and revisions or other potential causes of delay to the Scheduled Completion Date.

The Engineer will use the CPM and the following guidelines to assess delays to the Project:

1) The controlling operation of the Work is the first activity on the CPM of Record.
2) The Engineer will not grant a time extension for delays that result from schedule revisions of any sort, unless the revisions are necessary to mitigate unforeseeable and otherwise excusable delays, the revisions are required to incorporate changes to the Work agreed to by the Engineer, or the revisions are expressly requested by the Engineer to accommodate NCTA.
3) The Design-Build Team creates the CPM and is responsible for the accuracy and reliability of the CPM. The Engineer will not grant a time extension for delays that result from improper planning, incorrect sequences, scheduling errors, scheduling omissions, missing portions of the Work in the schedule, or any other cause related to the Design-Build Team's failure to properly manage and schedule the Work or the work of others. The Engineer will not consider a request for additional time from the Design-Build Team that relies on the assumption that the CPM of Record was inaccurate or erroneous.
4) When there are two or more causes for a critical delay, or in the case that two paths of activities are concurrently critical, the Engineer will only grant a time extension if all the causes for the critical delay are determined to be excusable.
5) The critical path is dynamic. The Engineer will assess the critical path on each day of an alleged delay. Only delays to the critical path will be eligible for consideration of a time extension.

6) The Engineer will use the CPM of Record in effect at the time of the delay to assess Project delays. The Engineer will not use rejected schedules, later approved schedules, or new schedules, including "impacted" or "collapsed schedules" to assess a delay to the Project.
7) Float belongs to the Project and is shared between the Design-Build Team and NCTA on a first-come, first-served basis until it is depleted.

**(B) Completion Date, Intermediate Completion Date, and Intermediate Completion Time Extensions**

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, consumes all available float, 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. No extension of the completion date, intermediate completion date, or intermediate completion time will be allowed for any reason except as provided for below:

(1) If the Design-Build Team's current controlling operation(s) are delayed by circumstances originating from work required under the contract and beyond his control and without his fault or negligence, he may, at any time prior to payment of the final estimate, make a written request to the Engineer for an extension of the completion date, intermediate completion date, or intermediate completion time. This request shall include:

(a) the circumstances resulting in the alleged delay and documentation of said circumstances as may be required by the Engineer,

(b) the controlling operation(s) alleged to have been delayed,

(c) the calendar dates or calendar dates and times on which the controlling operation(s) were delayed and

(d) the number of calendar days or hours by which he is requesting the completion date, intermediate completion date, or intermediate completion time to be extended.

If the Engineer determines that the controlling operation(s) were delayed because of circumstances beyond the control of and without the fault or negligence of the Design-Build Team, and that the Design-Build Team has pursued the work in accordance with Article 108-1, he will extend the completion date, intermediate completion date, or intermediate completion time unless otherwise precluded by other provisions of the contract. No extension of the completion date, intermediate completion date, or intermediate completion time will be allowed for delays caused by restrictions, limitations or provisions contained in the contract.

Consideration will be given for an extension in the completion date, intermediate completion date, or intermediate completion time involving an intermediate contract time of more than 96 hours if the Design-Build Team's current controlling operation(s) is delayed in excess of 15 percent of the total contract time (days), as

defined in Section 101, the total intermediate contract time (days), as defined in Section 101, or the total intermediate contract time (hours), as defined in Section 101; due to weather or conditions resulting from weather. No other consideration will be given for extensions in the completion date, intermediate completion date, or intermediate completion time due to delays caused by weather.

Where the intermediate contract time is 96 hours or less, no consideration whatsoever will be given for an extension in the intermediate completion time due to weather or conditions resulting from weather.

(2) If changes in the work from that originally contemplated in the contract are ordered by the Engineer and these changes result in reduction in quantities, elimination of items, additional work and/or extra work, the Engineer will allow an extension in the completion date, intermediate completion date, or intermediate completion time as he may deem warranted by such changes. Pursuit of the work with adequate forces and equipment and efficiency of the Design-Build Team's operations will be considered by the Engineer in determining an extension in the completion date, intermediate completion date, or intermediate completion time. It is, however, the Design-Build Team's responsibility to show just cause for an extension in the completion date, intermediate completion date, or intermediate completion time due to the aforesaid conditions.

The Design-Build Team's plea that insufficient contract time (days), intermediate contract time (days), or intermediate contract time (hours) was specified in the contract will not be considered as a valid reason for an extension in the completion date, intermediate completion date, or intermediate completion time.

When all work on the project is totally complete, with the exception of an item or items on which work is precluded by seasonal limitations set forth in the contract, the Engineer may, provided that the Design-Build Team has diligently pursued the work with adequate forces and equipment, waive the assessment of liquidated damages during the period of time from the date all work other than that precluded by seasonal limitations was completed until the date of expiration of the seasonal limitations. The Design-Build Team shall make the request to waive the assessment of liquidated damages in writing prior to the beginning date of the requested waiver. The non-assessment of liquidated damages during the aforesaid period shall not operate to waive any other liquidated damages that may be assessable, or any other terms of the contract.

## 108-11 LIQUIDATED DAMAGES

Time is an essential element of the contract, and that delay in completing the work will result in damages due to public inconvenience, obstruction to traffic, interference with business, and the increasing of engineering, inspection, and administrative costs to the Turnpike Authority. It is therefore agreed that in view of the difficulty of making a precise determination of such damages, a sum of money in the amount stipulated in the contract, will be charged against the Design-Build Team for each calendar day, each hour, or portion thereof that the work, or any portion of the work as described in the contract, remains uncompleted after the expiration of the completion date, intermediate completion date, substantial completion date, or intermediate completion time shown in the contract, not as a penalty but as liquidated damages.

Should the Design-Build Team or, in case of default, the Surety fail to complete the work or any portion of the work by any of the applicable completion dates, intermediate completion

dates, substantial completion date, or intermediate completion times shown in the contract, a deduction of the amount stipulated in the contract as liquidated damages will be made for each and every calendar day, for each and every hour, or portion thereof that the work or any portion of the work remains uncompleted after the expiration of any completion date, substantial completion date, intermediate completion date, or intermediate completion time applicable to the uncompleted work. This amount will be deducted from any money due the Design-Build Team or his Surety under the contract, and the Design-Build Team and his Surety will be liable for any liquidated damages in excess of the amount due.

In the event that the contract establishes one or more intermediate completion dates and/or one or more intermediate completion times and/or substantial completion date in addition to the completion date, each of the liquidated damages stipulated will be considered to be cumulative to any other liquidated damages stipulated.

In case of default of the contract and the completion of the work by the Department, the Design-Build Team and his Surety will be liable for the liquidated damages under the contract, but no liquidated damages will be chargeable for any delay in the final completion of the work by the Department due to any action, negligence, omission, or delay of the Department.

In any suit for the collection of or involving the assessment of liquidated damages, the reasonableness of the amount stipulated in the contract will be presumed. The liquidated damages referred to herein are intended to be and are cumulative, and will be in addition to every other remedy now or hereafter enforceable at law, in equity, by statute, or under the contract.

Permitting the Design-Build Team to continue and finish the work or any part thereof after the expiration of the completion date, intermediate completion date, substantial completion date, or intermediate completion time shall in no way operate as a waiver on the part of the Department of any of its rights under this contract.

## 108-12 EXTENSION OF CONTRACT TIME AND APPORTIONMENT OF LIQUIDATED DAMAGES

In accordance with Articles 108-10 and 108-11, when a contract is not completed by the completion date, intermediate completion date, substantial completion date, or intermediate completion time, the Design-Build Team shall be entitled to an extension of the completion date, substantial completion date, intermediate completion date, or intermediate completion time and apportionment and remittance of liquidated damages to the extent that the failure to complete was due to the conditions set forth in Article 108-10. The Design-Build Team, however, shall be entitled to an extension of the completion date, intermediate completion date, substantial completion date, or intermediate completion time, or an apportionment and remittance of liquidated damages only to the extent and in the proportion that such delays were caused by the conditions set forth in Article 108-10, and it is understood that any extension granted shall not operate to waive any liquidated damages or any claim which the Department has or may have against the Design-Build Team by reason of failure of the Design-Build Team to complete the said contract by the completion date, intermediate completion date, substantial completion date, or intermediate completion time specified therein or as revised by authorized extensions.

## 108-13 TERMINATION OF CONTRACT

The Board of Transportation may terminate the contract in accordance with the following:

**(A)** Consideration will be given to termination of the contract if any of the following circumstances exist:

(1) If it is impossible for the Design-Build Team to obtain critical materials for completion of the contract within a practical time limit, or

(2) If it is impossible for the Design-Build Team to complete the work in accordance with the contract by reason of unanticipated conditions at the site, including slides and unstable subsoil, without a major change in the design of the project and the Design-Build Team will be unduly delayed in completing the project by reason of such unanticipated conditions and changes in design, or

(3) If the Design-Build Team is prevented from proceeding with the contract as a direct result of an Executive Order of the President with respect to the prosecution of war or in the interest of national defense, or(4) If the Design-Build Team is prevented from proceeding with the work required by the contract as a direct result of a restraining order, or other court order, or by reason of a permit requirement, and the Design-Build Team will be unduly delayed in completing the project by reason of such order or requirement, or

(5) If the Design-Build Team is prevented from proceeding with the work due to the unavailability of the site.

**(B)** The Design-Build Team shall determine when the circumstances in item (A) exist and are beyond his control, and shall notify the Turnpike Authority in writing of his determination and include adequate documentation of these circumstances along with such notification.

**(C)** The Contract will be terminated under this article if:

(1) Request by Design-Build Team

(a) The Board of Transportation concurs in the determination by the Design-Build Team of the circumstances or makes an independent determination that such circumstances herein above indicated exist, and

(b) The Board of Transportation determines that such circumstances are beyond the control of the Design-Build Team, and the Design-Build Team was not at fault in creating the circumstances, and

(c) The Board of Transportation determines that a termination of the contract is in the best public interest, or

(2) Authority of the Board of Transportation:

The Board of Transportation determines that a termination of the contract is in the best public interest.

**(D)** The Design-Build Team will be notified in writing by the NCTA Chief Engineer of the action of the Board of Transportation.

**(E)** After a contract is terminated in accordance with this termination provision, the following provisions shall be applicable:

(1) When the contract is terminated before completion of all items of work in the contract, payment will be made for the actual number of acceptably completed items of work or acceptably completed portions thereof at the contract unit or lump sum prices. When the contract is terminated before completion of all items of work in the contract and items of work are partially completed or not begun, payment will be made in accordance with Article 104-6.(2) Upon request from the Design-Build Team, materials meeting the requirements of the contract that were to have been incorporated into the work or were to remain the property of the Department or the Turnpike Authority but are not used in the work will be paid for in accordance with Article 109-6.

(3) No claim for loss of anticipated profits will be considered and no payment will be made for loss of anticipated profits.

(3) Termination of a contract shall not relieve the Design-Build Team of his responsibilities for any completed portion of the work nor shall it relieve his Surety, of its obligation for and concerning any just claims arising out of the work performed.

## 108-14 TERMINATION OF DESIGN-BUILD TEAM'S RESPONSIBILITY

After the project has been completed and accepted, as provided for in Article 105-17, the Design-Build Team's responsibility will cease except as provided in Article 107-21 and as set forth in his contract bonds. The Design-Build Team shall remain responsible for any amounts determined to be owed the Turnpike Authority in the processing of the final estimate and such amounts shall be paid by the Design-Build Team upon notification by the Turnpike Authority prior to processing of the final estimate.

# SECTION 109
# MEASUREMENT AND PAYMENT

## 109-1 MEASUREMENT OF QUANTITIES

All work completed under the contract will be measured by the Engineer according to United States standard measures unless otherwise stated in the contract.

The method of measurement and computations used in the determination of quantities of material furnished and of work performed under the contract will be those methods generally recognized as conforming to accepted engineering practice.

The terms *gauge* and *thickness*, when used in connection with the measurement of plates, sheets, and steel wire, shall be applied as follows:

| | |
|---|---|
| Uncoated Steel Sheets and Light Plates | United States Standard Gage |
| Galvanized Sheets | AASHTO M218 or M167 |
| Aluminum Sheets | AASHTO M196 or M197 |
| Steel Wire | AASHTO M32 |

The term ton will mean short ton (mass) consisting of 2,000 pounds.

Cement will be measured by the barrel unless otherwise indicated elsewhere in the contract. The term *barrel* will mean 376 pounds of cement.

Trucks used to haul material being paid for by weight will be either weighed empty prior to each loading or weighed empty on a daily basis. When trucks are weighed empty on a daily basis, each truck shall be weighed prior to hauling its first load of the day and shall bear a legible identification mark.

Where aggregates that are to be paid for by weight have been stockpiled after being produced, measurement for purposes of payment will be made after the aggregates have been loaded on trucks for direct delivery to the project.

When a complete structure or structural unit, as may be indicated by the unit, *lump sum* or *each*, is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.

When standard manufactured items are specified, and these items are identified by gage, unit weight, section dimensions, and/or other dimensions, such identification will be considered to be nominal weights or dimensions. Unless more stringently controlled by tolerances in cited specifications, manufacturing tolerances established by the industries involved will be accepted.

## 109-2 SCOPE OF PAYMENT

The Design-Build Team shall receive and accept payment provided for in the contract as full payment for furnishing all materials and performing all work under the contract in a complete and acceptable manner and for all risk, loss, damage, or expense of whatever character arising out of the nature of the work or the prosecution thereof, subject to the requirements of Article 107-21. 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.

If the *Measurement and Payment* clause in the specifications relating to any unit price or lump sum price in the bid schedule requires that the said unit price or lump sum price cover and be considered compensation for certain work or material essential to the item, this same work or material will not also be measured or paid for under any other pay item that may appear elsewhere in the contract.

## 109-3 FORCE ACCOUNT WORK

All force account work shall be performed as directed by the Engineer including the numbers and types of equipment, the numbers and classifications of labor and foremen, and material requirements.

The Engineer may adjust the Contract Lump Sum Amount bid for the entire project for Work which is reduced or eliminated as a direct result of the force account work. Such adjustments will be made in accordance with the provisions herein.

All work to be paid for on a force account basis shall be paid for in the following manner:

**(A)** **Labor** For all authorized labor and foremen in direct charge of the specific operations, the Design-Build Team will receive the rate of base (actual) wages (or scale) actually being paid by the Design-Build Team for each hour that the labor and foremen are actually engaged in the specific force account work.

In addition to reimbursement for each hour that the labor and foremen are actually engaged in the specific force account work, the Design-Build Team may receive compensation for travel time to and from the project if and only if the labor and foremen needed are outside a 75 mile radius as included in Subarticle 109-3(B). The base location will be established and approved by the Engineer prior to performing the specific force account work. If the approved labor and foremen travel to another project upon completion of the specific force account work, payment for travel time may not exceed the travel time that would have been required to return to the point of origin in accordance with Subarticle 109-3(B). When travel time is approved by the Engineer, it shall be included in the total hours approved and worked for that specific week. The Engineer will approve the mode of travel.

Prior to beginning the specific force account work, the Design-Build Team will submit in writing for the Engineer's approval a list of all wage rates applicable to the work. Approval will not be granted where these wage rates are not actually representative of wages being paid elsewhere on the project for comparable classes of labor performing similar work.

Payment for overtime will be allowed when approved by the Engineer prior to performing the specific force account work. Overtime for labor and foremen will be paid based on the company's policy for overtime payment. Verification of such payment will be tracked by submission of weekly payrolls as required on federal projects and as requested on all other projects. Failure to submit payrolls as required or requested shall act as a bar to the Design-Build Team for payment of overtime for labor and foremen. If the labor or foremen is employed partly on specific force account work and partly on other work, the amount of overtime to be reimbursed will be prorated based upon the number of hours worked on the specific force account work during the payroll period.

An additive amount equal to the Design-Build Team's actual labor burden rate, up to a maximum of 60 percent, will be paid to the Design-Build Team for all base (actual) wages paid to labor and foremen for the specific force account work. No additive will be provided for overtime payments. The labor burden rate(s) will include costs associated with the employee's actual base wages benefits, including FICA, unemployment contributions, Social Security and Medicare taxes and company fringe benefits. Company fringe benefits are the actual costs paid to, or on behalf of, workers by reason of health and welfare benefits, pension fund benefits, or other benefits, when such amounts are required by prevailing wage laws generally applicable to the classes of labor employed on the work. The Design-Build Team's actual labor burden rate(s) will be submitted to and approved by the Engineer prior to beginning the work. When the Design-Build Team cannot verify actual labor burden rate(s), an amount equal to 35% percent of the total base (actual) wage paid for labor and foremen will be added to the total base wages paid to the Design-Build Team. These percentage additives will be full compensation for overhead, benefits, contingencies, and all other costs associated with labor for the specific force account work.

**(B)** **Subsistence and Travel Allowances** The Design-Build Team may receive payment for actual costs paid to, or on behalf of, labor and foremen by reason of subsistence and travel allowances under certain circumstances. When the Design-Build Team is required to mobilize a crew for specific operations, the Engineer may approve reimbursement of

subsistence, including meals and overnight lodging, if the specific force account work is determined to be outside of the scope of the original contract and the distance from the Design-Build Team's base location to the project is more than 75 miles. Should the Design-Build Team utilize forces currently working at the location of the specific force account work, the Engineer may approve the payment of subsistence, including meals and overnight lodging, if the work is determined to be outside of the scope of the original contract, the forces currently working at the location have routinely stayed overnight during the life of the project, and the distance from the Design-Build Team's base location to the project is more than 75 miles. The Engineer will approve the mode of travel.

Payment will be made to the Design-Build Team for subsistence, including meals and overnight lodging, paid in accordance with the Design-Build Team's usual policy for authorized labor and foremen in direct charge of the specific operations. Subsistence will be limited to the lesser of actual amount paid or the current maximum in-state rate for State employees. Verification of such costs paid to, or on behalf of, labor and foremen will be submitted to the Engineer. If the labor or foremen are partly employed on specific force account work and partly on other work, the amount of subsistence to be reimbursed will be prorated based upon the number of hours worked on the specific force account work during the payroll period.

**(C)** **Materials** For materials authorized and accepted by the Engineer and used, the Design-Build Team will receive the actual cost of such materials, including sales tax and transportation charges paid by him (exclusive of equipment rentals as hereinafter set forth), to which costs 15% will be added. The Design-Build Team will furnish records to the Engineer to verify the quantities of materials used in the specific force account work, prices of the materials, sales tax, and costs of transportation for the materials.

If materials used in the specific force account work are not specifically purchased for such work but are taken from the Design-Build Team's stock, the Design-Build Team will furnish an affidavit certifying that such materials were taken from his stock, the quantity was actually used in the specific force account work, and the price and transportation cost claimed represent the actual cost to the Design-Build Team.

**(D)** **Equipment** For all equipment authorized by the Engineer to be used on the specific force account work the Design-Build Team will receive rental payment.

Hourly rental rates paid for equipment in use, which is Design-Build Team owned or rented from another Contractor, will not exceed 1/176th of the monthly rate listed in the *Rental Rate Blue Book for Construction Equipment* that is current at the time the specific force account work is performed.

In determining the hourly rate, the regional adjustment factor and the rate adjustment factor for equipment age, as set forth in the current Blue Book, will both be applied to the basic rate. An additive payment equal to 100% percent of the Blue Book estimated operating cost per hour will also be paid for all hours that equipment is in use. This additive payment will be full compensation for fuel, lubricants, repairs, servicing (greasing, fueling, and oiling), small tools, and other incidentals.

If rental rates for the equipment actually being used in the work are not listed in the Blue Book, the Design-Build Team will receive the prevailing rental rates being paid for such

equipment in the area where the project is located. An additive payment equal to 15 percent of the prevailing rental rate will also be paid for all hours equipment is in use. This additive payment will be full compensation for fuel, lubricants, repairs, servicing (greasing, fueling, and oiling), small tools, and other incidentals.

Hourly rental rates for equipment held in ready as directed by the Engineer will be 50 percent of the rate paid for equipment in use. An additive payment will not be made for equipment held in ready. When equipment is in use less than 40 hours for any given week and is held in ready as directed by the Engineer, payment for held in ready time will be allowed for up to 40 hours, less hours in use. When payment is made for equipment held in ready as directed by the Engineer, the payment for held in ready time will be allowed for up to 8 hours in a day less hours in use.

Hourly rental rates for idle equipment that is held in ready in accordance with Article 104-4 will be paid at 50 percent of the rate paid for equipment in use. Hourly rental rates for idle equipment held in ready in accordance with Article 104-4 that is rented from a commercial rental agency will be paid for in accordance with the invoice rate for the equipment. An additive payment will not be made for idle equipment. When equipment is in use less than 40 hours for any given week and is held in ready as idle equipment in accordance with Article 104-4, payment for idle equipment time will be allowed for up to 40 hours, less hours in use. When payment is made for idle equipment held in ready in accordance with Article 104-4, the payment for idle equipment time held in ready will be allowed for up to 8 hours in a day less hours in use.

In the event the Design-Build Team does not possess or have readily available such equipment necessary for the performance of the work and such equipment is rented from a commercial rental agency, the Design-Build Team will receive payment based on the approved invoice rate for the equipment.

An additive payment equal to 15 percent of the calculated hourly invoice rate will also be paid for all hours equipment is in use. This additive payment will be full compensation for fuel, lubricants, repairs, servicing (greasing, fueling and oiling), small tools, and other incidentals. The commercial rental agency cannot be the Design-Build Team or an affiliate of the Design-Build Team.

No compensation will be made for the use of equipment not authorized by the Engineer.

The Design-Build Team will be reimbursed for the actual transportation costs for equipment which the Design-Build Team is directed to furnish. Such payment will be limited to transportation costs from the nearest source of available equipment. If equipment is not returned to the point of origin, but is transported to another location, transportation costs will not exceed the cost of return to the point of origin. Rental for such equipment will not be paid when the equipment is being transported. The Design-Build Team will furnish records to the Engineer to verify the actual transportation costs for equipment.

The Design-Build Team will provide to the Engineer for approval a listing of all equipment and attachments to be utilized in the prosecution of the work. The list will include the manufacturer's name, type, model, serial number, and year of manufacture. The list will also include the invoice rate for equipment rented from a commercial rental agency. It will be the Design-Build Team's responsibility to verify the age of the equipment in a manner acceptable to the Engineer. Where such verification is not

available, the rate adjustment factor used will be for the oldest equipment listed in the Blue Book.

The above prices and payments will be full compensation for fuel, lubricants, cutting edges, all repairs, and all other operating and maintenance costs other than operator's wages.

**(E)** **Owner-Operated Equipment** For all owner-operated equipment authorized by the Engineer to be used on the specific force account work, the Design-Build Team will receive rental payment equal to the existing contract rate(s) with no additive as provided in Subarticles 109-3(A), 109-3(B), 109-3(D) and 109-3(H). When existing contract rate(s) have not been established, the Design-Build Team will submit the proposed rate(s) for the owner-operated equipment with sufficient documentation as deemed necessary by the engineer for approval.

For fully maintained and operated trucks used for the specific force account work, the Design-Build Team will receive rental payment equal to the existing contract rate(s) with no additive as provided in Subarticles 109-3(A), 109-3(B), 109-3(D) and 109-3(H). When existing contract rate(s) have not been established, the prevailing industry rate(s) for fully maintained and operated trucks will be used for the specific force account work with approval of the Engineer.

For the purposes of force account work, owner-operated equipment, including fully maintained and operated trucks, will be considered subcontractors. No additional additives other than those allowed under Subarticle 109-3(G) will be allowed.

**(F)** **Miscellaneous** No additional allowance will be made for general superintendence, the use of manually powered tools, or other costs for which no specific allowance is herein provided.

**(G)** **Subcontracting** For administrative costs of the Design-Build Team in connection with approved subcontract work at any level and the use of owner-operated equipment at any level, the Design-Build Team will receive an additive amount in accordance with the rate schedule shown below of the total cost of such subcontracted work. The total cost of such subcontracted work will include applicable labor and additive, bond and insurance, materials, and equipment costs incurred by the subcontractor; overhead and profit computed in accordance with Subarticles 109-3(A) through 109-3(D), 109-3(F), 109-3(H) and 109-3(I); and costs for owner-operated equipment, including fully maintained and operated trucks in accordance with Subarticle 109-3(E). No additional additives will be allowed.

| Total Cost of Subcontract Work | Rate Schedule |
|---|---|
| $0 - $10,000 | 10% |
| Above $10,000 | $1,000 + 5% Above $10,000 |

**(H)** **Overhead and Profit** An additive payment equal to 10 percent of the specific force account total will be paid to the Design-Build Team. This specific force account total is exclusive of the portion of the work included with Subarticles 109-3(C) Materials, 109-3(E) Owner-Operated Equipment and 109-3(G) Subcontracting. This payment will be full compensation for all costs including but not limited to home

office and field overhead, burdens, and profit associated with the specific force account work.

An additive payment equal to 10 percent of the specific force account total for approved subcontract work will also be paid to the subcontractor for overhead and profit. This specific force account total for subcontract work is exclusive of the portion of the work included with Subarticles 109-3(C) Materials and 109-3(E) Owner-Operated Equipment. This payment will be full compensation for all costs including but not limited to home office and field overhead, burdens, and profit associated with the specific force account subcontracted work. No additional additives will be allowed.

**(I)** **Bond and Insurance** For property damage and liability insurance premiums and bond premiums on the specific force account work the Design-Build Team will receive the actual cost. The Design-Build Team will furnish satisfactory evidence to the Engineer of the rate or rates paid for such insurance and bond.

An annualized composite percentage may be used to determine the cost for bond and insurance. Insurance costs will be limited to the direct costs associated with the specific force account work. The Design-Build Team will furnish satisfactory evidence to the Engineer of the annualized composite percentage for the bond and insurance.

**(J)** **General** The Engineer will maintain the payment records of work performed on a force account basis. The Design-Build Team will compare records of work with the Engineer at the end of each day on which such work is in progress.

Any contention the Design-Build Team may have for an extension in the completion date, intermediate completion date, or intermediate completion time, due to performance of specific force account work will be considered as provided in Article 108-10.

## 109-4 PARTIAL PAYMENTS

### (A) General

The Turnpike Authority will make partial payments based upon the Engineer's review of the Design-Build Team's payment requests. The Design-Build Team will prepare a payment request at least once each month on the date established by the Engineer. If in the judgment of the Engineer the amount of work performed is sufficient to warrant, the Engineer may accept from the Design-Build Team payment requests twice each month. The Turnpike Authority will not make a partial payment when the total value of work performed since the last partial payment, excluding mobilization, amounts to less than $10,000.00.

The Engineer may correct partial payments at any time prior to final payment. This will include corrections to the progress of the Work and the amount of the partial payment. The Engineer's adjustments on partial payments are final.

The Design-Build team shall use the most recent accepted cost-loaded CPM to estimate the value of the work performed and will submit this estimate as its payment request to the Engineer. The Design-Build Team shall submit the estimate of the value of the Work performed and the updated cost-loaded Schedule for each partial payment request. Failure to submit either part of the partial payment request will result in the Engineer withholding payment. With each payment request, the Design-Build Team shall certify that it has reviewed the cost-loaded CPM, that the payment request presents an accurate

assessment of the level of completion of each work activity for which payment is being sought, and that the dollar value assigned to each work activity is reasonable and consistent with the dollar values assigned to all other work activities.. The Engineer will only accept payment requests that have been certified by the Design-Build Team.

The Design-Build Team will maintain and update the cost-loaded CPM as further described in Article 108-2 of this Special Provision.

If an Interim Schedule was submitted in accordance with Article 102-2 this Schedule was accepted by the Engineer, the Design-Build Team may estimate the value of the work performed using the Interim Schedule for the first 90 days after the Notice of Proceed. After 90 days, the Engineer will not process partial payment requests until the Design-Build Team develops a cost-loaded, initial CPM and the Engineer accepts this schedule.

If the Design Build Team did not submit an Interim Schedule acceptable to the Engineer, NCTA will issue payments for the mobilization costs (reference Article 800-2 of the Standard Specifications and the Project Special Provision, Mobilization), but will not otherwise process partial payment requests until the Design-Build Team submits an cost-loaded, Initial CPM and this CPM is accepted by the Engineer. The Design-Build Team's failure to develop an acceptable, cost-loaded Initial CPM may result in the Engineer withholding payment.

The Engineer will withhold from the partial payments amounts sufficient to cover any anticipated liquidated damages as determined by the Engineer as provided in Articles 108-8 and 109-4.

NCTA will not pay interest to the Design-Build Team on payments that are withheld in accordance with the requirements of this Special Provision or any other provision of the contract. The Design-Build Team is not entitled to payment, damages, or any other form of compensation due to the withholding of partial payments in accordance with the requirements of this Special Provision or any other provision of the contract.

## (B) Prompt Payments

The Design-Build Team and Contractors at all levels, prime, subcontractor, or second tier subcontractor shall within seven calendar days of receipt of monies, resulting from the satisfactory completion of work performed, pay subcontractors, second tier subcontractors, or material suppliers. This seven-day period begins upon knowledgeable receipt by the contracting firm obligated to make a subsequent periodic or final payment. This prompt payment requirement will be met if each firm mails the payment to the next level firm by evidence of postmark within the seven-day period. For the purposes of this section, the satisfactory completion of work performed shall exist when a subcontractor, second tier subcontractor or material supplier completes tasks called for in the subcontract and are in conformance with the terms of the Contract as required by the Turnpike Authority. This specification for prompt payment shall be incorporated into each subcontract or second tier subcontract issued for work performed on the project or for services provided.

The Design-Build Team shall not withhold any payments to a subcontractor, second tier subcontractor or material supplier for any claim or action arising outside the current

contract with the Department. Notwithstanding the provisions of this section, the Design-Build Team may withhold up to 3% retainage if any subcontractor does not obtain a payment and performance bond for their portion of the work. If any retainage is held on subcontractors, all retainage shall be released within seven calendar days of satisfactory completion of all work. For the purpose of release of retainage, satisfactory completion is defined as completion of all physical elements and corresponding documentation as defined in the contract, as well as agreement between the parties as to the final quantities for all work performed in the subcontract. The Turnpike Authority will provide internal controls to expedite the determination and processing of the final quantities for the satisfactorily completed subcontract portions of the project.

Failure of any entity to make prompt payment as defined herein may result in the Department (1) withholding money from the Design-Build Team due for work performed by that entity in the next partial payment until the necessary assurances are made consistent with this specification; (2) removing the Design-Build Team and affiliated companies from consideration for future Turnpike Authority projects; or (3) a removal of the contractor from the Department's prequalified bidders list or the Department's approved subcontractors list.

**(C) Unbalanced Bids**

Any excess monies included in an unbalanced bid price that the Turnpike Authority determines to be in excess of a reasonable unit or lump sum bid price for the work, shall be retained by the Turnpike Authority until the last partial payment estimate, at which time these funds will be paid to the Design-Build Team. These retained funds will not be eligible for deposit in any trust account established pursuant to this contract nor for interest for such delay in the payment for the retained portion of the bid price. Partial payment for work performed on an unbalanced bid item shall be at the reasonable unit or lump sum price determined in accordance with this subarticle.

For purposes of this subarticle, a reasonable unit or lump sum price will be deemed to be the average of the Engineer's Estimate and the individual balanced bid prices received from the other bidders for the item in question.

## 109-5 PAYMENT FOR MATERIAL TO BE USED IN THE WORK.

**(A) Material Delivered on the Project**

When so authorized by the Engineer, partial payments will be made up to 95 percent of the delivered cost of materials on hand that are to be incorporated in the work, provided that such materials have been delivered on or in close proximity to the project and stored in an acceptable manner. Material payments will be allowed when 95 percent of the accumulated costs of unpaid invoices are equal to or greater than $10,000.00, materials have been inspected and approved by the Engineer, and the documents listed in Subarticle 109-5(C) have been furnished to the Engineer.

**(B) Material Stored at Fabricator's Facilities or Design-Build Team's Facilities**

When so authorized by the Engineer, partial payments will be made up to 95 percent of the invoiced cost, exclusive of delivery cost, for bulky materials requiring fabrication at an off site location that are durable in nature and represent a significant portion of the

project cost, if it has been determined by the Engineer, that the material cannot be reasonably stockpiled in the vicinity of the work. Material payments will be allowed when the materials have been inspected and approved by the Engineer and the documents listed in Subarticle 109-5(C) have been furnished to the Engineer.

**(C) Required Documents**

(1) Written consent of surety to make such partial payments,

(2) Bill of Sale from the Design-Build Team to the Turnpike Authority,

(3) Copy of invoice from material supplier verifying the cost of the material.

**(D) General Requirements**

The partial payments will be made on the conditional basis that the material meets the requirements of the contract and will be incorporated into the project. The Design-Build Team shall reimburse the Turnpike Authority for all partial payments for material paid for, but not incorporated into the project.

Partial payments for materials on hand will not constitute acceptance, and any faulty material will be rejected even though previous payment may have been made for same in the estimates.

Partial payment will not be made for fuel, supplies, form lumber, falsework, or used materials.

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 Turnpike Authority.

## 109-6 PAYMENT FOR LEFTOVER MATERIALS

Payment will be made to the Design-Build Team for materials meeting the requirements of the contract which were to have been permanently incorporated into the work or were to remain the property of the Department or Turnpike Authority but due to revisions or elimination of items of work by the Engineer, due to discrepancies in the contract, or due to termination of the contract are not used in the work. The Design-Build Team upon request will be reimbursed for the verified actual cost of such material delivered to a site designated by the Engineer, including any handling charges less any discount, but in no event shall payment exceed that which would have been made at the contract unit or lump sum price for the completed work.

The Design-Build Team shall furnish invoices and cost records to the Engineer to verify the actual cost of materials, handling charges, discounts that were taken, and transportation charges. No percentage additive will be added to the verified cost of such material.

No payment will be made for loss of anticipated profits and no other payment will be made for leftover materials except as listed above.

## 109-7 COMPENSATION PAID AT CONTRACT PRICES

Except as provided for by this article, payment for work performed will be made at the contract unit price or the contract lump sum price. Payment shall be made at the adjusted contract unit price, as applicable, when a price adjustment or pay factor is provided for by the contract or as determined by the Engineer in accordance with Article 105-3. In addition to the compensation made at the unit or lump sum price, adjustment in compensation will be made in accordance with Article 109-8. The Design-Build Team shall not be paid for any work performed for which there is not a contract price, nor shall the Design-Build Team receive additional compensation over and above the contract price for work performed or for extra work performed, except for work performed pursuant to an executed supplemental agreement or work performed in accordance with the applicable requirements of Section 104.

## 109-8 FUEL PRICE ADJUSTMENTS

Fuel price adjustments will be made to the payments due the Design-Build Team for contract items specified in the contract, or for extra work item specified in the supplemental agreement, when the average terminal price has fluctuated from the Base Index Price contained in the contract. The average terminal price is the average of the F.O.B. price for diesel fuel at the terminals in Charlotte, Wilmington and Selma, North Carolina. When the average terminal price fluctuates upward or downward from the Base Index Price, an amount will be added to or deducted from the monies due the Design-Build Team as follows.

The current quantity for the specified contract items for which partial payment is made will be multiplied by the respective Diesel Fuel Usage Factor contained in the contract to determine the theoretical diesel fuel usage for each specified contract item. The sum of the theoretical diesel fuel usage for all specified contract items will be multiplied by the algebraic difference between the average F.O.B. price for diesel fuel at the above specified terminals and the Base Index Price contained in the contract to determine the fuel price adjustment to be made on the partial payment estimate.

The following formula will be used to calculate the appropriate payment or credit on the estimate.

$$S = (A - B)(\Sigma QF)$$

Where:

S= Fuel Price Adjustment for partial payment
B= Base Index Price
A= Average terminal price
Q= Partial payment quantity for contract item
F= Fuel factor for contract item

The average terminal price in effect on the first day of the month in which the partial payment period ends will be used to make payment adjustments for fuel whether or not more than one price fluctuation has occurred within a single partial payment period.

The Engineer's estimate of quantities for contract items measured by cross sections shall be utilized on the various partial payment estimates to determine fuel price adjustments. When the

Engineer determines after payment for all or a portion of such contract item that is subject to a fuel price adjustment that the total quantity of work paid to date will be adjusted to reflect more accurate quantity determinations, the Engineer will make a pro rata increase or decrease in the fuel price adjustment proportionate to the adjustment in the total quantity of work paid. The prorated fuel price adjustment for the contract item will be determined by multiplying the cumulative fuel price adjustment made for that contract item for the previous estimate period(s) by the adjusted quantity for that contract item and divided by the total quantity of work paid for the previous estimates for the contract item. Payment for the prorated fuel price adjustment will be made accordingly on the partial payment estimate that includes the adjustment in the quantity of work paid.

## 109-9 FINAL PAYMENT

Upon completion of the final estimate assembly, the Engineer will notify the Design-Build Team giving the final quantities and the apparent liquidated damages, if any are assessed. After the Design-Build Team reviews the final quantities and submits the documents listed in Article 109-10, the entire sum found to be due after deducting all previous payments and all amounts to be retained or deducted under the requirements of the contract will be paid the Design-Build Team.

## 109-10 DOCUMENTS REQUIRED FOR THE PROCESSING OF THE FINAL ESTIMATE

Submit the following documents to the Engineer within 120 days after the contract Final Acceptance Date, as defined in Article 101-3. Failure to submit Item C, the final claim information, within the 120 days after the Final Acceptance Date, shall be a bar to recovery for any extension in the completion date or any adjustment in compensation from that shown in the final estimate.

**(A)** Statement of Consent of Surety on the contract bonds for payment of money due the Design-Build Team.

**(B)** Affidavit of the Design-Build Team that all obligations and debts arising out of the construction have been satisfied, or affidavit which shall include a list of obligations not satisfied.

**(C)** Written notice that the Design-Build Team has no request for any extension in the completion date or any adjustment in compensation from that shown in the final estimate or in lieu thereof written notice presenting all request for adjustment of the final estimate setting forth full justification for such requests.

**(D)** As-constructed plans or other submittals as required by the Contract.

**(E)** Documents or guarantees to support any warranty provided by the Design Build Team.

Submission of false information in the documents required by this section shall be a basis for disqualifying the Design-Build Team from further bidding on both Turnpike Authority and Department projects in accordance with Article 102-16.

## 109-11 INTEREST ON FINAL PAYMENT

Should final payment on a project not be made within 120 calendar days after the project final acceptance date, interest, at the average rate earned by the State Treasurer on the investment within the State's Short Term Investment Fund during the month preceding the date interest becomes payable, will be paid the Design-Build Team on the final payment for the period beginning on the 121st day after final acceptance and extending to the date the final estimate is paid, provided that the documents required by Article 109-10 have been submitted within 30 days of the mailing of the notification outlined in Article 109-9. In the event the Design-Build Team fails to submit the required documents within the stipulated 30 day period, and the final estimate is not paid until 120 calendar days following final acceptance of the project, the number of days on which interest accrues will be reduced by the number of days in excess of 30 that the Design-Build Team requires to submit the document(s).

# SECTION 150

# MAINTENANCE OF TRAFFIC

## 150-1 GENERAL

The Design-Build Team will be required to maintain traffic within the limits of the project, including all existing roadways that cross or intersect the project, unless otherwise provided in the contract or approved by the Engineer. Traffic shall be maintained from the time the Design-Build Team begins work on the project site until acceptance of the project, including any periods during which the Design-Build Team's operations are suspended, unless otherwise provided for in the contract or approved by the Engineer. The Design-Build Team shall conduct his work in a safe manner that will create a minimum amount of inconvenience to traffic.

The Design-Build Team shall be responsible for maintaining in a safe, passable, and convenient condition, such part or parts of existing roads as are being used by him to maintain traffic within the limits of the project from the time the Design-Build Team begins work on the project until acceptance of the project. As an exception to the above, the Turnpike Authority and the Department will be responsible for the removal of ice and snow from all portions of the project open to traffic.

Whenever it is necessary to use traffic control devices as shown in the contract, as determined by the Engineer, or in order to conform to the requirements of this section, the work of furnishing, erecting, operating, maintaining, covering, relocating, and removing traffic control devices shall be in accordance with the requirements of Division 11 & 12.

# ITEMIZED PROPOSAL FOR CONTRACT No. C 202587

**Jun 08, 2010 3:01 pm** 

**County: Union, Mecklenburg**

| Line # | Item Number # | Sec # | Description | Quantity | Unit Cost | Amount |
|---|---|---|---|---|---|---|
| | | | **ROADWAY ITEMS** | | | |
| 0001 | 0000900000-N | SP | GENERIC MISCELLANEOUS ITEM DESIGN, CONSTRUCTION & INSPECTION | Lump Sum | L.S. | |

**1501/Jun08/Q1.0/D 900000 /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 |
| Aggregate Base Course<br>Aggregate for Cement Treated Base Course<br>Portland Cement for Cement Treated Base Course | Gal / Ton | 0.55 | _____ Tons |
| Asphalt Concrete Base Course<br>Asphalt Concrete Intermediate Course<br>Asphalt Concrete Surface Course<br>Open-Graded Asphalt Friction Course<br>Sand Asphalt Surface Course, Type F-1 | Gal / Ton | 2.90 | _____ Tons |
| Portland Cement Concrete Pavement<br>Structural Concrete (cast-in-place only)<br>Concrete Shoulders Adjacent to Pavement | Gal / CY | 0.98 | _____ CY |

☐ 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 Cost Proposal.)*

# LISTING OF DBE SUBCONTRACTORS

Sheet ____ of ____

| FIRM NAME AND ADDRESS | ITEM NO. | ITEM DESCRIPTION | (*) AGREED UPON UNIT PRICE | DOLLAR VOLUME OF SUBLET ITEM |
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**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 DBE PARTICIPATION MUST SO INDICATE THIS ON THE FORM BY ENTERING THE WORD OR NUMBER ZERO.

# LISTING OF DBE SUBCONTRACTORS

Sheet ____ of ____

| FIRM NAME AND ADDRESS | ITEM NO. | ITEM DESCRIPTION | (*) AGREED UPON UNIT PRICE | DOLLAR VOLUME OF SUBLET ITEM |
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**CONTRACT NO.**_____ **COUNTY**_____ **FIRM**_____

# LISTING OF DBE SUBCONTRACTORS

Sheet ____ of ____

| FIRM NAME AND ADDRESS | ITEM NO. | ITEM DESCRIPTION | (*) AGREED UPON UNIT PRICE | DOLLAR VOLUME OF SUBLET ITEM |
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**CONTRACT NO.**_____ **COUNTY**_____ **FIRM**_____

# LISTING OF DBE SUBCONTRACTORS

Sheet ____ of ____

| FIRM NAME AND ADDRESS | ITEM NO. | ITEM DESCRIPTION | (*) AGREED UPON UNIT PRICE | DOLLAR VOLUME OF SUBLET ITEM |
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**CONTRACT NO._____ COUNTY_____ FIRM_____**

**COST OF CONSTRUCTION WORK ONLY** **$ _____**

(*) The Dollar Volume Shown In This Column Shall be Actual Price Agreed Upon by the Prime Contractor and the DBE Subcontractor, and These Prices Will Be Used to Determine The Percentage of the DBE Participation in this Contract.

**Dollar Volume of DBE Subcontractor **$** _____

Percentage of Total Construction Cost _____**%**
(Including Right-of-Way Acquisition Services)

**MUST HAVE ENTRY EVEN IF FIGURE TO BE ENTERED IS ZERO.

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

## CORPORATION

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the bidder has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

*N.C.G.S. § 133-32* and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

## SIGNATURE OF CONTRACTOR

_____
Full name of Corporation

_____
Address as prequalified

Attest _____ By _____

Secretary/Assistant Secretary
*Select appropriate title*

President/Vice President/Assistant Vice President
*Select appropriate title*

_____
Print or type Signer's name

_____
Print or type Signer's name

## CORPORATE SEAL

## AFFIDAVIT MUST BE NOTARIZED

Subscribed and sworn to before me this the
_____ day of _____, 20_____

_____
Signature of Notary Public
Of _____County
State of _____
My Commission Expires _____

## NOTARY SEAL

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

## PARTNERSHIP

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the bidder has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

*N.C.G.S. § 133-32* and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

## SIGNATURE OF CONTRACTOR

_____
Full Name of Partnership

_____
Address as Prequalified

_____ By _____
Signature of Witness Signature of Partner

_____ _____
Print or type Signer's name Print or type Signer's name

## AFFIDAVIT MUST BE NOTARIZED

Subscribed and sworn to before me this the
day of _____ 20_____.

_____
Signature of Notary Public

of _____County
State of _____
My Commission Expires:_____

**NOTARY SEAL**

# 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 Member/Manager** _____
Individually

_____
Print or type Signer's Name

## AFFIDAVIT MUST BE NOTARIZED

Subscribed and sworn to before me this the
_____ day of _____ 20__.

_____
Signature of Notary Public
of _____County
State of _____
My Commission Expires:_____

**NOTARY SEAL**

# 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*

| | | |
|---|---|---|
| *NOTARY SEAL* | *NOTARY SEAL* | *NOTARY SEAL* |
| *Affidavit must be notarized for Line (2)* | *Affidavit must be notarized for Line (3)* | *Affidavit must be notarized for Line (4)* |
| Subscribed and sworn to before me this | Subscribed and sworn to before me this | Subscribed and sworn to before me this |
| _____day of_____ 20___ | _____day of _____ 20___ | ____day of _____ 20_____ |
| _____ | _____ | _____ |
| Signature of Notary Public | Signature of Notary Public | Signature of Notary Public |
| of _____County | of _____County | of _____County |
| State of _____ | State of _____ | State of _____ |
| My Commission Expires:_____ | My Commission Expires:_____ | My Commission Expires:_____ |

**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 |

## AFFIDAVIT MUST BE NOTARIZED

Subscribed and sworn to before me this the
_____ day of _____ 20__.

_____
Signature of Notary Public
of _____County
State of _____
My Commission Expires:_____

**NOTARY SEAL**

# 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

## AFFIDAVIT MUST BE NOTARIZED

Subscribed and sworn to before me this the
_____ day of _____ 20__.

_____
Signature of Notary Public
of _____County
State of _____
My Commission Expires:_____

**NOTARY SEAL**

# 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** **C 202587 (R-3329, R-2559)**

**County (ies):** **Mecklenburg and Union**

ACCEPTED BY THE
DEPARTMENT OF TRANSPORTATION

Contract Officer

Date

Execution of Contract and Bonds
Approved as to Form:

Attorney General