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

DESIGN-BUILD PACKAGE

FINAL RFP **AUGUST 17, 2004**

VOID FOR BIDDING

DATE AND TIME OF TECHNICAL AND PRICE PROPOSAL SUBMISSION: **SEPTEMBER 7, 2004** AT **4:00 PM**

DATE AND TIME OF PRICE PROPOSAL OPENING: **SEPTEMBER 23, 2004** AT **10:00 AM**

CONTRACT ID: C 201235 MILES: 2.6

WBS ELEMENT NO. 34410.3.27

STATE FUNDED

COUNTY: MECKLENBURG

ROUTE NO. I-485

T.I.P. NO. R-2248F

LOCATION: I-485 (CHARLOTTE OUTER LOOP) FROM WEST OF I-77 TO SR 1143

TYPE OF WORK: DESIGN-BUILD AS SPECIFIED IN THE SCOPES OF WORK CONTAINED IN THE DESIGN-BUILD PACKAGE

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.

_____

5% BID BOND OR BID DEPOSIT REQUIRED

_____

PROPOSAL FORM FOR THE CONSTRUCTION OF CONTRACT NO. C201235

IN MECKLENBURG COUNTY, NORTH CAROLINA

Date_____ 20_____

DEPARTMENT OF TRANSPORTATION,

RALEIGH, NORTH CAROLINA

The Design Build Team has carefully examined the location of the proposed work to be known as Contract No. C201235; has carefully examined the preliminary plans and specifications, which are acknowledged to be part of the proposal, the special provisions, the Design-Build Package, the form of contract, and the forms of contract payment bond and contract performance bond; and thoroughly understands the stipulations, requirements and provisions. The undersigned Design Build Team agrees to bound upon his execution of the proposal and subsequent award to him by the Board of Transportation in accordance with this proposal to provide the necessary contract payment bond and contract performance bond within fourteen calendar days after the written notice of award is received by him. The undersigned Design Build Team further agrees to provide all design services and all necessary machinery, tools, labor, and other means of construction; and to do all the work and to furnish all materials, except as otherwise noted, necessary to perform and complete the said contract in accordance with the 2002 Standard Specifications for Roads and Structures by the dates(s) specified in the Design Build Package and in accordance with the requirements of the Engineer, and at the lump sum price(s) for the various items given on the sheets contained herein.

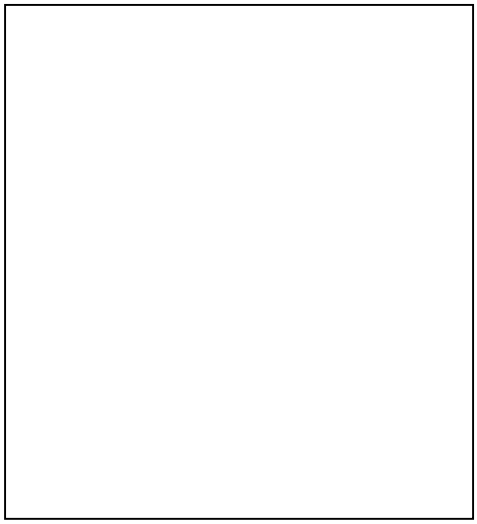
The Design-Build Team shall provide a Technical Proposal, a Price Proposal and furnish all the materials, machinery, implements, appliances and tools, and perform the work and required labor to design, construct and complete State Highway Contract No. C201235 in Mecklenburg County, for the lump sum price(s) bid by the Design Build Team in his Price Proposal and according to the proposal, plans, and specifications prepared by said Department and/or Design Build Team, which proposal, plans, and specifications show the details covering this project, and hereby become a part of this contract.

The published volume entitled *North Carolina Department of Transportation, Raleigh, Standard Specifications for Roads and Structures*, *JANUARY 2002* with all amendments and supplements thereto, is by reference, incorporated into and made a part of this contract; that, except as herein modified, all the Construction and work included in this contract is to be done in accordance with the specifications contained in said volume, and amendments and supplements thereto, under the direction of the Engineer.

All design manuals, policy and procedures manuals, and AASHTO publications and guidelines referenced in the Request For Proposal, are by reference, incorporated and made part of this contract.

If the proposal is accepted and the award is made, the technical proposal submitted by the proposer is by reference, incorporated and made part of this contract. The contract is valid only when signed either by the Contract Officer or such other person as may be designated by the Secretary to sign for the Department of Transportation. The conditions and provisions herein cannot be changed except by written approval as allowed by the Request For Proposal.

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



Contract Officer Seal

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STANDARD SPECIAL PROVISIONS (YELLOW SHEETS)

PROPOSAL FORM ITEM SHEET, ETC.

Item Sheet
Award Limits
Signature

PROJECT SPECIAL PROVISIONS

CONTRACT TIME AND LIQUIDATED DAMAGES (Projects without Permits)

The date of availability for this contract is **November 1, 2004.**

The completion date for this contract is defined as the date proposed in the Design Build Package by the proposer who is awarded the project. The completion date thus proposed shall not be later than **June 1, 2006**.

When observation periods are required by the special provisions, they are not a part of the work to be completed by the completion date and/or intermediate contract times. Should an observation period extend beyond the final completion date, the acceptable completion of the observation period shall be a part of the work covered by the performance and payment bonds.

The liquidated damages for this contract are Five Thousand Dollars ($5,000.00) per calendar day. As an exception to this amount, where the contract has been determined to be substantially complete as defined in Section 105-18 contained elsewhere in this package, the liquidated damages will be reduced to One Thousand Dollars ($1,000.00) per calendar day.

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

Liquidated damages of Five Thousand Dollars ($5,000.00) per calendar day will be applicable to the early date for substantial completion proposed by the bidder. Liquidated damages of One Thousand Dollars ($1,000.00) per calendar day will be applicable to the final completion date proposed by the bidder.

DB1G06

OTHER LIQUIDATED DAMAGES AND INCENTIVES

Refer to the Traffic Control Scope of Work for more information on the following time restrictions and liquidated damages:

> Liquidated Damages for the above lane closures, narrowing of lanes, holidays and special events time restriction for I-485 and I-77 including all ramps and loops is $5,000.00 per hour.
>
> Liquidated Damages for the above road closure time restriction for I-485 and I-77 including all ramps and loops, is $1,500.00 per 15 minute period or any portion thereof.

Liquidated damages for erosion control efforts apply to this project. Reference Erosion and Sedimentation Control Scope of Work under liquidated damages.

PROGRESS SCHEDULE

The Design Build Team shall be responsible for planning, scheduling and reporting the progress of the work to ensure timely completion of the contract.

The Design Build Team shall submit a schedule in accordance with the following:

CRITICAL PATH METHOD PROJECT SCHEDULE (CPM)

DESCRIPTION

The work of this provision consists of the Design Build Team planning, scheduling, designing, and constructing this project using a Critical Path Method Project Schedule (CPM). Use the CPM for coordinating and monitoring all the work specified in this contract including all activities of subcontractors, vendors, suppliers, utilities, railroads, NCDOT, and all other parties associated with the design or construction of this project. The work covered by this section includes but is not limited to submittals, major procurement, delivery, construction activities, submitting an initial CPM, and providing monthly updates to the CPM. The schedule shall have considered the time requirement for ordering articles of special manufacture to meet specific requirements of the work and for any inspection requirements of the various sections of the specifications, such as Section 1072 when structural steel fabrication inspection is required. Make sure that all activities quantified in the contract are included in the CPM.

MATERIALS

Use software for the CPM that generates files that are compatible with Primavera Project Planner.

REQUIREMENTS

(A) Float

Float is defined as the amount of time between when an activity "can start or finish" (early start or early finish) and when an activity "must start or finish" (late start or late finish). Float is a shared commodity for the use of NCDOT and/or the Design Build Team and is not for the exclusive use or benefit of either party. Both parties have the full use of the float until it is depleted.

(B) Design Build Team's Scheduling Representative

Designate an individual from the Design Build Team's organization, prior to submission of the Initial Critical Path Method Schedule, who will be the Design Build Team's authorized representative responsible for the development, updating, and revising of the Design Build Team's CPM schedule. Have the scheduling representative represent the Design Build Team in all matters regarding the schedule and attend all schedule related meetings. The scheduling representative must be skilled in the application of computer network schedules on construction projects of the magnitude and complexity of this project.

(C) Initial Critical Path Method Schedule (ICPM)

Within thirty (30) calendar days of receiving the Notice of Award, submit an ICPM for approval. Within twenty-one (21) calendar days of receipt of the Design Build Team's ICPM, the Engineer will complete the review of the ICPM. If required, a Joint Review Conference will be convened at which the Engineer and the Design Build Team will make any necessary corrections or adjustments to the ICPM. If a revision to the ICPM is necessary due to the Engineer's review or a Joint Review Conference, submit a revised ICPM within seven (7) calendar days after the date of the Joint Review Conference. The Engineer will respond to the submitted revised ICPM with seven (7) calendar days of receipt.

Once the ICPM has been accepted, it becomes the CPM of record. Acceptance of the ICPM in no way attests to the validity of the assumptions, logic constraints, dependency relationships, resource allocations, manpower and equipment, or any other aspect of the ICPM. The Design Build Team is and will remain solely responsible for the planning and execution of work in order to meet project milestones or contract completion dates.

Include the following in the ICPM submittal:

(1) A time scale diagram containing the following:
   (a) an acceptable scale and format
   (b) all activities clearly labeled
   (c) all activity identification clearly shown for each activity
   (d) all relationships between activities shown

(2) Tabular reports containing the following:
   (a) Precedence diagrams with activities listed and lead and lag times shown
   (b) Activity duration shown. All activities must have a duration of not more than 20 days unless otherwise approved. Divide activities with longer durations into subgroups of activities not exceeding 20 working days in duration. Indicate logical start and end points (e.g. stationing, staging, etc.) for each subgroup.
   (c) Activity descriptions shown
   (d) Early start and finish dates shown
   (e) Late start and finish dates shown
   (f) Status (critical or not) shown
   (g) Total float shown
   (h) Responsibility (i.e. Design Build Team, specific subDesign Build Team, specific supplier, NCDOT, etc.) shown

(3) Written narrative complying with the requirements listed below

(4) Data disk containing all of the information in the ICPM. The disk must be compatible with Primavera Project Planner software.

(D) Written Narrative

Provide a written narrative that explains the sequence of work, the critical path, interim completion dates, project phasing, non-work days or periods, maintenance of traffic, and labor and equipment resources. In addition, explain in the written narrative how the Design Build Team has provided for permit requirements, environmental requirements, coordination with other public contractors, milestone dates, other entities, coordination with utility companies, special non-work days or periods, and weather in the ICPM.

Provide the following information for each activity listed in the ICPM:

(1) Estimated start and completion date
(2) Description of work to be done including the type and quantity of equipment, labor, and material to be used
(3) Description of the location on the project where activity occurs
(4) Description of planned production rates (e.g. cubic yards (cubic meters) of excavation per day/week)
(5) Description of work days per week, holidays, number of shifts per day, and number of hours per shift
(6) Description of expected and critical delivery dates for equipment or material that can affect timely completion of the project
(7) Identify the vendor, supplier, or subDesign Build Team to perform the activity. State all assumptions made in the scheduling of the subDesign Build Team's or supplier's work.
(8) Utilize the written narrative to explain the following:
    (a) relationship between activities not obviously identified
    (b) equipment usage and limitation
    (c) manpower usage and limitations
    (d) use of additional shifts and/or overtime
    (e) activity codes, abbreviations, and activity identification system
    (f) all calendars used in the CPM
    (g) constraints (date or time constraints)
    (h) all abbreviations used in the ICPM
    (i) scheduling of weather and/or temperature sensitive activities
    (j) describe critical completion dates for maintaining the design and construction schedule

(E) Schedule Updates

Submit an update of the CPM of record monthly and at the preconstruction conference. The data date for the CPM update will be seven days prior to the cut-off date for the monthly partial payment. Submit the update within seven calendar days of the data date. Failure to submit the CPM update may result in the Engineer withholding partial payments. Upon acceptance, the monthly update will become the CPM of record for the time period between its data date and the next approved update or revision.

Include in the monthly updates activity data as specified in (1) through (4) under (C) Initial Critical Path Method Schedule using actual activity start dates. Use the monthly update to

describe the project progress to date. Include in the written narration a description of the work performed during the update period, the current critical path, any delays or disruptions experienced during the update period, any change in manpower or equipment, and any potential delays or disruptions.

(F) Revisions to the Schedule of Record

A revision to the schedule of record is defined as one or more of the following:

(1) a change in the original duration of an activity
(2) a change in the logic of the schedule
(3) a change to resources
(4) a change to any Actual date, previously established
(5) the deletion or addition of an activity
(6) a change to, addition of, or deletion of a constraint (date or time constraint)
(7) a change to, addition of, or deletion of an activity code
(8) a change to an activity description
(9) any change other than updating an activity

Whenever a revision is proposed for any of the above reasons, contact the Engineer and verbally discuss the revision. If the revision is considered minor, the Engineer may allow the revision to be included in the next update of the CPM. If the revision is not considered minor, submit for approval the proposed revision with the same requirements as the ICPM including the following:

- an updated CPM including the proposed revision
- a written narrative that describes the reason for the revision, the resulting critical path, and all particulars of the revision including but not limited to:

(1) changes in the method or manner of the work
(2) changes in the specifications
(3) changes in resources
(4) extra work
(5) addition or deletion of work
(6) increased or decreased quantities
(7) defective work
(8) acceleration of work

Submitted revisions will be responded to within fourteen (14) calendar day after receipt. If the Design Build Team is required to resubmit the proposed revision, do so within seven (7) calendar days after receipt of the Engineer's comments. The Engineer reserves the right to reject any proposed revision which adversely affects the NCDOT, utilities, or other interested parties.

No measurement or direct payment will be made for Design Build Team costs relating to preparation and submission of schedules and reports and revisions thereto, the cost being considered as included in the lump sum Price Proposal.

Acceptance of the Design Build Team's schedules by the Engineer is not to be construed as relieving the Design Build Team of its obligation to complete the work within the contract time; or as granting, rejecting, or in any other way acting on the Design Build Team's requests for adjustments to the date for completing contract work, or claims for additional compensation. Such requests shall be processed in strict compliance with other relevant provisions of the contract.

DB1G12

PARTNERING

As a part of its quality management program, the North Carolina Department of Transportation 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 and participation will be totally voluntary. The cost associated with effectuating this relationship will be agreed to by both parties and shall be shared equally.

To implement this initiative prior to starting work in accordance with the requirements of Section 108 of the Standard Specifications and prior to the preconstruction conference, the Design Build Team's management personnel and NCDOT's 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.

Follow-up workshops may be held periodically throughout the duration of the contract as agreed by the Design Build Team and the North Carolina Department of Transportation.

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.

DB1G49

EXECUTION OF SIGNATURE SHEETS AND DEBARMENT CERTIFICATION

The Proposer's attention is directed to the various sheets in the Design Build Package which are to be signed by the Proposer. A list of these sheets is shown below. The signature sheets are located behind the item sheets in the Design Build Package. The bid bond is inserted in the Design Build Package.

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

2. Bid Bond (Proposal Insert)

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

DB1G52

SUBMISSION OF DESIGN BUILD PROPOSAL

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

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

2. The Proposer shall deliver the Design Build Proposal to the place indicated, and prior to the time indicated in the Design Build Package.

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

4. The Design Build Proposal shall be accompanied by Bid surety in the form of a Bid bond or Bid deposit.

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

6. The Design Build Proposal shall address all the requirements as specified in the Request For Proposal document.

In addition to the above requirements, failure to comply with any of the requirements of Articles 102-8, 102-9, 102-10 or 102-11 of the specifications may result in a Design Build Proposal being rejected.

DB1G55

CONFIDENTIAL QUESTIONS 04-05-04

The Design-Build Team will be permitted to ask confidential questions of the Department, which neither the question nor answer will be shared with other proposing teams. For the purpose of this provision, *confidential question is defined as a private inquiry containing information whose disclosure could alert others to certain details of doing business in a particular manner*.

I. Confidential questions arising prior to issuance of the final Request for Proposal will be allowed at the draft RFP review with the individual teams.

The Department will answer the confidential question verbally at the meeting if possible. If not answered verbally during the meeting, the Department will answer the confidential question by subtle changes in the Final Request For Proposal, which will clarify the scope by either allowing or disallowing the request. The revision will be made in such a manner as to not disclose the confidential question.

II. After the issuance of the Final Request for Proposal, confidential questions may be asked by requesting a meeting with the Contract Officer. The request shall be in writing and provide sufficient detail to evaluate the magnitude of the request. Questions shall be of such magnitude as to warrant a special meeting. Minor questions will not be acknowledged or answered.

After evaluation, the Contract Officer will respond to the question in writing to the Design Build Team only. Other teams will not be notified of the question or answer.

If the Design Build Team includes work based on the confidential questions and answers, the work shall be included and discussed in the technical proposal. The Technical Proposal will be evaluated in accordance with existing policies.

DB1G56

VALUE ANALYSIS

Value Engineering Construction Proposals (VECP), as identified in the 2002 *NCDOT Standard Specifications for Roads and Structures* Article 104-12, will be accepted. Only proposals, which alter the requirements of the RFP issued by the Department, will be considered as Value Engineering Construction Proposals.

DB1G57

SCHEDULE OF ESTIMATED COMPLETION PROGRESS

The Design Build Team's attention is directed to the Standard Special Provision entitled "Availability Of Funds - Termination Of Contracts" included elsewhere in this proposal form. 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)
2005 (07/01/04 – 06/30/05)	76 % of Total Amount Bid
2006 (07/01/05 – 06/30/06)	24% of Total Amount Bid

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

DB1G58

MINORITY AND WOMEN BUSINESS

7-17-01$_R$

POLICY

It is the policy of the North Carolina Department of Transportation that minority and women businesses shall have the maximum opportunity to participate in the performance of contracts financed by Non-Federal Funds.

The Design Build Team is also encouraged to give every opportunity to allow MB/WB participation in Supplemental Agreements.

OBLIGATION

The Design Build Team and any subsequent Subcontractor shall ensure that minority and women businesses have the maximum opportunity to participate in the performance of the work included in this contract. The Design Build Team and any subsequent Subcontractor shall take all necessary and reasonable steps to ensure that minority and women businesses have the maximum opportunity to compete for and perform a portion of the work included in this contract and shall not discriminate on the basis of race, color, national origin or sex. Failure on the part of the Design Build Team to carry out the requirements set forth herein shall constitute a breach of contract and after proper notification, may result in award disqualification, termination of the contract, disqualification from bidding, or other appropriate remedy.

GOALS

Pursuant to the requirements of North Carolina General Statute 136-28.4, the following goals for participation are established for this contract:

Minority Business Enterprises	10 %
Women Business Enterprises	5 %

This goal is to be met through utilization of highway construction contractors. Utilization of MB/WB firms performing design-related functions or Construction Engineering and Inspection are not included in this goal. MB/WB utilization for engineering related services is expected and is credited through the technical scoring process.

The Design Build Team shall exercise all necessary and reasonable steps to ensure that Minority Businesses (MB) and Women Businesses (WB) participate in at least the percentage of the contract as set forth above as goals for this contract.

LISTING OF MB AND WB SUBCONTRACTORS

All bidders, at the time the bid proposal is submitted, must also submit a listing of MB and WB participation on the appropriate form (or facsimile thereof) contained elsewhere in this proposal in order for the bid to be considered responsible. Bidders must indicate the total dollar value of MB and WB participation of the contract. In the event the bidder has no MB and WB participation, he is still required to indicate this on the forms by entering the word or number zero. Blank forms will not be deemed to represent zero participation. BIDS SUBMITTED WHICH DO NOT HAVE MB AND WB PARTICIPATION INDICATED ON THE APPROPRIATE FORM WILL NOT BE READ PUBLICLY DURING THE OPENING OF BIDS. These bids will not be considered for award by the Department and they will be returned to the bidder. Bidders have the option of submitting their MB and WB participation in an abbreviated format as required in Paragraph A below, or the bidders may submit their MB and WB participation in the additional detail required by Paragraph B below. In the event the bidder elects to submit MB and WB participation in accordance with Paragraph A and is determined to be the apparent lowest responsible bidder, that bidder must deliver to the Department no later than 12:00 noon of the sixth day following the opening of bids, a detailed MB and WB submittal as required by Paragraph B below.

Only those MB and WB firms with current certification by the Department will be considered acceptable for listing in the bidders submittal of MB and WB participation.

A. The Design Build Team shall indicate on the form for listing of MB and WB Subcontractors the following required information:

REQUIRED INFORMATION

(1) The names of MB and WB firms committed to participate in the contract;

(2) The Contract Item Numbers of work to be performed by each MB and WB firm; and

(3) The total dollar amount to be paid to each MB and WB based on agreed upon unit prices.

B. In lieu of submitting the information required by (A) above, the bidder may submit the detailed information required below along with the bid proposal form.

REQUIRED INFORMATION

(1) The names of MB and WB firms committed to participate in the contract;

(2) The Contract Item Numbers and Contract Item Descriptions and agreed upon unit prices of work to be performed by each MB and WB firm; and

(3) The total dollar amount to be paid to each MB and WB based on agreed upon unit prices.

Failure to indicate the required information of either Part A or B on the specified form will cause the bid to be considered non-responsible and it may be rejected.

The Department will not allow any substitutions, deletions, or other alterations to the listing of firms committed for MB and WB participation and/or the respective listed contract item numbers after opening of bids. The Department will not allow adjustments to total dollar amount of MB and/or WB participation after the opening of bids which would result in the MB and/or WB participation being less than the contract goal. The only exceptions to the requirements of this paragraph will be: (1) to allow for replacement of a MB or WB firm that had been decertified after opening of bids, and (2) to allow alteration of the listed contract item numbers subject to the Bidder submitting sufficient documentation to verify an obvious error in the initial submittal.

C. If the bid of the lowest responsible bidder exceeds $500,000 and if the MB and/or WB participation submitted in response to Paragraph B exceeds the algebraic sum of the MB and WB goals by $1000 or more, the excess will be placed on deposit by the Department for future use by the bidder. Separate accounts will be maintained for MB and WB participation and these may accumulate for a period not to exceed 24 months.

If the MB and WB participation submitted in response to Paragraph A/B does not meet or exceed the MB and WB contract goals, the apparent lowest responsible bidder must submit information to satisfy the North Carolina Department of Transportation that sufficient reasonable efforts have been made to meet the contract goals. One complete set and nine (9) copies of this information must be received in the office of the State Contractual Services Engineer no later than 12:00 noon of the sixth day following opening of bids. Where the information submitted includes repetitious solicitation letters it will be acceptable to submit a sample representative letter along with a distribution list of the firms being solicited. Documentation of MB and WB quotations shall be a part of the good faith effort submittal as necessary to demonstrate compliance with the factors listed below which the Department considers in judging good faith efforts. This documentation may include written subcontractor quotations, telephone log notations of verbal quotations, or other types of quotation documentation.

Where the bidder fails to provide this information by the deadline, the Department may impose the following sanctions: (1) disqualify the Design Build Team and any affiliated companies from further bidding for a period of time of no more than 90 days from the date of disqualification as established in notification by certified mail; and (2) disqualify the Design Build Team and any affiliated companies for award of all contracts for which bids have been received and opened. Additionally, the Proposal may be considered non-responsive and no stipend may be paid.

The Department will consider the following factors in judging whether or not the bidder has made adequate good faith effort:

(1) Whether the bidder attended any pre-bid meetings that were scheduled by the Department to inform MBs and WBs of subcontracting opportunities;

(2) Whether the bidder provided written notice to a reasonable number of specific MBs and WBs that their interest in the contract is being solicited and whether the firms solicited could have reasonably been expected to quote the work in the contract;

(3) Whether the bidder followed up on initial solicitations of interests by contacting MBs and WBs to determine with certainty whether they were interested;

(4) Whether the bidder selected portions of the work to be performed by MBs and WBs in order to increase the likelihood of meeting the contract goals;

(5) Whether the bidder provided interested MBs and WBs with adequate information about the plans, specifications and requirements of the contract;

(6) Whether the bidder negotiated in good faith with interested MBs and WBs not rejecting them as unqualified without sound reasons based on a thorough investigation of their capabilities;

(7) Whether quotations were received from interested MB and WB firms but rejected as unacceptable without sound reasons why the quotations were considered unacceptable;

(8) Whether the bidder made efforts to assist interested MBs and WBs in obtaining any required insurance or bonding that may be required by the bid proposal or by the bidder;

(9) Whether the bidder specifically negotiated with Subcontractors to assume part of the responsibility to meet the contract MB and WB goal when the work to be sublet includes potential for MB and WB participation.

In the event one bidder is the apparent low bidder on two non-federally funded projects within the same letting located in the same geographic area of the state, as a part of the good faith effort the Department will consider allowing the bidder to

combine the MB participation on the two projects so long as the overall MB goal value of both projects is achieved.

In the event one bidder is the apparent low bidder on two non-federally funded projects within the same letting located in the same geographic area of the state, as a part of the good faith effort the Department will consider allowing the bidder to combine the WB participation on the two projects so long as the overall WB goal value of both projects is achieved.

Where the apparent lowest responsible bidder fails to submit sufficient participation by MB firms to meet the contract goal, as part of the good faith effort the Department will consider allowing the bidder to withdraw funds to meet the MB goal so long as there are adequate funds available from the bidders MB bank account.

Where the apparent lowest responsible bidder fails to submit sufficient participation by WB firms to meet the contract goal, as part of the good faith effort the Department will consider allowing the bidder to withdraw funds to meet the WB goal so long as there are adequate funds available from the bidders WB bank account.

Where the apparent lowest responsible bidder fails to submit sufficient participation by MB and WB firms to meet the contract goal and upon a determination by the Goal Compliance Committee based upon the information submitted that the apparent lowest responsible bidder failed to make sufficient reasonable efforts to meet the contract goal, the Department may reject the bid.

In the event that the Department does not award the contract to the apparent lowest responsible bidder, the Department reserves the right to award the contract to the next lowest responsible bidder that can satisfy the Department that the contract goal can be met or that adequate good faith efforts have been made to meet the goal.

DIRECTORY OF CERTIFIED BUSINESSES

Included with this Proposal Form is a list of Businesses which have been certified by the North Carolina Department of Transportation. Only those MB firms with current certification may be used to meet the contract MB goal and only those WB firms with current certification may be used to meet the contract WB goal.

The listing of an individual firm certified by the Department shall not be construed as an endorsement of the firms capability to perform certain work.

REPLACEMENT OF MBs AND WBs

(A) Performance Related

If any MB or WB Subcontractor indicated on the form for listing of MB and WB Subcontractors, contained elsewhere in this proposal form, does not perform satisfactorily to the extent indicated or anticipated, the Design Build Team shall take all necessary, reasonable steps to replace the MB Subcontractor with another MB Subcontractor and/or the Design Build Team shall take all necessary, reasonable steps to replace the WB Subcontractor with another WB Subcontractor.

Any substitution of MB or WB firms after award of the contract shall be approved by the Department. The Design Build Team shall submit any requests for substitutions through the Resident Engineer and the request must provide a valid basis or reason for the proposed substitution.

To demonstrate necessary, reasonable efforts, the Design Build Team shall document the steps he has taken to replace any MB or WB Subcontractor that is unable to perform successfully with another MB or WB Subcontractor. Such documentation shall include but not be limited to the following:

(a) Copies of written notification to MBs/WBs that their interest is solicited in subcontracting the work defaulted by the previous MB or WB Subcontractor or in subcontracting other items of work in the contract.

(b) Efforts to negotiate with MBs and WBs for specific subbids including at a minimum:

  (1) The names, addresses, and telephone numbers of MBs and WBs that were contacted;

  (2) A description of the information provided to MBs and WBs regarding the plans and specifications for portions of the work to be performed; and

  (3) A statement of why additional agreements with MBs and WBs were not reached.

(c) For each MB or WB contacted but rejected as unqualified, the reasons for the Design Build Team's conclusion.

(d) Efforts made to assist the MBs and WBs contacted, if needed, in obtaining bonding or insurance required by the Design Build Team.

Failure of the Design Build Team to demonstrate reasonable efforts to replace a MB or WB firm that does not perform as intended or anticipated, shall be just cause to disqualify the Design Build Team from further bidding for a period of up to 6 months after notification by certified mail.

(B) Decertification

1. If the Department has approved a Request for Subcontract for a particular MB or WB Subcontractor and that MB or WB Subcontractor is subsequently decertified by the Department; then the Department will not require the Design Build Team to solicit replacement MB or WB participation equal to the remaining work to be performed by the decertified firm.

2. If a Design Build Team has listed a MB or WB firm in his low bid submittal and the MB or WB firm is decertified prior to the Department approving a Request for Subcontract for the named MB or WB firm, the Design Build Team may be required to make a good faith effort to:

   (a) Replace the decertified firm with a certified firm, or

   (b) To obtain replacement MB or WB participation in other areas of work.

DEFINITIONS

For purposes of this provision, the following definition will apply:

Minority Business or MB means a small business concern, which is owned and controlled by one or more minorities. Except that such term shall not include any concern or group of concerns controlled by the same minority or minorities which has average annual gross receipts over the preceding 3 fiscal years in excess of $14,000,000, as adjusted by the Department for inflation. For the purposes of this part, owned and controlled means a business:

(a) Which is at least 51 percent owned by one or more minorities or in the case of a publicly owned business, at least 51 percent of the stock of which is owned by one or more minorities; and

(b) Whose management and daily business operations are controlled by one or more such individuals.

Minority is defined as a citizen or lawful permanent resident of the United States and who is:

(1) Black (a person having origins in any of the black racial groups of Africa);

(2) Hispanic (a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race);

(3) Asian American (a person having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands);

(4) American Indian

Women Business or WB means a small business concern, which is owned and controlled by one or more women. Except that such term shall not include any concern or group of concerns controlled by the same woman or women which has average annual gross receipts over the preceding 3 fiscal years in excess of $14,000,000, as adjusted by the Department for inflation. For the purposes of this part, owned and controlled means a business:

(a) Which is at least 51 percent owned by one or more women or in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and

(b) Whose management and daily business operations are controlled by one or more of the women who own it.

COUNTING MB/WB PARTICIPATION TOWARD MEETING THE MB/WB GOAL

(1) If a firm is determined to be an eligible MB or WB firm and certified by the Department, the total dollar value of the participation by the MB or WB will be counted toward the appropriate MB or WB goal. The total dollar value of participation by a certified MB or WB will be based upon unit prices agreed upon by the Design Build Team and MB or WB Subcontractor.

(2) The Design Build Team may count toward its MB or WB goal a portion of the total dollar value of participation with a joint venture, eligible under the standards of this provision, equal to the percentage of the ownership and controls of the MB or WB partner in the joint venture.

(3) (a) The Design Build Team may count toward its MB or WB goal only expenditures to MBs or WBs that perform a commercially useful function in the work of a contract. A MB or WB is considered to perform a commercially useful function when it is responsible for execution of a distinct element of the work of a contract and carrying out its responsibilities by actually performing, managing, and supervising the work involved. To determine whether a MB or WB is performing a commercially useful function, the Department will evaluate the amount of work subcontracted, industry practices, and other relevant factors.

(b) Consistent with normal industry practices, a MB or WB may enter into subcontracts. If a MB or WB Contractor or Subcontractor subcontracts a significantly greater portion of the work of the contract than would be expected on the basis of normal industry practices, the MB or WB shall be presumed not to be performing a commercially useful function. The MB or WB may present evidence to rebut this presumption to the Department. The Department's decision on the rebuttal of this presumption shall be final.

(4) A Design Build Team may count toward its MB or WB goal 60 percent of its expenditures for materials and supplies required to complete the contract and obtained from MB or WB regular dealer and 100 percent of such expenditures to a MB or WB manufacturer.

(a) For purposes of this provision, a manufacturer is a firm that operates or maintains a factory or establishment that produces on the premises the materials or supplies obtained by the Design Build Team.

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

(5) A contractor may count toward its MB or WB goal the following expenditures to MB or WB firms that are not manufacturers or regular dealers:

(a) The fees or commissions charged for providing a bona fide service, such as professional, technical, consultant or managerial services and assistance in the procurement of essential personnel, facilities, equipment, materials or supplies required for performance of the contract, provided that the fee or commission is determined by the Department to be reasonable and not excessive as compared with fees customarily allowed for similar services.

(b) The fees charged for delivery of materials and supplies required on a job site (but not the cost of the materials and supplies themselves) when the hauler, trucker, or delivery service is not also the manufacturer of or a regular dealer in the materials and supplies, provided that the fee is determined by the Department to be reasonable and not excessive as compared with fees customarily allowed for similar services.

(c) The fees or commissions charged for providing any bonds or insurance specifically required for the performance of the contract provided that the fee or commission is determined by the Department to be reasonable and not excessive as compared with fees customarily allowed for similar services.

REPORTS

Within 30 days after receipt of materials, supplies, or services from MBs or WBs, not otherwise documented by Request for Subcontracts (RS-1A/RS-1B), the Design Build Team shall furnish to the Engineer appropriate documentation (canceled checks, paid invoices, etc.) to verify expenditures with MB and WB concerns. The documentation should also indicate the percentage (60% or 100%) of expenditures claimed for MB or WB credit.

All requests for subcontracts involving MB or WB Subcontractors shall be accompanied by a certification executed by both the Design Build Team and the MB or WB Subcontractor attesting to the agreed upon unit prices and extensions for the affected contract items. This document shall be on the Departments Form RS-1-D, or in lieu of using the Departments Form, copies of the actual executed agreement between the Design Build Team and the MB or WB Subcontractor may be submitted. In any event, the Department reserves the right to require copies of actual subcontract agreements involving MB and WB Subcontractors.

The RS-1-D certification forms may be obtained from the Department's Resident Engineer.

> These certifications shall be considered a part of the project records, and consequently will be subject to any penalties under State Law associated with falsifications of records related to projects.

REPORTING MINORITY BUSINESS ENTERPRISE OR WOMEN BUSINESS ENTERPRISE PARTICIPATION

When payments are made to Minority Business Enterprise firms or Women Business Enterprise firms, including material suppliers, contractors at all levels (prime, subcontractor, or second tier subcontractor) shall provide the Engineer with an accounting of said payments. 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 (1) withholding of money due in the next partial pay estimate; or (2) removal of an approved Design Build Team from the prequalified bidders list or the removal of other entities from the approved subcontractors list. The accounting shall list for each payment made to a MB/WB Enterprise firm the following:

DOT Project Number
Payee Design Build Team Name
Receiving Design Build Team or Material Supplier
MB/WB Certification Basis, e.g., Woman Owned, Native American, African American, etc.
Amount of Payment
Date of Payment

A responsible fiscal officer of the payee Design Build Team, subcontractor, or second tier subcontractor who can attest to the date and amounts of the payments shall certify that the accounting is correct. A copy of an acceptable report may be obtained from the Engineer.

DB1G67

CONTRACTOR'S LICENSE REQUIREMENTS

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).

DB1G88

DOMESTIC STEEL AND IRON PRODUCTS

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 one-tenth of one percent (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 by this Special Provision 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, must 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 Resident Engineer a notarized certification certifying that the product conforms to the above requirements of this Special Provision. The Resident Engineer will forward a copy of each certification to the Materials and Tests Unit.

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 Department or the Federal Highway Administration.

DB1G97

SUBSURFACE INFORMATION

Available subsurface information will be provided on this project. The Design Build Team will be responsible for additional investigations.

DB1G119

SAFETY VESTS

All the Design Build Team's personnel, all subcontractors and their personnel, and any material suppliers and their personnel, must wear an OSHA approved reflective vest or outer garment at all times while on the project.

DB1G139

BID DOCUMENTATION

General:

The successful Proposer (Design Build Team) shall submit the original, unaltered bid documentation or a certified copy of the original, unaltered bid documentation used to prepare the Price Proposal for this contract to the Department. Such documentation shall be placed in escrow with a banking institution or other bonded document storage facility selected by the Department and preserved by that institution or facility as specified in the following sections of this provision.

Bid Documentation:

The terms "bid documentation" as used in this provision means all written information, working papers, computer printouts and diskettes, charts, and all other data compilations which contain or reflect information, data, and calculations used by the Proposer in the preparation of their Price Proposal. The term "bid documentation" includes, but is not limited to, Design Build Team equipment rates, Design Build Team overhead rates, labor rates, efficiency or productivity factors, arithmetical calculations, and quotations from subcontractors and material suppliers to the extent that such rates and quotations were used by the Proposer in formulating and determining the bid. The term "bid documentation" also includes any manuals, which are standard to the industry used by the Proposer in determining the bid. Such manuals may be included in the bid documentation by reference. Such reference shall include the name and date of the publication and the publisher. The term does not include bid documents provided by the Department for use by the Proposer in bidding on this project.

Submittal of Bid Documentation:

A representative of the Proposer shall deliver the original, unaltered bid documentation or a certified copy of the original, unaltered bid documentation to the Department, in a container suitable for sealing, within ten (10) days after the notice of award is received by him. Bid documentation will be considered a certified copy if the Proposer includes a letter to the Department from a chief officer of the company stating that the enclosed documentation is an EXACT copy of the original documentation. The letter must be signed by a chief officer of the company, have the person's name and title typed below the signature, and the signature MUST be notarized at the bottom of the letter. The Department will not execute the contract until the original, unaltered bid documentation or a certified copy of the original, unaltered bid documentation has been received by the Department. The container shall be clearly marked "Bid

Documentation" and shall also show on the face of the container the Proposer's name, Proposer's address, the date of submittal, the Project Number, and the County.

Affidavit:

In addition to the bid documentation, an affidavit signed under oath by an individual authorized by the Proposer to execute the bid shall be included. The affidavit shall list each bid document with sufficient specificity so a comparison may be made between the list and the bid documentation to ensure that all of the bid documentation listed in the affidavit has been enclosed. The affidavit shall attest that the affiant has personally examined the bid documentation, that the affidavit lists all of the documents used by the Proposer to determine the bid for this project, and that all such bid documentation has been included.

Verification:

Upon delivery of the bid documentation, the Department's Contract Officer and the Proposer's representative will verify the accuracy and completeness of the bid documentation compared to the affidavit. Should a discrepancy exist, the Proposer's representative shall immediately furnish the Department's Contract Officer with any other needed bid documentation. The Department's Contract Officer upon determining that the bid documentation is complete will, in the presence of the Proposer's representative, immediately place the complete bid documentation and affidavit in the container and seal it. Both parties will deliver the sealed container to a banking institution or other bonded document storage facility selected by the Department for placement in a safety deposit box, vault, or other secure accommodation.

Duration and Use:

The bid documentation and affidavit shall remain in escrow until sixty (60) calendar days from the time the Design Build Team receives 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 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 Department, or receipt of a letter from the Design Build Team authorizing release, the Department may obtain the release and custody of the bid documentation. If the bid documentation remains in escrow sixty (60) calendar days after the time the Design Build Team receives the final estimate and the Design Build Team has not filed a written claim, filed a written and verified claim, or has not initiated litigation against the Department related to the contract, the Department 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 bid documentation used to determine the bid 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.

Failure to Provide Bid Documentation:

The Proposer's failure to provide the original, unaltered bid documentation or a certified copy of the original, unaltered bid documentation within ten (10) days after the notice of award is received by him may be just cause for rescinding the award of the contract and may result in the removal of the Proposer from the Department's list of qualified Proposers for a period up to 180 days. Award may then be made to the next lowest responsible Proposer or the work may be readvertised and constructed under the contract or otherwise, as the Board of Transportation may decide.

Escrow Agreement:

The Proposer will be required to sign an Escrow Agreement within ten (10) days after the notice of award is received by him. A copy of this Escrow Agreement document will be mailed to the Proposer with the notice of award for informational purposes. The Proposer and Department will sign the Escrow Agreement at the time that the bid documentation is delivered to a Banking Institution or other facility as outlined above. The Proposer's failure to sign the Escrow Agreement at the time the bid documentation is delivered may be just cause for rescinding the award of the contract and may result in the removal of the Proposer from the Department's list of qualified Proposers for a period up to 180 days. Award may then be made to the next lowest responsible Proposer or the work may be readvertised and constructed under the contract or otherwise, as the Board of Transportation may decide.

Confidentiality of Bid Documentation:

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

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

Cost and Escrow Instructions:

The cost of the escrow will be borne by the Department. 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 bid documentation. Payment at the various contract unit or lump sum prices in the contract will be full compensation for all such costs.

DB1G142

TWELVE-MONTH GUARANTEE

A. The Design Build Team shall guarantee materials and workmanship against latent and patent defects arising from faulty materials, faulty workmanship or negligence for a period of twelve months following the date of final acceptance of the work for maintenance and shall replace such defective materials and workmanship without cost to the Department.

B. Where items of equipment or material carry a manufacturer's guarantee for any period in excess of twelve months, then the manufacturer's guarantee shall apply for that particular piece of equipment or material. The Department's first remedy shall be through the manufacturer although the Design Build Team is responsible for invoking the warranted repair work with the manufacturer. The Design Build Team's responsibility shall be limited to the term of the manufacturer's guarantee.

This guarantee provision shall be invoked only for major components of work for which the Design Build Team would be wholly responsible under the terms of the contract. Examples would include pavement structures, bridge components, and sign structures. This provision shall not be used as a mechanism to force the Design Build Team to return to the project to make repairs or perform additional work for which the Department would normally compensate the Design Build Team. In addition, routine maintenance activities (i.e. mowing grass, debris removal, ruts in earth shoulders,) are not parts of this guarantee.

Appropriate provisions of the payment and/or performance bonds shall cover this guarantee for the project. In addition, failure on the part of the Design Build Team to perform guarantee work within the terms of this provision shall be just cause to remove the Design Build Team from the Department's prequalified bidder's list. The Design Build Team will be removed for a minimum of 6 months and will be reinstated only after all work has been corrected and the Design Build Team requests reinstatement in writing.

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

DB1G145

PRICE ADJUSTMENTS FOR ASPHALT BINDER

Adjustments will be made to the payments due the Design Build Team for each grade of asphalt binder when it has been determined that the monthly average terminal F.O.B. Selling Price of asphalt binder, Grade PG 64-22, has fluctuated from the Base Price Index for Asphalt Binder included in this Project Special Provision. The methods for calculating a Base Price Index, for calculating the monthly average terminal F.O.B. Selling Price and for determining the terminals used are in accordance with procedures on file with the Department's Construction Unit.

When it is determined that the monthly average terminal F.O.B. 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 CEI firm is responsible for:

Maintaining records in accordance with the procedures outlined in the Construction Manual for "Weight Tickets As A Basis Of Payment."

Summarizing and submitting these records monthly for review and approval by the Resident Engineer.

The Base Price Index for this project is $211.67 per ton.

DB6R25

PRICE ADJUSTMENTS - ASPHALT CONCRETE PLANT MIX

Revise the 2002 Standard Specifications as follows:

Page 6-36, 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 $35 per theoretical ton. This price shall apply for all mix types.

DB6R26

GENERAL 03-1-04

USE OF TERMS

Throughout this Design Build Package and all manuals, documents and standards referred to in the Design Build Package the terms Contractor, Bidder, Design Builder, Design Build Team and Proposer are synonymous. Throughout this Design Build Package and all manuals, documents and standards referred to in the Design Build Package, the terms NCDOT, Department, and State are synonymous.

DESIGN REFERENCES

Design references developed and published by NCDOT and those developed and published by other agencies and adopted for use by NCDOT which are to be used in the design of this project may be obtained by contacting the Contract Office of the Project Services Unit. Standard prices for materials, which the Department 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.

REVIEW AND APPROVAL OF DESIGN SUBMITTALS

Major design milestones and required design submittals shall be identified as activities on the approved CPM for the project. Submittals will be reviewed within 10 working days (15 days for temporary structures) from the date of receipt by NCDOT unless otherwise stipulated in the scope of work. The Department will not accept subsequent submittals until prior submittal reviews have been completed for that item. The Design Build Team shall prioritize submittals in the event that multiple submittals are made based on the approved CPM. All submittals (four full size copies) shall be made simultaneously to the Resident Engineer (two hard copies) and to the designated person in the Project Services Unit (two hard copies and an electronic copy following NCDOT CADD standards) unless otherwise stated in the scope of work. All submittals shall include pertinent Special Provisions. No work shall be performed prior to Department approval of the design submittals.

OVERVIEW

The project will be the widening of existing I-485 (Charlotte Outer Loop) from West of I-77 to SR 1143 (Brown-Grier / Arrowood Road) from a four-lane divided facility to a six-lane divided facility with a 46-foot median. The additional 12-foot lane in each direction will be constructed within the median. The project is located in Mecklenburg County.

Project services shall include but are not limited to:

Design Services –Final designs and construction plans

Construction Services – necessary to build and ensure workmanship of the designed facility.

The CE was approved April 30, 2004

GENERAL SCOPE

The scope of work for this project will include design, construction and construction engineering and management of the project. The design work will include all aspects to widen the 4-lane divided highway to a 6-lane divided highway. The designs shall meet all appropriate latest versions of *AASHTO Policy on Geometric Design of Highways and Streets*, *AASHTO Standard Specifications for the Design of Highway Bridges, Manual of Uniform Traffic Control Devices*, and all NCDOT design criteria.

Construction will include but not be limited to all necessary roadway, drainage, utility coordination, and erosion and sediment control work items. Construction engineering and management, including quality control and quality assurance, will be the responsibility of the Design Build Team. Construction will comply with *NCDOT Standard Specifications for Roads and Structures Edition of 2002* and any special provisions.

Areas of work required for this project will include, but are not limited to the following items:

Roadway Plan Preparation
ITS
Drainage Design
Erosion and Sediment Control
R/W Utilities, Conflicts and Construction
Traffic Control and Pavement Markings
Sign Design
Subgrade Stabilization
Lighting
Foundation Design for Roadway
Construction
Project Management
Construction Management
Construction Surveying
QC/QA including inspections and testings
Public Awareness

All designs shall be in Microstation format using Geopak software.

DESIGN, CONSTRUCTION AND CEI WORK PERFORMED BY DESIGN BUILD TEAM

The design work consists of the preparation of all construction documents for widening I-485 (Charlotte Outer Loop) as outlined in the Scope of Work section of this package. The Design Build Team shall prepare final designs, construction drawings and special provisions.

The Design Build Team shall be fully and totally responsible for the accuracy and completeness of all work performed under this contract and shall save the State harmless and shall be fully liable for any additional costs and all claims against the State which may arise due to errors, omissions and negligence of the Design Build Team in performing the work.

There shall be no assignment, subletting or transfer of the interest of the Design Build Team in any of the work covered by the Contract without the written consent of the State, except that the Design-Build Team may, with prior notification of such action to the State, sublet property searches and related services without further approval of the State.

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

All work by the Design Build Team shall be performed in a manner satisfactory to the State and in accordance with the established customs, practices, and procedures of the North Carolina Department of Transportation, and in conformity with the standards adopted by the American Association of State Highway Transportation Officials, and approved by the Secretary of Transportation as provided in Title 23, US Code, Section 109 (b). The decision of the Engineer/State/Department shall control in all questions regarding location, type of design, dimension of design, and similar questions.

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

The Design Build Team shall not change team members, subconsultants or subcontractors identified in the RFQ or RFP without written consent of the Engineer. In addition, subconsultants and subcontractors not identified in the RFQ or RFP 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 submittal shall not perform any work without written consent by the Engineer. Failure to comply with this requirement may be justification for removing the Team from further consideration for this project and disqualification from submitting on future Design Build Projects.

The Department shall prequalify all firms for the work they are identified to perform. Design firms and Natural Systems firms are prequalified by the particular office performing the work. If the work shall be performed by an office other than the one that is prequalified that office shall be prequalified prior to any design submittals.

ETHICS POLICY

Employees employed by the Design Build Team or employees employed by any subconsultant for the Design Build Team to provide services for this project shall comply with the Department’s ethics policy. Failure to comply with the ethics policy will result in the employee's removal from the project and may result in removal of the Company from the Department’s listing of Registered Qualified Engineering Firms.

APPROVAL OF PERSONNEL

The Department will have the right to approve or reject 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 State during the time of this contract, without written consent of the State.

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 State. The restriction period shall be for the duration of the contracted project with which the person was involved. *Former Involvement* shall be defined as active participation in any of the following activities:

Drafting the contract
Defining the 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 Secretary and approved by the Board of Transportation.

Failure to comply with the terms stated above in this section shall be grounds for termination of this contract and/or not being considered for selection of work on future contracts for a period of one year.

SUBMITTAL OF PROPOSALS

GENERAL

Technical and Price Proposals will be accepted until **4:00 P.M. Local Time on Tuesday September 7, 2004**, at the office of the Contract Officer, 1020 Birch Ridge Drive, Century Center Complex Bldg. B, Raleigh, NC. No Proposals will be accepted after the time specified.

Proposals shall be submitted in 2 separate, sealed parcels containing the Technical Proposal in one and the Price Proposal in the other parcel.

TECHNICAL PROPOSAL

Technical Proposals shall be submitted in a sealed package. The outer wrapping shall clearly indicate the following information:

Technical Proposal
Submitted By: (Design Build Team's name)
Contract Number C201235
TIP Number R-2248F
Mecklenburg County
I-485 (Charlotte Outer Loop) from West of I-77 to SR 1143

Technical Proposal Requirements

- 8 Copies
- 8 ½ inch by 11 inch pages
  - No fold-out sheets allowed
- Printed on one side only
- Double-spaced
- Font size 12
- No more than 50 pages,
  - excluding the 11 inch by 17 inch appropriate plan sheets

Key Project Team members, identified in the Request For Qualifications, shall not be modified in the Technical Proposal without written approval of the Department. Any such request should be sent to the attention of Mr. Randy Garris, P.E., at the address below:

NCDOT-Project Services Unit
Century Center-Building B
1020 Birch Ridge Drive
Raleigh, NC 27610

PRICE PROPOSAL

Price Proposals shall be submitted in a sealed package. The outer wrapping will clearly indicate the following information:

Price Proposal
Submitted by (Design Build Team's Name)
Contract Number C201235
TIP Number R-2248F
Mecklenburg County
I-485 (Charlotte Outer Loop) from West of I-77 to SR 1143

The Price Proposal shall be submitted by returning the Design Build Package with the item sheets completed, and all required signatures and bonds. Failure to execute the required documents may render the proposal non-responsive.

EVALUATIONS

Technical proposals shall address the technical elements of the design and construction of the project. The Technical Review Committee will consider the understanding of the project, the anticipated problems and the solutions to those problems.

The Design Build Team's Technical Proposal shall be developed using narratives, tables, charts, plots, drawings and sketches as appropriate. The purpose of the Technical Proposal is to document the firm's understanding of the project, their selection of appropriate design criteria, and their approach for completing all design and construction activities.

The award of the design build contract does not in any way imply that the Department accepts or approves the details of the technical proposal submitted by the Design Build Team. Decisions based on cost alone will not establish the design standards for the project. The proposal will be evaluated in each of the following areas:

	EVALUATION FACTOR	POINTS
1.	Responsiveness to Request for Proposal	35
2.	Schedule and Milestones	30
3.	Innovation	10
4.	Maintenance of Traffic and Safety Plan	20
5.	Oral Interview	5

TECHNICAL PROPOSAL EVALUATION CRITERIA

1. **Responsiveness to RFP – 35 points**

Design Build Team Management – 20 points

- Describe the Design Build Team's concept of design management. The proposal shall identify key positions and subordinate organizational units.
- Describe the plan for the coordination of civil/structural, utilities, traffic maintenance, constructability and environmental responsibility.
- Provide a narrative description of the proposed location of the design office(s).
- Describe how the designs developed by different firms and offices will be integrated.
- Describe how design personnel will interface with the construction personnel.
- Describe the overall strengths of the Design team and their ability to fulfill the design requirements of this project.

Quality Management

- Describe how the Design Build Team will comply with the quality control requirements for both design and construction. Specifically, include a narrative describing the Design Build Team's understanding of the Department's construction quality control philosophy for this project and how the Design Build Team will implement it.
- The Design Build Team shall provide a schedule indicating the minimum number of inspectors that will be supplied at different stages during the project duration.
- The narrative shall include both design and construction activities.

- Detail all additional warranties and/or guarantees provided beyond that required under the Twelve Month Guarantee provision.
-

Construction Management

- Describe the Design Build Team's concept of the project construction management organization and how it interrelates with the other elements of the Design Build Team's organization for the project.
- Provide a brief narrative description of the Design Build Team's proposed plan for performing construction on the project. This description shall include at least the following:
    - A construction organization chart for the project, showing the relationships between functions shown on the chart and the functional relationships with subcontractors.
    - The chart shall indicate how the Design Build Team intends to divide the project into work segments to enable optimum construction performance.
    - Descriptions of those categories of work that the Design Build Team anticipates will be performed by the Design Build Team's own direct labor force and those categories that will be performed by subcontractors.
    - The Design Build Team's plans and procedures to insure timely deliveries of materials to achieve the project schedule.
    - Describe the overall strengths of the construction team and their ability to fulfill the construction management requirements of this project.

Disadvantaged or Minority and Women's Business Enterprises (DB/MB/WB)

- Describe the Design Build Team's approach to ensuring that DB/MB/WB will have opportunity to participate in the design and in the Construction Engineering and Inspection (CEI) aspect of the project.
- DB/MB/WB firms to be utilized in the design and the CEI work (if applicable) shall be noted in the submittal for this RFP.
- It is expected that DB/MB/WB design and CEI firm participation will be at least 5% of the overall design and CEI cost.
- The overall approach to ensuring DB/MB/WB participation in all areas of work also needs to be addressed.

Natural Environmental Responsibility – 5 Points

- Describe the Design Build Team's approach to addressing environmental concerns within the project boundaries.
- Identify efforts to minimize impacts on wetlands, streams, riparian buffers, and other environmentally sensitive areas.
- Identify innovative approaches to minimize any impacts in environmentally sensitive areas. Describe any temporary impacts and associated minimization approaches.
- Identify methods of construction in wetlands and buffers.

Design Features – 10 points

- Show plan view of design concepts with key elements noted.

- Identify preliminary horizontal and vertical alignment of all roadway elements.
- Show typical sections for the mainline of the project.
- Identify drainage modifications and designs to be implemented.
- Identify the appropriate design criteria for each feature if not provided.
- Identify any deviations, including proposed design exceptions, from the established design criteria that will be utilized. Explain why the deviation is necessary. Describe any Geotechnical investigations to be performed by the Design Build Team.
- Identify any special aesthetics considerations that will be part of the design.
- Describe the general approach to the design and incorporation of the ITS components of the project.
- Describe how any utility conflicts will be addressed and any special utility design considerations

2. Schedule and Milestones – 30 points

Provide a schedule for the project including both design and construction. The schedule shall show the sequence and continuity of operations, as well as the month of delivery of usable segments of the project.

The schedule shall also include the Design Build Team's final completion date and, if proposed, their substantial completion date. These dates shall be clearly indicated on the Project Schedule and labeled "Final Completion Date" and "Substantial Completion Date".

3. Innovation – 10 points

Identify any aspects of the design or construction elements that the firm considers innovative. Include a description of alternatives that were considered whether implemented or not.

4. Maintenance of Traffic and Safety Plan – 20 points

- Describe any traffic control requirements that will be used for each construction phase.
- Describe how traffic will be maintained as appropriate and describe the Design Build Team's understanding of any time restrictions noted in the RFP.
- Specifically describe how business and residential access will be maintained, if applicable.

Safety Plan

- Describe the safety considerations specific to the project.
- Discuss the Design Build Team's overall approach to safety.

5. Oral Interview – 5 points

Content

- The Design Build Team's Project Management Team shall present a brief introduction of the project team and design/construction approach.
- Introductory comments shall be held to no more than 15 minutes.
- The Department will use this interview to ask specific questions about the team's background, philosophies, and approach to the project.
- Presentation, questions, and answers shall not exceed 90 minutes. No more than 8 people from the Design Build Team may attend.

The Department will use the information presented in the oral interview to assist in the evaluation of the technical proposal.

SELECTION PROCEDURE

There will be a Technical Review Committee (TRC) composed of Project Managers, and three or more senior personnel from involved engineering groups that will evaluate the Technical Proposal on the basis of the criteria provided in the Design Build Package.

The selection of a Design Build Team will involve both technical quality and price. The technical proposals will be presented to the TRC for evaluation. The TRC shall first determine whether the proposals are responsive to the requirements of the Design Build Package. Each responsive technical proposal shall be evaluated based on the rating criteria provided in the Design Build Package. The TRC will submit an overall technical proposal score for each firm to the Manager of the Contract Office. A maximum quality credit percentage will be assigned for each project, as determined by the TRC.

Quality Credit Evaluation Factors for Technical Proposals

Responsiveness to Request for Proposal	35
Schedule and Milestones	30
Innovation	10
Maintenance of Traffic and Safety Plan	20
Oral Interview	5
Maximum Score	100

The Manager of the Contract Office will use a table based on the maximum quality credit percentage to assign a Quality Credit Percentage to each proposal based on the proposal's overall technical score. The maximum percentage for this project will be 25%.

Quality Credit Percentage for Technical Proposals

Technical Score	Quality Credit (%)	Technical Score	Quality Credit (%)
100	25.00	84	11.67
99	24.17	83	10.83
98	23.33	82	10.00
97	22.50	81	9.17
96	21.67	80	8.33
95	20.83	79	7.50
94	20.00	78	6.67
93	19.17	77	5.83
92	18.33	76	5.00
91	17.50	75	4.17
90	16.67	74	3.33
89	15.83	73	2.50
88	15.00	72	1.67
87	14.17	71	0.83
86	13.33	70	0.00
85	12.50		

If any of the technical proposals were considered non-responsive, the manager of the Contract Office will notify those Design Build Teams of that fact. The Manager of the Contract Office shall publicly open the sealed price proposals and multiply each Design Build Team's price proposal by the Quality Credit Percentage earned by the Design Build Team's technical proposal to obtain the Quality Value of each Design Build Team's technical proposal. The Quality Value will then be subtracted from each Design Build Team's price proposal to obtain an Adjusted Price based upon Price and Quality combined. Unless all proposals are rejected, the Department will recommend to the State Transportation Board that the Design Build Team having the lowest adjusted price be awarded the contract. The cost of the design build contract will be the amount received as the price proposal.

The following table shows an example of the calculations involved in this process.

As Example of Calculating Quality Adjusted Price Ranking

Proposal	Technical Score	Quality Credit (%)	Price Proposal ($)	Quality Value ($)	Adjusted Price ($)
A	95	20.83	3,000,000	624,900	2,375,100
B	90	16.67	2,900,000	483,430	2,416,570
C *	90	16.67	2,800,000	466,760	2,333,240
D	80	8.33	2,700,000	224,910	2,475,090
E	70	0.00	2,600,000	0	2,600,000
* Successful Design Build Team – Contract Cost $2,800,000					

Best and Final Offer

In the event initial cost proposals exceed the Department's budget for the project or if the Department feels it is necessary for any reason the Department may choose to make amendments to the details of the RFP and request a Best and Final Offer from all of the previously shortlisted teams. Alternately, the Department may choose to redistribute to the shortlisted firms another RFP for the project with no amendments to the RFP scope.

After receipt of the redistributed RFP, the Design Build Team has the option of changing their Technical Proposal details. If the Design Build Team changes any component of the Technical Proposal, the TRC will review those amended components of the Technical Proposal and reevaluate the scores accordingly. The Design Build Team shall highlight the changes to bring them to the Department's attention. A revised total score will be calculated, if appropriate, based on these amendments to the Technical Proposal.

Additional oral interviews will not be held. The Design Build Teams will submit both a revised Price Proposal and a revised Technical Proposal (if applicable) at the time, place, and date specified in the redistributed RFP. A revised Quality Value (if required) and Adjusted Price will be determined as elsewhere in the RFP. This will constitute the Design Build Team's Best and Final Offer. Award of the project may be made to the team with the lowest adjusted price on this Best and Final Offer for the project.

Stipend

A stipulated fee of $ 25,000 will be awarded to each Design Build Team on the short-list who provides a responsive, but unsuccessful, proposal. If a contract award is not made, all responsive Design Build Teams shall receive the stipulated fee. The stipulated fee shall be paid to eligible Design Build Teams within ninety days after the award of the contract or the decision not to award. Once award is made, unsuccessful Design Build Teams will be notified of the opportunity to apply for the stipulated fee. If the Design Build Team accepts the stipulated fee, the Department reserves the right to use any ideas or information contained in the proposals in connection with any contract awarded for the project, or in connection with any subsequent procurement, with no obligation to pay additional compensation to the unsuccessful Design Build Teams. Unsuccessful Design Build Teams may elect to refuse payment of the stipulated fee and retain any rights to its proposal and the ideas and information contained therein.

ROADWAY DESIGN SCOPE OF WORK

- Design and construct I-485 (Charlotte Outer Loop) from West of I-77 to SR 1143 (Brown-Grier/Arrowood Road). Widen the existing divided facility by providing for one lane in the median in both directions with a 46-foot median. In addition to these new 12 ft. lanes, the resulting typical section shall have 14 ft. median shoulders, 12 ft. of which is a full depth paved shoulder. These paved shoulders shall be constructed as future lanes with appropriate cross slope. The resulting typical section shall be constructed the full length of the project. The eastern terminus of the project will be the end of the western approach slabs for the I-485 dual structures over I-77. The western terminus of the project will be the start of the existing 6-lane section immediately West of the Arrowood Road Bridge over I-485.

- The proposed design shall adhere to a 70-mph design speed for rolling freeway facilities. Include all other proposed design criteria in the technical proposal. All design criteria must be approved by the Department prior to the submittal of preliminary plans. A geometric profile is not required.

- Design and construct a modification to the existing Eastbound I-485 off ramp to I-77. Modify the existing off ramp to a two lane exit with one lane dedicated to the I-77 Northbound flyover bridge and the other dedicated to the I-77 Southbound on ramp. Any widening to the outside proposed to accomplish this modification shall be done without the need to acquire a permit. The Design Build Team should include a proposed typical section(s) of this off ramp in the technical proposal.

- If intending to include the existing paved median shoulders in the final typical section, all associated design exceptions, drainage modifications and rideability assurances (grinding, profilograph, etc.) will be the responsibility of the Design Build Team and shall be clearly noted in the Technical Proposal.

- The design shall be in accordance with the 2001 AASHTO *A Policy on Geometric Design of Highways and Streets*, January 2002 NCDOT *Roadway Standard Drawings*, NCDOT 2002 *Roadway Design Manual*, *Roadway Design Policy and Procedure Manual*, NCDOT *Guidelines for Roadway Design Activities*, January 2002 North Carolina *Standard Specifications for Roads and Structures*, and the *AASHTO Roadside Design Guide* 2002.

- If the NCDOT *Roadway Design Manual*, the 2001 AASHTO *A Policy on Geometric Design of Highways and Streets*, the January 2002 NCDOT *Roadway Standard Drawings* and/or any other guidelines, standards or policies have desirable and/or minimum values, the Design Build Team shall use the desirable values. Similarly, in case of conflicting design parameters in the various resources, the proposed design shall adhere to the most conservative values.

- If the Design Build Team anticipates a design exception in their proposed design, it shall be clearly indicated in the technical proposal. Prior to requesting/incorporating a design exception, the Design Build Team must obtain prior approval from the Department. If approval is obtained, the Design Build Team will be responsible for the development and approval of all design exceptions.

- The Department will provide copies of the CE (Categorical Exclusion) and all pertinent approvals and correspondence. No environmental commitments are anticipated.

- The project shall follow the NCDOT-FHWA Oversight Agreement. The NCDOT shall provide this Agreement. Any changes that affect previous approvals shall be re-submitted by the Design Build Team for FHWA approval.

- It is anticipated that all construction will be performed within the existing right of way. Any additional design or construction methods that require additional right of way and/or easements including but not limited to hydraulic recommendations and traffic control measures shall be the responsibility of the Design Build Team and shall be detailed in the technical proposal.

- Guardrail or Cable guiderail placement shall be in accordance with NCDOT standard drawings and/or approved details in lieu of standards.

- The Design Build Team shall identify the need for any special roadway design details (e.g. drainage structures, rock embankment, rock plating, guardrail, retaining walls, concrete barriers, etc.) and shall provide special design drawings. If available, the NCDOT will provide special details to the Design Build Team upon request. All special details shall be reviewed and approved by the Department prior to their incorporation in the project. The Design Build Team shall refer to the list of details to be used in lieu of standards located at www.ncdot.org/business/.

- Final pavement designs are provided. Reference the Pavement Design Scope of Work. The Design Build Team will be responsible for all temporary pavement designs.

- The Design Build Team shall develop construction plans using the current version of Microstation and Geopak software required by NCDOT and shall be in english units. The plans shall follow NCDOT CADD standards including but not limited to NCDOT's file naming convention, leveling chart, and file folder structure. These standards can be found on the Engineering Guidelines web page: www.doh.dot.state.nc.us/guidelines/.

- The Design Build Team shall provide 8 hard copies of all submittals directly to the Project Services Unit. Half size plans are not acceptable; half size cross-sections are acceptable. Submit electronic plans electronically when requested. The submittals shall be as follows:

  - Preliminary Plans
  - Right of Way Plans
  - Final Plans - summary sheets and quantity sheets are not required
  - Released for Construction (RFC) Plans (signed and sealed – not for review)

- All submittals must adhere to the NCDOT Review requirements for Preliminary, Right of Way and Final Plans located at www.doh.dot.state.nc.us/guidelines/. The Design Build Team shall use the Department's *Guidelines for Roadway Design Activities* for specific requirements for each of these submittals.

- The Design Build Team shall provide a copy of the final plans in both electronic and hard copy form. All final designs shall be signed and sealed by a professional engineer registered in the state of North Carolina.

- Electronic surveys will be furnished to the Design Build Team. All supplemental surveys, including but not limited to, additional topography, existing and proposed roadway, structure sites, underground and overhead utilities, existing and proposed drainage, wetland delineation, right of way, parcel names, and deed research and descriptions shall be the responsibility of the Design Build Team to acquire and process.

- The Design Build Team shall assume full responsibility for the project design, including the use of portions of the NCDOT's designs.

HYDRAULICS SCOPE OF WORK

- All 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.*

- The Design-Build team shall employ a private engineering firm to perform hydraulic design for all work required under this contract. Private engineering firms must be prequalified under the Department's normal prequalification procedures prior to bid submission.

- Perform an analysis of the existing crosspipes and median drainage. If the existing crosspipes are found to be insufficient, the Design Build team shall make recommendations, in their Technical Proposal, what corrective measures are required. The Design Build team will be responsible for all work needed to upgrade the existing crosspipe drainage system.

PAVEMENT DESIGN SCOPE OF WORK

The pavement design for the mainline widening and mainline inside paved shoulders will consist of the following:

12.0" doweled jointed concrete pavement
4.0" PADL
1.0" SF9.5A
Subgrade Stabilization

(Match joint spacing with existing concrete pavement)

The Design-Builder may 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.

If a dowel bar inserter is used, the Design-Builder will provide equipment that will document dowel bar location and alignment. Dowel bar locations and alignment will be verified each time the Design-Builder mobilizes for paving. Twenty percent of the joints in the initial 1.0 mile will be evaluated at randomly selected locations.

If mislocated dowels are detected, an additional 25 percent of the dowel locations will be checked. If mislocated dowels are detected in the additional 25%, NCDOT will have the option of suspending the use of the selected method, and requiring the team to use the alternate method.

If mislocated dowel bars are not detected in the initial 20%, the Design-Builder will evaluate 10% of the remaining dowel bar locations at random intervals.

Subgrade stabilization will be to a depth of 8 inches for lime and 7 inches for cement. The type of subgrade stabilization and amount of stabilizing agent will be determined in accordance with the "Cement and Lime Stabilization of Subgrade Soils" scope of work found elsewhere in this Design Build Package. Typically, projects adjacent to this one have been stabilized with lime.

The Design/Build team will be responsible for the design of all temporary pavements and for evaluation of existing shoulders regarding their suitability for carrying traffic during construction, if necessary. Temporary pavements will 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 comment using the contract submittal process. The expected duration for traffic on temporary pavement must be included as part of the submittal.

The Design/Build team will be responsible for design of continuous shoulder drains and outlets for the mainline on the median sides. The shoulder drain design and outlet locations are to be submitted for review and comment using the contract submittal process. The shoulder drain design will be according to Standard Drawing 816.02 of the *Roadway Standard Drawings*, NCDOT. The existing median shoulder drain should be removed prior to constructing the widening.

GEOTECHNICAL ENGINEERING SCOPE OF WORK

I. GENERAL:

Obtain the services of a firm prequalified for geotechnical work from the Highway Design Branch List. The prequalified geotechnical firm should prepare a design recommendation report for use in designing roadway foundations. The prequalified geotechnical firm should also determine if additional subsurface information is required based upon the subsurface information provided by NCDOT and the final roadway designs. Perform any additional subsurface investigation and laboratory testing in accordance with the current NCDOT *Geotechnical Unit Guidelines and Procedure Manual*.

II. DESCRIPTION OF WORK:

Design embankments, slopes, and temporary structures in accordance with the current allowable strength design AASHTO *Standard Specifications for Highway Bridges*, NCDOT *Structure Design Manual*, NCDOT *Roadway Design Manual* and the Geotechnical Engineering Unit *Roadway and Structure Foundation Guidelines*.

A. Roadway Foundations

Design all unreinforced fill slopes for a slope of 2:1 (H:V) or flatter except bridge end bent slopes (see Section A) and a minimum stability factor of safety of 1.3. Design all cut slopes for a slope of 1.5:1 (H:V) or flatter and a minimum stability factor of safety of 1.5. Use limiting equilibrium methods, such as Modified Bishop, Simplified Janbu, Spencer or any other generally accepted method for slope stability analysis.

Design and construct embankments such that a minimum of 90% of primary consolidation occurs after the embankment has reached finished grade. Embankment monitoring in accordance with the Embankment Monitoring Special Provision and the Standard Settlement Plate Detail is required when a waiting period of more than one month is recommended. Two settlement plates are required at each location. Space settlement plate locations no more than 200 feet (61 meters).

B. Temporary Structures

Design temporary retaining structures in accordance with Section 4 of the 1995 or current allowable stress design AASHTO *Guide Design Specifications for Bridge Temporary Works* and the NCDOT Temporary Shoring for Maintenance of Traffic Special Provision. Submit a "Standard Shoring Selection Form" for all standard sheeting designs.

Design and construct temporary retaining walls in accordance with the applicable NCDOT *Project Special Provision*. For temporary retaining walls, do not place a barrier within 5 feet (1.5 meters) of the face of the wall. If the barrier is between 5 and 9 feet (1.5 to 2.7 meters) from the face of the wall, anchor the barrier in accordance with Roadway Standard Detail No. 1170.01.

III. SUBMITTALS:

Submit all roadway foundation design recommendation reports and temporary structure designs for review. A roadway foundation design recommendation report is required for the entire project. Seal all foundation design recommendation reports, plans, special provisions and calculations by a registered professional engineer licensed in the state of North Carolina.

IV. CONSTRUCTION REQUIREMENTS:

All construction and materials must be in accordance with the NCDOT 2002 *Standard Specifications* and current NCDOT *Project Special Provisions*. The D/B team is responsible for investigating and proposing remedial measures for any construction problems related to subgrades, settlement, slopes, and construction vibrations. The NCDOT Geotechnical Engineering Unit will review and approve these proposals.

Do not allow vibratory compaction of fill within 100 feet (30 meters) of any existing structure. If these requirements can not be met or damage occurs to any existing structure, employ the services of a qualified private engineering firm experienced in the effects of construction on existing structures to do a study of the structure's response to vibration. The purpose of this study is to set vibration limits to avoid damage to the existing structure and provide modifications to construction methods as necessary. Any existing structure is not intended to include existing bridges unless they are historic or will remain in service upon completion of construction. Existing bridges used for detours that will be taken out of service upon completion of construction should be protected from vibration damage to the extent necessary for the safety of the traveling public.

The prequalified geotechnical firm that did the roadway foundation design must review the embankment monitoring data a minimum of once a month. Waiting periods may not be ended until less than 0.1 inches (2.5 mm) of settlement is measured over a period of four weeks.

Geotechnical Engineering Unit
ROADWAY FOUNDATION GUIDELINES

The geotechnical firm is responsible for (but not limited to) addressing the following items for the roadway foundation design of the project.

1. Analyze the stability of embankments and utilize recognized geotechnical engineering designs and construction methods to ensure embankment stability.
2. Analyze embankment settlement and if necessary, recommend mitigation through the use of undercut or soil improvement methods such as surcharges, waiting periods, wick drains, etc.
3. Address the following regarding embankment problems:
    a. The feasibility of using geo-textiles to achieve stability, reduce excavation of soft soils and reduce the effect of settlement on the roadway.
    b. The need for settlement gages, slope inclinometers and other embankment monitoring devices and their placement and location.
4. Determine the feasibility and recommend types of shoring for temporary situations. Design all shoring in accordance with the current allowable stress design AASHTO *Standard Specifications for Highway Bridges* and applicable FHWA manuals.
5. Determine amount of and recommend methods to mitigate any differential settlement problems at locations of culverts and utilities.
6. Analyze the stability of cut sections. Utilize recognized geotechnical engineering designs and construction methods to ensure cut slope stability.

The geotechnical firm's attention is directed to the latest design guide entitled *Soils and Foundations Workshop Manual*, NHI Course No. 13212, Publication No. FHWA HI-88-009, published by the FHWA.

CEMENT AND LIME STABILIZATION OF SUB-GRADE SOILS

GENERAL

The scope of work consist of the following:

1. Sampling Sub-grade soils
2. Conducting Laboratory tests to determine:
   a. Soil classifications
   b. Moisture-density Characteristics
   c. Quantity of lime or cement required to achieve specified strengths
3. Designating areas to be stabilized by either lime or cement and the required rates of application.
4. Conducting field tests to determine unconfined compressive strength

SAMPLING

Take soil samples, after project has been graded to within 2 inches (50mm ± of final sub-grade elevation. Sample top 8 inches (200 mm) at a minimum frequency of one sample per 985 feet (300 linear meters), per each lane, for classification tests and one sample per 3280 feet (1000 linear meters), per each lane, for moisture density tests and lime or cement mix design tests in each lane. Additional samples may 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

Perform the following tests to determine AASHTO classifications of different soils in accordance with AASHTO specifications as modified by NCDOT. Copies of these modified procedures can be obtained from Materials and Test Unit's Soil Sub-unit.

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, perform the Moisture Density Tests, using either lime or cement. Use 10% cement by weight in soil cement, 4% lime by weight, in soil-lime mixtures. Conduct the tests in accordance to AASHTO T-99, and T-134 for soil-lime and soil-cement mixtures respectively. In each case 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

Use cement for all soils meeting criteria in Column "A"
Use Lime for all soils meeting criteria in Column "B"
Designer can 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

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° (23°C ±1.5°) and a humidity of 100%. At the end of curing period, immerse the specimens in water for 4 hours, after immersion test the specimens using the unconfined Compressive Strength test (AASHTO T 208 Section 7). Report the maximum strength obtained and the percent strain corresponding to it. Select the rate of cement that provides a minimum unconfined Compressive Strength of 200PSI (1400 KPA) and a maximum of 350 PSI (2400 KPA).

SOIL LIME MIXTURES

The procedure for soil lime mixtures is similar to soil cement with the following exceptions:

1. The quantity of lime required is in the rage of 3.5 to 6.5 percent by weight.
2. Compact specimens to a minimum density of 95% of maximum dry density obtained by AASHTO T99.
3. Do not immerse the specimens in water at the end of the curing period.
4. Select the rate of lime that provides a minimum unconfined compressive strength of 58 PSI (400 KPA).

SUBMITTALS FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION

1. Submit all laboratory test results for review.
2. 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.
3. Submit any other documentation that would support recommendations made in 2 above.

CONSTRUCTION OF LIME TREATED SUBGRADE

Construct the lime treated sub-grade as specified in Section 501 of the North Carolina Department of Transportation *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

Construct the soil cement sub-grade as specified in section 542 of the North Carolina Department of Transportation *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

Allow a minimum of seven days curing before testing for strength. Test lime stabilized sub-grades using Dynamic Cone Penetrometer. Sketch of the design of this equipment and testing procedures can be obtained from NCDOT Geotechnical Unit. Required unconfined compressive strength for lime is 58 PSI (400 KPA). For Cement stabilized sub-grades, make field specimens, cure them for seven days and test them in the laboratory. Required unconfined compressive strength for soil cement is 200 PSI (1400 KPA). In both cases one test will be required for every 443 feet (135 meters) per 12.5 feet (3.8 meters) lane, at random locations selected using random number tables.

SUBMITTALS FOR REVIEW DURING CONSTRUCTION

Submit unconfined compressive strength test results for review.

EROSION AND SEDIMENTATION CONTROL SCOPE OF WORK

Erosion and Sedimentation Control Plans should at minimum address the following:

I. Complete Set of Plans

A. Clearing and grubbing phase

1. Use correct NCDOT symbology
2. Utilize adequate perimeter controls (temporary diversions, silt fence, etc.)
3. Utilize rock measures w/ sediment control stone @ drainage outlets
4. Take into account existing topography and show contour lines
5. Protect existing streams
6. Need adequate silt storage for 1800(2400 for High Quality Water/Environmentally Sensitive Areas) cubic feet per disturbed acre (127(170 for High Quality Water/Environmentally Sensitive Areas) cubic meters per disturbed hectare) and sediment basins should be sized with surface area equal to .01 times the peak inflow rate using 10-year(25-year for High Quality Water/Environmentally Sensitive Areas) peak runoff data(NCDENR-*Land Quality's Erosion and Sediment Control Planning and Design Manual*)
7. Design Riser Basins to the following standards:
   a. Surface Area should be determined by Equation A(sq. ft.) = Q10(cfs) * 435.6
   b. Riser Pipe should have a cross-sectional area 1.5 times that of the barrel pipe
   c. Perforations in the riser pipe should be reduced to increase dewatering time to twenty-four(24) hours

B. Intermediate and final grade phases

1. Use correct NCDOT symbology
2. Protect proposed inlets with RIST-A, RIST-C, PIST-A, etc.
3. Utilize temp. slope drains and earth berms at top of fill slopes 10 ft or higher or where there are super elevations above .04 and fills are greater than 5 ft
4. Utilize rock energy dissipater at outlet of slope drain
5. Devices at all drainage turnouts should utilize sediment control stone (TRSD-B, TRSC-A, etc.)
6. Need adequate silt storage for 1800(2400 for High Quality Water/Environmentally Sensitive Areas) cubic feet per disturbed acre (127(170 for High Quality Water/Environmentally Sensitive Areas) cubic meters per disturbed hectare) and sediment basins should be sized with surface area equal to .01 times the peak inflow rate using 10-year(25-year for High Quality Water/Environmentally Sensitive Areas) peak runoff data (NCDENR-*Land Quality's Erosion and Sediment Control Planning and Design Manual*)
7. Show matting on all ditch lines (non-jurisdictional streams) with 1.25% grade or larger and all cut/fill slopes 2:1 or greater where it is difficult to establish vegetation and/or slope failure is occurring
8. Show erosion control for period between Clearing & Grubbing and Final Grade

9. Design Riser Basins to the following standards:
   a. Surface Area should be determined by Equation A(sq. ft.) = Q10(cfs) * 435.6
   b. Riser Pipe should have a cross-sectional area 1.5 times that of the barrel pipe
   c. Perforations in the riser pipe should be reduced to increase dewatering time to twenty-four(24) hours

II. Detail Sheets and Notes
   A. Reforestation sheet(s): regular, wetland, streambank showing appropriate species
   B. Construction entrance detail
   C. Special details and notes

III. Title Sheet
   A. Show correct notes: HQW, ESA, critical habitat, clearing and grubbing, etc.
   B. Show correct standards for project
   C. List of standard NCDOT symbology

IV. Special Provisions
   A. Included as an attachment to this scope are the NCDOT Special Provisions that may be applicable to the Erosion and Sedimentation Control Plans. All included Special Provisions may or may not be needed and additional special provisions may be necessary.

V. Miscellaneous
   A. Plan submittal must include all pertinent design information required for review, such as

   design calculations, drainage areas, etc.
   B. The NCDOT Roadside Environment Unit (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 tool palette to the Designer/Planner for reference if requested.
   C. Plans must address any environmental issues raised during the permitting process.
   D. Sufficient time must be allowed for the Designer/Planner to make any changes to the Erosion and Sedimentation Control Plans deemed necessary by the NCDOT REU.
   E. All Erosion and Sedimentation Control plans must be approved by the NCDOT REU before **any** land disturbing activities can commence.
   F. 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.
   G. Borrow or waste areas that are part of the project will require a separate Erosion and Sedimentation Control 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).
   H. Whenever the Engineer determines that significant erosion and sedimentation continues despite the installation of approved protective practices, the Design-Builder will be required to and shall take additional protective action.
   I. Final Grade Erosion Control Plans are final only if Roadway Drainage Design has been completed and finalized.

J. An approved Erosion and Sedimentation Control Plan Does Not Exempt the Builder from Making Every Effort to Contain Sediment Onsite.

K. Any Erosion Control Design revisions made during the construction of the project should be submitted to REU by the 15th of the month. At anytime the Engineer or the Roadside Environmental Unit can request the contractor to provide an updated version of the erosion control plan from the Erosion Control Designer for distribution to all parties involved in the construction process

L. The contractor shall comply with the North Carolina *Administrative Code Title 15 A Department of Environment and Natural Resources* Chapter 4, Sediment Control.

M. A pre-design meeting must take place between the REU Soil & Water Engineering Section, the Design-Builder, and any other pertinent DOT personnel before Erosion Control Design begins.

VI. Submittal Requirements shall include, but not be limited to:

A. 90% Submittal
   1. 1 Full size bond copy
   2. 1 Half size set of final cross sections
   3. 1 set of design calculations and all other pertinent design information

B. 100 % Submittal
   1. 1 Full size bond copy
   2. 1 set of design calculations and all other pertinent design information

C. RFC
   1. 3 Half size bond copies

No Violations of Laws, Ordinances, Orders or Decrees:

The Design-Builder shall abide by all environmental laws, ordinances, orders or decrees and not be issued Notices of Violations (NOV) nor Cease and Desist (C&D) orders by regulatory agencies. In addition the Design-Builder shall conduct construction activities such that the Department erosion control compliance inspections do not result in the issuance of Immediate Corrective Action (ICA) reports by the Field Operations Engineer or his designated representative.

Erosion Control Liquidated Damages:

The Design-Builder shall take all reasonable precaution 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-Builder's negligence, carelessness, or failure to implement the erosion and sediment control plan and specifications, will be deducted from monies due the Design-Builder on his contract. 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-Builder's negligence, carelessness, or failure to

implement the erosion and sediment control plan and specifications, will be deducted from the monies due to the Design-Builder.

Seeding And Mulching (6)

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

August 1 - June 1		May 1 - September 1	
100# (110kg)	Tall Fescue	100# (110kg)	Tall Fescue
15# (17kg)	Kentucky Bluegrass	15# (17kg)	Kentucky Bluegrass
15# (17kg)	Hard Fescue	15# (17kg)	Hard Fescue
500# (560kg)	Fertilizer	25# (28kg)	Kobe or Korean Lespedeza
4000# (4500kg)	Limestone	500# (560kg)	Fertilizer
		4000# (4500kg)	Limestone

Approved Tall Fescue Cultivars:

Adventure	Adventure II	Amigo	Anthem
Apache	Apache II	Arid	Austin
Brookstone	Bonanza	Bonanza II	Chapel Hill
Chesapeake	Chieftain	Coronado	Crossfire II
Debutante	Duster	Falcon	Falcon II
Finelawn Petite	Finelawn	Finelawn I	Genesis
Grande	Guardian	Houndog	Jaguar
Jaguar III	Kentucky 31	Kitty Hawk	Monarch
Montauk	Mustang	Olympic	Pacer
Phoenix	Pixie	Pyramid	Rebel
Rebel Jr.	Rebel II	Renegade	Safari
Shenandoah	Tempo	Titan	Tomahawk
Trailblazer	Tribute	Vegas	Wolfpack
Wrangler			

Approved Kentucky Bluegrass Cultivars:

Adelphi	Baron	Bristol	Challenger
Columbia	Fylking	Glade	Kenblue
Merit	Plush	Ram I	Rugby
Sydsport	Touchdown	Vantage	

Approved Hard Fescue Cultivars:

Aurora	Bardur	Crystal	Reliant	Scaldis
Spartan	Valda	Waldina	Warwick	

On cut and fill slopes 2:1 or steeper add 25# (28kg) Rye Grain November 1 - March 1.

On cut and fill slopes 2:1 or steeper add 30# (35 kg) Sericea Lespedeza January 1 - December 31.

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

Temporary Seeding:

Fertilizer shall be the same analysis as specified for "Seeding and Mulching" and applied at the rate of 400 pounds (450kg) and seeded at the rate of 50 pounds per acre (55kg per hectare). Kobe or Korean Lespedeza, German Millet, or Browntop Millet shall be used in summer months and rye grain during the remainder of the year. The Engineer will determine the exact dates for using each kind of seed.

Fertilizer Topdressing:

Fertilizer used for topdressing shall be 16-8-8 grade and shall be applied at the rate of 500 pounds per acre (560 kg per hectare). Upon written approval of the Engineer, a different analysis of fertilizer may be used provided the 2-1-1 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as 16-8-8 analysis.

Supplemental Seeding:

The kinds of seed and proportions shall be the same as specified for "Seeding and Mulching", and the rate of application may vary from 25# to 75# per acre (28kg to 85kg per hectare). The actual rate per acre (hectare) will be determined by the Engineer prior to the time of topdressing and the Contractor will be notified in writing of the rate per acre (hectare), total quantity needed, and areas on which to apply the supplemental seed. Minimum tillage equipment, consisting of a sod seeder shall be used for incorporating seed into the soil as to prevent disturbance of existing vegetation. A clodbuster (ball and chain) may be used where degree of slope prevents the use of a sod seeder.

Mowing:

The minimum mowing height on this project shall be six inches (150 mm).

Specialized Seeding Under Guiderail and Guardrail (Hard Fescue/Bluegrass):

General:

Areas under guiderail and guardrail sections shall be seeded in accordance with these provisions and as directed by the Engineer. Perform the work covered by this provision including but not

limited to litter and debris removal, mowing, disposal of weeds and other unacceptable growth, grading, soil preparation and amendment, surface smoothing, seed applications, and matting installation.

Materials:

Only approved Hard Fescue and Kentucky Bluegrass seed that complies with Section 1060 of the NCDOT *Standard Specifications for Roads and Structures* shall be used.

Soil Preparation:

Remove litter and other debris. Mow and satisfactorily dispose of weeds or other unacceptable growth on the areas to be seeded.

Prior to seeding, all eroded, uneven and rough areas shall be contour graded and/or filled with soil as directed by the Engineer. The soil shall be scarified or otherwise loosened to a depth of not less than 5 inches (130 mm) with a minimum width of 48 inches (1145 mm) and a maximum width of 52 inches (1320 mm). Clods shall be broken and the top 2 to 3 inches (52 to 78 mm) of soil shall be worked into an acceptable soil bed by the use of soil pulverizers, drags, or harrows.

Soil amendments shall be as follows:

> Limestone: Limestone shall be applied at a rate of 4000 pounds (4500 Kg/Hectare) per acre.
>
> Fertilizer: Fertilizer shall be 10-20-20 analysis and applied at a rate of 500 pounds (560kg/Hectare) per acre.

After soil preparation, lime and fertilizer shall be uniformly distributed by mechanical means using a 48 inch (1065 mm) drop type spreader and thoroughly mixed with the top five inches (130 mm) of the soil by discing, harrowing, or other approved methods.

The area shall then be harrowed, dragged, raked, or prepared by other approved methods which will give a lawn type finish. All trash, debris and stones larger than 1-1/2 inch (38 mm) in diameter or other obstructions shall also be removed.
Application:

(Hard Fescue/Bluegrass) seed shall be uniformly distributed at a rate of 75 pounds per acre (85 kilograms per hectare) of Hard Fescue and 20 pounds per acre (28 kilograms per hectare) of Kentucky bluegrass by mechanical means.

Immediately following the placement of seed, the area shall be rolled or tamped carefully and firmly by means acceptable to the Engineer to ensure a smooth surface. Use of rubber tired equipment to roll shall not be allowed.

Matting:

Immediately upon completion of seeding work and herbicidal application, 48 inch wide matting shall be installed over the seeded area in accordance with Section 1631 of the Standard Specifications.

Specialized Hand Mowing:

The work covered by this section consists of specialized hand mowing around or under fixed objects, including but not limited to guardrails, signs, barriers and slopes in a method acceptable to the Engineer.

The work of specialized hand mowing shall be completed with mechanically powered trimmers, string trimmers, hand operated rotary mowers, or self-propelled mowers of sufficient size and quality to perform the work timely and efficiently.

Minimize Removal Of Vegetation

The Design-Builder shall minimize removal of vegetation at stream banks and disturbed areas within the project limits as directed by the Engineer.

Stockpile Areas

The Design-Builder shall install and maintain erosion control devices sufficient to contain sediment around any erodible material stockpile areas as directed by the Engineer.

Reforestation:

Reforestation will be planted within areas of pavement removal, in areas designated by the Engineer. Reforestation is not shown on the plan sheets. See the reforestation detail sheet.

Seasonal limitations: Seedlings shall be planted from November 15 through March 15.

Seedlings shall be planted as soon as practical following permanent Seeding and Mulching. Seedlings shall be planted in a 16 ft. (5 meters) wide swath adjacent to mowing pattern line. Root dip: The roots of reforestation seedlings shall be coated with a slurry of water, and either a fine clay ("kaolin") or a superabsorbent that is made to be used as a bare root dip. The type, mixture ratio, method of application, and the time of application shall be submitted to the Engineer for approval. With the approval of the Engineer, seedlings may be coated before delivery to the job or at the time of planting, but at no time shall the roots of the seedlings be allowed to dry out. The roots shall be moistened immediately prior to planting.

Gravel Construction Entrance:

Description:

The work covered by this section consists of furnishing, installing, and maintaining and removing any and all material required for the construction of a Gravel Construction Entrance.

Materials:

The filter fabric shall meet the requirements of Section 1056 for Type 2 Fabric.

Stone shall be Class A Stone and shall meet the requirements of Section 1042 for Stone for Erosion Control, Class A.

Construction:

The Design-Builder shall install a Gravel Construction Entrance in accordance with the details in the plans and at locations as directed by the Engineer.

Impervious Dike:

The work covered by this section consists of furnishing, installing, maintaining, and removing an impervious dike for the purpose of diverting normal stream flow around the construction site. The Design-Builder shall construct an impervious dike in such a manner approved by the Engineer. The impervious dike shall not permit seepage of water into the construction site or contribute to siltation of the stream. The impervious dike shall be constructed of an acceptable material in the locations noted on the plans or as directed by the Engineer.

Acceptable materials shall include but not be limited to sheet piles, sandbags, and/or the placement of an acceptable size stone lined with polypropylene or other impervious fabric.

Earth material shall not be used to construct an impervious dike when it is in direct contact with the stream unless vegetation can be established before contact with the stream takes place.

Temporary Pipe For Culvert Construction:

The work covered by this section consists of furnishing, installing, maintaining and removing any and all temporary pipe used on this project in conjunction with the culvert construction. The Design-Builder shall install temporary pipe in locations shown on the plans in such a manner approved by the Engineer. The temporary pipe shall provide a passage-way for the stream through the work-site. The minimum size requirements will be as stated on the Erosion and Sediment Control plans.

Special Stilling Basin(s):

The work covered by this section consists of furnishing, placing, and removing a special stilling basin(s) as directed by the Engineer. The special stilling basin(s) shall be used to filter pumped water during construction of drilled piers, or other dewatering operation.

The special stilling basin(s) shall be a water permeable fabric bag that traps sand, silt, and fines as sediment laden water is pumped into it. This device shall be constructed such that it is portable and can be used adjacent to each drilled pier, or other dewatering operation.
The special stilling basin(s) shall be a bag constructed to a minimum size of 10' x 15' made from a nonwoven fabric. It shall have a sewn-in 8 in. (maximum) spout for receiving pump discharge. The bag seams shall be sewn with a double needle machine using a high strength thread. The seams shall have a minimum wide width strength as follows:

Test Method	Minimum Specifications
ASTM D-4884	60 lb/in

The fabric used to construct the bag shall be stabilized to provide resistance to ultra-violet degradation and meet the following specifications for flow rates, strength, and permeability:

Property	Test Method	Units	Minimum Specifications
Weight	ASTM D-3776	oz/yd	8.0
Grab tensile	ASTM D-4632	lb	200.0
Puncture	ASTM D-4833	lb	130.0
Flow rate	ASTM D-4491	gal/min/sf	80.0
Permittivity	ASTM D-4991	1/sec	1.5
UV Resistance	ASTM D-4355	%	70.0

The special stilling basin(s) shall be placed so the incoming water flows into and through the bag without causing erosion. The neck or spout of the bag shall be tied off tightly to stop the water from flowing out of the bag without going through the walls.

The special stilling basin(s) shall be replaced and disposed of when it is 3/4 full of sediment or when it is impractical for the bag to filter the sediment out at a reasonable flow rate. Prior approval from the Engineer must be received before removal and replacement.

The Design-Builder shall be responsible for providing a sufficient quantity of bags to contain silt from pumped effluent during construction of drilled piers, or other dewatering operation.

Environmentally Sensitive Areas:

This project is located in an "Environmentally Sensitive Area". This designation requires special procedures to be used for clearing and grubbing, temporary stream crossings, and grading

operations within the area identified on the plans. This also requires special procedures to be used for seeding and mulching and staged seeding within the project.

Clearing and Grubbing:

In areas identified on the erosion control plans as "Environmentally Sensitive Areas", the Design-Builder may perform clearing operations, but not grubbing operations until immediately prior to beginning grading operations as described in Section 200, Article 200-1, in the Standard Specifications. The "Environmentally Sensitive Area" shall be defined as a 50 foot (16 meter) buffer zone on both sides of the stream (or depression), measured from top of streambank, (or center of depression). Only clearing operations (not grubbing) shall be allowed in this buffer zone until immediately prior to beginning grading operations. Erosion control devices shall be installed immediately following the clearing operation.

Grading:

Once grading operations begin in identified "Environmentally Sensitive Areas", work will progress in a continuous manner until complete. All construction within these areas must progress in a continuous manner such that each phase is complete and areas permanently stabilized prior to beginning of next phase. Failure on the part of the Design-Builder to complete any phase of construction in a continuous manner in "Environmentally Sensitive Areas" as specified will be just cause for the Engineer to direct the suspension of work in accordance with Section 108-7 of the Standard Specifications.

Temporary Stream Crossings:

Any crossing of streams within the limits of this project must be accomplished in accordance with Section 107-13(b) of the Standard Specifications.

Seeding and Mulching:

Seeding and mulching shall be performed in accordance with Section 1660 of the Standard Specifications and vegetative cover sufficient to restrain erosion shall be installed immediately following grade establishment.

Seeding and mulching shall be performed on the areas disturbed by construction immediately following final grade establishment. No appreciable time shall lapse into the contract time without stabilization of slopes, ditches and other areas within the "Environmentally Sensitive Areas" as indicated on the E.C. Plans.

Stage Seeding:

The work covered by this section shall consist of the establishment of a vegetative cover on cut and fill slopes as grading progresses. Seeding and mulching shall be done in stages on cut and

fill slopes which are greater than 20 feet (6 meters) in height or greater than 2 acres (0.8 hectares) in area. Each stage shall not exceed the limits stated above.

Culvert Diversion Channel:

Description:

Provide a culvert diversion channel to detour existing stream around the culvert construction site at locations shown on the plans. Work includes constructing diversion channel, disposing of excess materials, providing and placing filter fabric liner, maintaining diversion area in an acceptable condition, removing filter fabric liner, backfilling diversion channel area with suitable material and providing proper drainage when diversion channel area is abandoned.

Material:

Use local material or material specified on plans.

Provide filter fabric to meet requirements of Section 1056 for Type 2 fabric.

Construction requirements:

Grade channel according to plan with channel surface free of obstructions, debris, and pockets of low density material.

Utilize suitable material and provide disposal area for unsuitable material.

Line channel with fabric unrolled in the direction of flow and lay smoothly but loosely on soil surface without creases. Bury top of slope fabric edge in a trench at least five inches (125mm) deep and tamp.

Make vertical overlaps a minimum of eighteen inches (450mm) with upstream fabric overlapping the downstream fabric.

Secure fabric with eleven gauge (3.05mm) wire staples shaped into a "u" shape with a length of not less than six inches (150mm) and a throat not less than one inch (25mm) in width. Place staples along outer edges and throughout the fabric a maximum of three feet (one meter) horizontally and vertically.

Open Burning:

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

LIGHTING SCOPE OF WORK

Provide and install roadway lighting equipment and materials, in accordance with Division 1400 of the *2002 NCDOT Standard Specifications for Roads and Structures*, and the *Roadway Standard Drawings*, except as amended below. NCDOT will provide the lighting design.

Allow 10 days to update and finalize lighting design after Release for Construction (RFC) Roadway plans are complete. Provide electronic CADD files in MicroStation format, showing design changes.

Allow 10 days for Department review of each submittal for all materials including poles and foundation designs. An additional 10 days may be required for pole submittals from vendors that do not commonly do business with the Department.

Maintain the lighting system until the project is accepted.

See Traffic Control Scope of Work for time restrictions and lane closure requirements.

MATERIALS

HIGH MOUNT STANDARD

Provide High Mount Standards that meet *1994 Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, and as specified in Section 1401 of the *2002 NCDOT Standard Specifications for Roads and Structures*, and the *Roadway Standard Drawings*.

HIGH MOUNT FOUNDATION

Provide and install High Mount Foundations in accordance with Section 1402 of the *2002 NCDOT Standard Specifications for Roads and Structures*, except as amended below.

Make a subsurface investigation at each high mount foundation site and provide soil-boring data in an NCDOT Standard Boring Log form. A licensed geologist or a professional engineer registered in the State of North Carolina must seal each boring log. 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 or 1 meter of final grade) is achieved. Locate each boring within 3 feet (1 m) of the center of the high mount foundation. Drill the boring to a minimum depth of 10 feet below the required high mount foundation tip elevation. Conduct Standard Penetrating Tests at 1 ft (0.3 m), 2.5 ft (0.8 m), 5 ft (1.5 m), 7.5 ft (2.3 m), 10 ft (3.0 m), and every 5 ft (1.5 m) after 10 ft (3.0 m) below the rough grade in accordance with ASTM D-1586. A boring may be terminated above the minimum depth required (10 feet or 3 meters below the tip elevation) if one of the following occurs: (a) a total of 100 blows have been applied in any 2 consecutive 6-in. (0.15 m) intervals; (b) a total of 50 blows have been applied with <3-in. (0.08 m) penetration.

Use only an NCDOT Highway Design Branch pre-qualified Geotechnical Engineering Firm to perform the foundation design. A North Carolina Licensed Professional Engineer must seal all design drawings and recommendations. Design a drilled pier foundation with maximum deflection of 1 inch (25 mm) at the top of the pier. Use NCDOT Standard for High Mount Foundation (NCDOT Detail Drawing for High Mount Foundation, 1402.01) if 1 inch (25 mm) deflection criteria is met. Provide alternate design if deflection at the top of pier is greater than 1 inch (25 mm) or boring is terminated above required drilled pier tip elevation. A minimum diameter of 3.5 feet (1066 mm) and a minimum depth of 8 feet (2.13 m) or 3 feet (1 m) embedment in competent and non-degradable rock, whichever is less, is required. Consider sloping ground in the analysis if required.

Submit the subsurface investigation and foundation design in one submittal for review.

HIGH MOUNT LUMINAIRES

Provide and install High Mount Luminaires in accordance with Section 1403 of the *2002 NCDOT Standard Specifications for Roads and Structures*, except as amended below.

Provide ballast capable of operating at 750 watt high pressure sodium lamp from source with nominal voltage as shown on plans with a tolerance of 10%. Provide luminaires with Type V, cutoff optical assemblies. Provide glare shields for each luminaire and position to eliminate spill light outside of the right of way. NCDOT will evaluate photometric data for submitted luminaire to ensure adequate light output from the fixture.

ELECTRICAL DUCT

HDPE Electrical Duct shall be 10” diameter made from materials conforming to standard PE code designation PE 3408 and suitable for electrical circuits.

Drilling fluid shall consist of a bentonite slurry. Admixtures may be added which are suitable to the site conditions encountered.

HDPE Electrical Duct shall be fused prior to placement beneath the stream noted on the plans. Join pipe segments by cutting ends square, heating and fusing under sufficient pressure to create a single length of pipe sufficient to complete installation in one continuous pulling operation. The pipe manufacturer’s listing of fusion parameters, validated by appropriate testing, and the parameters of the Contractor’s fusion systems, shall be submitted to the Resident Engineer prior to fusing segments of HDPE Electrical Duct into the pipe string.

HDPE Electrical Duct shall be installed beneath the stream by boring or drilling a small pilot hole along a parabolic arc beneath the stream. A minimum cover of 3’ shall be maintained over the HDPE Electrical Duct at all times. Enlarge the pilot hole by use of a reamer or reamers to the desired diameter. When the bored hole is of the diameter recommended by the pipe manufacturer for the 10” HDPE Electrical Duct, the Contractor shall pull the pipe string through the hole by the drill string. Cap the pipe string during the pulling operation. The pulling operation shall incorporate a swivel connection to minimize torsional stresses imposed upon the

pipe string. Fully support the pipe string before and during pull back so that the pipe string will move freely without damage.

The Contractor may elect to conduct reaming and pulling of the pipe string in one operation at the discretion of the Engineer. The reamer head shall be fitted with a sleeve to prevent possible spalling that may become lodged and prohibit the pull back of the pipe string.

Drilling fluid that does not remain in the bore hole shall be collected and disposed of properly. No drilling fluid shall enter the stream.

CONSTRUCTION

Perform clearing in accordance with Standard Specifications section 200.03 and Erosion and Sedimentation Control Scope of Work.

Contact Lighting/Electrical engineers from NCDOT to inspect the completed lighting system and perform insulation resistance testing for all conductors prior to contract acceptance.

Contact the local utility company, make application, pay all deposits and other costs to provide necessary electrical service.

MAINTENANCE

Assume responsibility for routine maintenance of the lighting system(s) for the duration of the contract in accordance with Section 1400 of the *2002 NCDOT Standard Specifications for Roads and Structures*, except as amended below.

NCDOT will pay the monthly power bills. NCDOT will assume maintenance responsibility for the completed lighting systems after the project is accepted, and there is no chance of construction-related damage.

SIGNING SCOPE OF WORK

General: The Signing plans will be prepared by the Design Build (DB) team in accordance with the latest edition of the 2003 *Manual on Uniform Traffic Control Devices (MUTCD)*, the 1988 NC *Supplement to the MUTCD*, NCDOT *Standard Specifications for Roads and Structures* (January 2002), the NCDOT *Roadway Standard Drawings* (January 2002) for the design and development of signing plans, the latest Standard Specifications for *Structural Supports for Highway signs, Luminaires, and Traffic Signals* published by AASHTO, and the contract requirements for Signing plan design and preparation including specific submittal requirements for department review (attached). All electrical installations are the responsibility of the Design Build Team and must meet NEC, State, and local codes. All electrical/electronics equipment and devices must be UL approved and listed.

Specific Signing Items:

Signs Furnished by Design Build Team: The signs will be furnished by DB team according to the specifications provided by the department.

Sign Design: The DB team will be responsible for all type A, B, and D sign designs for ground mounted signs. The DB team will be responsible for determining, sizing, and locating all type E (warning and regulatory signs) and type F signs (route marker assemblies). The DB team is not responsible for designing and locating any new proposed LOGO sign, however; the DB team will be responsible for relocating existing LOGO signs due to widening or realignment.

Sign Locations: The DB team will be responsible for determining the station locations for all signs. The DB team also must coordinate with known existing and future projects to avoid sign placement in locations where their usefulness will be short-lived.

Ground Mounted Support Designs: NCDOT will provide the software for support design. DB team is responsible for all design, fabrication, and installation. Instructions for loading support design software will be available via CD.

Guardrail or Other Protection for Signs and Overhead Assemblies: The DB team will be responsible for determining and designing any protection for sign installations and coordinating this design work with the department for approval.

Signing Typical Sheets: Sheets for use in summarizing pay items, standard specifications, and quantities and sheets for compiling type E signs and type F signs will be provided by the department on a compact disk. Typical sheets showing NCDOT signing standards for interchanges will also be provided for design reference.

Removal and Disposal of Existing Signs: The DB team will be responsible for determination of existing signs that will no longer be needed upon completion of the project, such as on –Y– lines and project tie-ins. The DB team will be responsible for removal and disposal of these signs and supports. These signs will need to be shown and noted on the plan view sheets of the signing plans designed by DB team.

Final Signing Design Plans: Final Signing Plans must be approved by the department.

Signing Construction Revisions: Any construction revision must be submitted to the department for approval.

DMS Locations: Reference the Intelligent Transportation System Scope of Work for all DMS locations.

Dynamic Message Sign (DMS) Assemblies: Three (3) new Dynamic Message Sign Assemblies are proposed to be included on this project. The DB team will be required to determine exact station locations for these assemblies, design structure line drawings including dead load, DMS notes and details, complete field verification, and all other requirements for overhead sign assemblies to be approved by the NCDOT Signing Section. Reference the Intelligent Transportation System's Scope of Work for all other DMS requirements.

Sign Lighting Catalog Cut Submittals: This facility meets all requirements of section 2E-9 and lighting will be required on all overhead structures. Sign lighting catalog cut transmittals shall be generated using the NCDOT Signing Section's online qualified products list (QPL). The online QPL is located at:

http://www.doh.dot.state.nc.us/preconstruct/traffic/congestion/SIGN/qpl/qpl.html

If a product complies with the requirements of the NCDOT Standard Specifications for Roads and Structures and isn't contained in the online QPL, the submittal process guidelines are online at:

http://www.doh.dot.state.nc.us/preconstruct/traffic/congestion/SIGN/qpl/equipment_submittal.html

Luminaire retrieval system (LRS) is deemed necessary for all overhead sign assemblies except for the following types of overhead sign assemblies.

- Pedestal type mounted signs mounted at 17' height.
- Overhead Sign Assemblies that only have exit directional signs.

Luminaire retrieval system shop drawings shall be submitted directly to the NCDOT signing section for review and approval.

Requirements For The Preparation Of
Signing Plans

I. Signing Information Available Electronically Per Request.
Electronic information prepared by Signing Section is available per request:

Non-proprietary computer software for support and sign design is included in this information.

ll. Description of Work Required of Design Build (DB) Team
An understanding of the signing sections of the *MUTCD*, 1998 NC *Supplement to the MUTCD*, 2002 NCDOT *Standard Specifications for Roads and Structures*, and 2002 NCDOT *Roadway Standard Drawings* are required for design and development of signing plans.

A. Signing Plan Preparation: Prepare signing plans (SP) on Microstation J and include the following information and supporting documentation:

1. General Requirements: Accurate 1" = 100', (for metric projects 1:1000), CADD drawings of roadway plans, hereafter referred to as signing plan view sheets, which show pavement, paved shoulders, bridges, culverts, guardrail, drainage pipe, survey lines, right-of-way lines, stationing as labeled on roadway plans, equalities, north orientation for each sheet, signalized intersections labeled, beginning Signing project station, and ending Signing project station. Proposed traffic flow arrows shall be shown on these sheets at the beginning and end of each sheet, at overhead sign locations, and following any lane transitions.

2. Sign Locations: Locations of re-erected existing signs, existing signs remaining in place, proposed signs, and future signs by station on L-lines. No stations are required for signs erected on intersections and Y-lines. When stationing is not available, such as outside of the project limits, signs are required to be dimensioned from a fixed point or sign spacing shall otherwise be indicated on plans. Graphic representation of all existing, proposed, and future signs on the L-lines, Y-lines, and ramps are to be positioned on the plans as traffic would see them.

3. Sign Design: Signs will be designed to accommodate future messages when necessary. Determination of type E and F signs will be made by the DB team and included in signing plans.

4. Ground Mounted Support Design for Type A and B Signs: Determination of S dimensions from X-sections (or from field survey when X-sections are not available) is required for type A and B ground mounted signs. Design of supports is required using these S dimensions. Support chart including support sizes, lengths, and weights, for all type A and B ground-mounted signs is required. (Spreadsheets are available electronically through FTP.)

5. Type D, E and F signs: Charts including sign number, sign size, and number of U channel posts for all Type D, E and F signs is required.

6. Special Provisions: Project Special Provisions for special signing items are required to be written by the DB team and sealed by a professional engineer of the DB team.

7. Overhead Sign Assembly: An overhead sign assembly cross-section sheet is required for each overhead sign assembly, hereafter referred to as a structure line drawing. These sheets include lane widths, slopes, location of supports, S-dimensions at support locations, positioning of signs relative to travel lanes, sign messages and / or future messages, future signs, minimum and maximum vertical clearance, existing and proposed guardrail, walkway detail (if required), labeling of facility and direction of travel, windload and deadload requirements to be used for the design of structure and footings, and all applicable notes.

8. Coordinate With Other Traffic Engineering Plan Requirements: The DB team is required to coordinate with the Traffic Control and Pavement Marking & Delineation plans when locating and designing overhead signs and sign assemblies, lane drop signing, and "All Traffic Exit" signing and to ensure that they match the requirements of the signing plans. The DB team is required to label signalized locations on the signing plans.

9. Requirements for Sign Lighting Design: Refer to section 2E-9 of the 1998 NC Supplement to the Manual on Uniform Traffic Control Devices for Streets and Highways. This facility is considered meets all requirements of the section 2E-9 and will require lighting on all overhead structures. The lighting design shall be engineered to meet the requirements of section 905 and 1097 of the 2002 NC *Standard Specifications for Roads and Structures* in an energy efficient and cost effective manner. The DB team shall design the lighting through computer aided lighting analysis, and the following provisions will be expected of the DB team:

I. The DB team shall provide the Signing Section with a licensed electronic copy of the lighting design software, if design software other than Visual Professional Edition – Release 2.2 is used.
II. With each signing plan submittal, the DB team shall provide the Signing Section with an electronic copy of the sign lighting design. The Signing Section shall be capable of reviewing the lighting design using the software provided in provision 9-I above.

B. Signing Plan Submittals: The DB team shall make submittals for review by the Traffic Engineering and Safety Systems Branch Signing Section at the following milestones:

Note: 1) The Signing Section may combine or eliminate milestone submittals depending on project specifics.

1. Initial SP review: 2 (1/2 size) sets of Signing Plans and 2 copies of roll out ½ size plan view consisting of the signing plan view sheets with all existing, proposed, future signs (including messages) located in the format of the final product. All necessary sign relocations are also required to be included in this submittal. The approval of this review shall complete 50% of the SP work.

Submittal of 1 (1/2 size) corrected set of initial SP is required for review by field personnel and FHWA.

2. Interim SP review: 2 (1/2 size) sets of plans and 2 copies of roll out ½ size plan view with plans consisting of the corrected signing plan view sheets with all signs located, completed type

E and F sign sheets, ground-mounted sign support chart with support designs and design calculation information (S-Dimension Worksheets), structure line drawings, and lighting design sheets completed in the format of the final product. The approval of this submittal shall complete 90% of the SP work.

Submittal of 1 (1/2 size) corrected set of interim SP is required for approval by Signing Engineer.

3. Final SP review: 2 (1/2 size) sets of plans and 2 copies of roll out ½ size plan view sheets with plans consisting of the summary of quantities sheet with list of applicable Roadway Standard Drawings, quantities estimate and computations, draft of Project Special Provisions (other than those prepared and sealed by NCDOT), and all corrected signing sheets and supporting documentation required in the 50% submittal. The approval of this submittal shall complete 100% of the SP work.

4. Final Plan submittal: Original sealed set of approved signing plans and 5 (1/2 size) copies, original quantities estimate and computations, sign designs in binder including cover sheet listing signs (form for cover sheet available electronically through FTP), original of Project Special Provisions sealed by Professional Engineer of DB team (see II.A.6. for when required), design files on CD that have name of sealer, registration number, and date of sealing inserted where seal, signature, and date are located on original plans, and all other supporting documentation shall be submitted for final acceptance by the Signing Section of the Traffic Engineering and Safety Systems Branch. The approval of this submittal shall complete 100% of the SP work.

C. Final plans shall meet the approval of the Department. Said approval shall not relieve the DB team of liability or the responsibility to correct any error in their plans or computations after the 100% Final Plan Submittal. The DB team will be required to make any such corrections without additional compensation.

III. Work Standards

A. The plans, sign designs, sign support designs, design and quantity calculations, project special provisions, any other supporting documentation, and design files are required on CDs and shall be submitted to the Department upon completion of the work and become the property of the Department. Cadd work units that are compatible with NCDOT are required such that when plans are printed by NCDOT, plans will be identical to the hard copy of what was submitted by DB team.

B. All plan sheets shall be 34” x 22” in finished dimensions. The Department may furnish the DB team with sheets to incorporate into their plans prior to final plan reproductions.

C. All plan sheets shall conform to the requirements of the signing section. A 4 ½ ” x 4 ½ ” area for full size sheets, directly below the project information block in the upper right corner of all sheets, shall be left blank and unobstructed.

D. Reproduction

1. The DB team shall be responsible for providing the following:

At 100%: 1 full size original set of plans sealed by Professional Engineer

The DB team shall be responsible for reproduction of the signing plans as necessary to provide the following bond prints:

At 50%: 2 (1/2 size) sets interim SP review prints; 2 copies of roll out ½ size plan view;
1 (1/2 size) set of corrected interim SP review prints;
At 90%: 2 (1/2 size) sets final SP review prints; 2 copies of roll out ½ size plan view;
At 100%: 5 (1/2 size) copies of approved final SP sealed by Professional Engineer;
1 roll out ½ size plan view.

E. Project Special Provisions - the North Carolina Department of Transportation *Standard Specifications for Roads and Structures*, *2002**, and the Standard Special Provisions issued by the Division of Highways shall apply for materials and construction on all work described above. The DB team shall prepare thorough and complete Project Special Provisions covering those items of material, work, and other conditions for the signing items of the project which are not covered at all, or not covered as desired in the Standard Specifications or Standard Special Provisions. These Project Special Provisions shall be submitted for review at the time prints of final plans are submitted for review. The 100% submittal of these Project Special Provisions shall be sealed by a Professional Engineer of the DB team.

TRAFFIC CONTROL SCOPE OF WORK

1-TRAFFIC CONTROL PLANS

Design and prepare the Traffic Control Plan for this project. Development of the Traffic Control Plan should proceed as follows:

Submit a Staging Concept, a description of the sequenced phases and steps to be followed in implementing the construction plans, of the Traffic Control Plan to the Resident Engineer and State Alternate Delivery Systems Engineer for review and acceptance. The Staging Concept for the entire project must be accepted before proceeding further with the development of the Traffic Control Plan. A complete Traffic Control Plan will not be required to begin phased construction activities on this project. If a barrier system will be used, the Staging Concept will need to identify what barrier system will be proposed for approval.

Construction may begin on a Phase once the Traffic Control Plan for that Phase has been sealed by the Design Build designer and accepted by the State Alternate Delivery Systems Engineer.

The Traffic Control Plan will identify all maintenance of traffic needs, including lane closures, road closures, traffic control devices, temporary lane markings, construction signing, phasing, project notes and other possible needs. The plan will identify lane widths, transition taper widths and any geometry necessary to define placement of devices and temporary roadway alignments. The Traffic Control Plan will show the pavement design to be used for pavement markings/markers for temporary patterns on existing/proposed/temporary roadways. NCDOT's *Roadway Standard Drawings* – Sections 1100 and 1200 are for traffic control and will need to be incorporated into the plans for most work activities. Detailed phasing plans will be required where traffic control activities and device placement cannot be entirely covered by these standard drawings. Sealed and accepted plans showing all pavement markings which are not covered in the NCDOT's *Roadway Standard Drawings* are required prior to placement of any temporary markings and temporary markers. Ensure the development of the Traffic Control Plan is in compliance with the NCDOT *Roadway Standard Drawings*, NCDOT *Roadway Standard Specifications*, and the *Manual on Uniform Traffic Control Devices (M.U.T.C.D.).*

Develop Traffic Control Plan details at a scale of 1"=50' (metric 1:500) and overviews at a scale of 1"=100' (metric 1:5000) unless otherwise agreed upon. Use the *Requirements for the preparation of Traffic Control & Pavement Markings plans* as guideline to developing plans. The Traffic Control Website provides key information necessary in preparing the Traffic Control Plans and is continuously updated. Traffic Control Website is located at the address shown below.

http://www.doh.dot.state.nc.us/preconstruct/traffic/congestion/tc/

Provide 2 sets of half size plans to the Resident Engineer and 3 sets of half size plans to the State Alternate Delivery Systems Engineer for Staging Concept and each phase submittal for review and approval.

Coordinate with the Engineer to promote public awareness for this project. Hold a coordination meeting with NCDOT one month prior to the beginning of construction. NCDOT will be responsible for the initial public information effort through its IMPACT Team. Once the project is announced formally to the public, it will be the Design-Build team's responsibility to hold public meetings and press conferences, make media announcements, distributing flyers, and posting advertisements.

Inform the following groups at least 3 weeks in advance of any construction activities that will have significant impact on the public:

- Governmental agencies
- Municipalities directly affected by the construction
- Transportation services
- Emergency services
- Neighborhood groups and private homes
- Industry and businesses
- Any other organization as deemed necessary by the Engineer.

Use traffic control devices that conform to all NCDOT requirements and are listed on the Department's Approved Products List as shown on NCDOT's Traffic Control Website. Use of devices not shown on the Approved Product List will require approval from the Traffic Control Unit.

2-FINAL PAVEMENT MARKING PLANS

Construction may proceed only with an accepted and sealed Final Pavement Marking Plan. Submit the Pavement Marking Plan to the Resident Engineer and State Alternate Delivery Systems Engineer for review and acceptance prior to the final pavement marking and marker installation. Prepare Final Pavement Marking Plans at a scale of 1"=50' unless otherwise agreed upon. NCDOT's *Roadway Standard Drawings* – Sections 1100 and 1200 pertaining to pavement markings, markers and devices left on the project will be utilized where applicable. Prepare detailed plans for all locations where NCDOT's *Roadway Standard Drawings* do not completely describe the required markings and markers. The plans will show lane widths, transition tapers, lane lines, edge lines, gore markings, symbols, word messages, and other appropriate markings and markers.

Use pavement marking and marker products that conform to all NCDOT's requirements and specifications and are listed on the Department's Approved Products List as shown on the NCDOT's Traffic Control Website. Install pavement markings and markers in accordance with NCDOT's *Standard Specifications for Roads and Structures*, and in accordance with the manufacturer's procedures and specifications.

Coordinate with the Resident Engineer, Engineer in charge of projects adjacent to R-2248F and State Alternate Delivery Systems Engineer for designing and installation of final/temporary pavement markings and/or Traffic Control Devices needed for the traffic pattern left in place at the completion of this project.

Provide 2 sets of half size preliminary pavement marking plans with the staging concept to the Resident Engineer and 3 sets of half size plans to the State Alternate Delivery Systems Engineer review and approval. Provide 2 set of final pavement marking plans with the final phase submittal and 3 sets of half size plans with the final phase submittal for review and approval.

3-PROJECT REQUIREMENTS

The following general notes apply at all times for the duration of the construction.

TIME RESTRICTIONS

A. Lane closure and narrowing restrictions

The Contractor shall maintain existing traffic patterns and do not close or narrow a lane of traffic on I-485 and I-77 including all ramps and loops during the following times:

6:00 AM to 8:00 PM	Monday – Friday
11:00 AM to 6:00PM	Saturday - Sunday

The Contractor shall not install, maintain or remove any traffic control device required for narrowing or closing a lane during the times listed above.

In addition, the Contractor shall not close or narrow a lane of traffic on I-485 and I-77 including all ramps and loops, detain and/or alter the traffic flow during holidays, holiday weekends, special events, or any other time when traffic is unusually heavy, including the following schedules:

Holiday

1. For any event that creates unusually high traffic volumes, as directed by the Engineer.

2. For New Year's, between the hours of 6:00 a.m. December 31st to 8:00 p.m. January 2nd. If New Year's day is on a Saturday or a Sunday, then until 8:00 p.m. the following Tuesday.

3. For Easter, between the hours of 6:00 a.m. Thursday and 8:00 p.m. Monday.

4. For Memorial Day, between the hours of 6:00 a.m. Friday to 8:00 p.m. Tuesday.

5. For Independence Day, between the hours of 6:00 a.m. the day before Independence Day and 8:00 p.m. the day after Independence Day.
   If Independence Day is on a Saturday or Sunday, then between the hours of 6:00 a.m. the Thursday before Independence Day and 8:00 p.m. the Tuesday after Independence Day.

6. For Labor Day, between the hours of 6:00 a.m. Friday to 8:00 p.m. Tuesday.

7. For Thanksgiving, between the hours of 6:00 a.m. Tuesday to 8:00 p.m. Monday.

8. 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 Monday after the week of Christmas.

9. For auto racing events occurring at Lowe's Motor Speedway, between the hours of 7 a.m. the day before the racing event and 7 a.m. the day after the racing events as directed by the engineer.

10. For Bobcat games occurring at the Coliseum, between 3 hours before the start and 3 hours after the end of the games as directed by the engineer.

11. For Carolina Panthers games occurring at the Bank of America Stadium, between 4 hours before the start and 4 hours after the end of the games as directed by the engineer.

Liquidated Damages for the above lane closures, narrowing of lanes, holidays and special events time restriction for I-485 and I-77 including all ramps and loops is $5,000.00 per hour.

B. Road closure restrictions for construction operations

The Contractor shall maintain existing traffic patterns a minimum, maintain all existing I-485 and I-77 ramps and loops traffic during times listed below.

In addition the Contractor shall reopen the travel lanes to traffic until the existing traffic queue is depleted.

a) The Contractor shall not close I-485 and I-77 including all ramps and loops during the following times:

6:00 AM to 8:00PM Monday – Sunday

The maximum allowable time for road closures on I-485 and I-77 including all ramps and loops is **30 minutes** and can only be used for operations listed below:

Operations:

- Installing Overhead Sign Assemblies
- Installing Overhead DMS Assemblies
- Installation of high mast lighting
- Installation of ITS systems
- Traffic shifts, including tie-in work and placement of pavement markings

Liquidated Damages for the above road closure time restriction for I-485 and I-77 including all ramps and loops, is $1,500.00 per 15 minute period or any portion thereof.

C. Hauling Restrictions

Do not conduct single vehicle and multi-vehicle hauling as follows; ingress and egress from ramps will not be allowed: See *2002 NCDOT Standard Specifications for Roads and Structures* for other specific hauling restrictions requirements.

For Single Vehicle Hauling:

Road Name	Day and Time Restrictions	
I-485 including all ramps and loops	6:00 AM to 9:00AM and 4:00 PM to 8:00PM	Monday – Friday

For Multi Vehicle Hauling:

Road Name	Day and Time Restrictions	
I-485 including all ramps and loops	6:00 AM to 8:00 PM	Monday – Friday

Do not conduct any hauling operations against the flow of traffic of an open travelway unless the work area is protected by barrier or guardrail or otherwise directed by the Engineer.

LANE AND SHOULDER CLOSURE REQUIREMENTS

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, or as directed by the Engineer.

When personnel and/or equipment are working within 40 ft of an open travel lane, close the nearest open shoulder using *Roadway Standard Drawing* no. 1101.04 unless the work area is protected by barrier or guardrail.

When personnel and/or equipment are working on the shoulder adjacent to an undivided facility and within 5 ft of an open travel lane, close the nearest open travel lane using *Roadway Standard Drawing* no. 1101.02 unless the work area is protected by barrier or guardrail.

When personnel and/or equipment are working on the shoulder adjacent to a divided facility and within 10 ft of an open travel lane, close the nearest open travel lane using *Roadway Standard Drawing* no. 1101.02 unless the work area is protected by barrier or guardrail.

When personnel and/or equipment are working within a lane of travel of an undivided or divided facility, close the lane according to the, *Roadway Standard Drawing*s, as directed by the Resident Engineer or by the State Alternate Delivery Systems Engineer. Conduct the work so that all personnel and/or equipment remain within the closed travel lane.

Do not perform work involving heavy equipment within 15 ft of the edge of travelway when work is being performed behind a lane closure on the opposite side of the travelway.

Maintain at least 2 lanes of traffic in each direction during times when lane closures are not allowed.

Do not install more than 1 mile of lane closure on I-485 or I-77, measured from the beginning of the merge taper to the end of the lane closure.

Don not install more than one lane closure in any one direction on I-77.

Do not install more than 2 (Two) lane closures, in any one direction on I-485, the second lane closure can only be used for lighting or ITS work.

Provide a minimum of 2 miles between lane closures, measured from the end of one closure to the first sign of the next closure.

Maintain minimum 11 ft lanes, which are open to traffic on I-485 and I-77. In addition, a minimum 2 ft offset from the edge of travel to any traffic control device is required at all times.

Maintain a minimum 10 ft wide outside shoulders, with a minimum 8’ paved and 2’ graded on all roads which are open to traffic.

PAVEMENT EDGE DROP OFF REQUIREMENTS

Backfill at a 6:1 slope up to the edge and elevation of existing pavement in areas adjacent to an opened travel lane that has a drop-off as follows:

Backfill drop-offs that exceed 2 inches on roadways with posted speed limits of 45 mph or greater.

Backfill drop-offs that exceed 3 inches on roadways with posted speed limits less than 45 mph.

Backfill with suitable compacted material, as approved by the Engineer, at no expense to the Department.

TRAFFIC PATTERN ALTERATIONS

Notify the Engineer twenty-one (21) calendar days prior to any traffic pattern alteration.

SIGNING

Use FLUORESCENT ORANGE SHEETING (TYPE VII or Higher) on all advanced work signs. Use WZ Advance Warning Sign drawings that may apply which can be found at the Traffic Control Web Site. (See Project Special Provision)

Install advance work zone warning signs when work is within 100 ft from the edge of travel lane and no more than three (3) days prior to the beginning of construction.

When no work is being conducted for a period longer than one week, remove or cover all advance work zone warning signs, as directed by the Engineer, at no cost to the Department.

All detour signing is the responsibility of the Design Build Team.

Ensure all necessary signing is in place prior to altering any traffic pattern.

TRAFFIC BARRIER

Install approved barrier system a maximum of two (2) weeks prior to beginning work in any location. Once the approved barrier system is installed at any location, proceed in a continuous manner to complete the proposed work in that location unless otherwise directed by the Engineer.

Once the approved barrier system is installed and if no work has been performed behind the approved barrier system for a period longer than two (2) months, remove/reset the approved barrier system at no cost to the Department unless barrier is protecting a hazard, or as directed by the Engineer

Protect the approach end of the approved barrier system at all times during the installation and removal of the barrier. If system requires installation of a temporary crash cushion, a truck mounted impact attenuator can be used for a maximum of 72 hours.

Offset the approach's end of the approved barrier system a minimum of 40 ft from oncoming traffic or protect at all times by a temporary crash cushion if the approved barrier system requires a temporary crash cushion.

Install approved barrier system with the traffic flow, beginning with the upstream side of traffic. Remove the approved barrier system against the traffic flow, beginning with the downstream side of traffic.

Install and space drums no greater than twice the posted speed limit (mph) to close or keep closed the section of the roadway until the barrier can be placed or after barrier is removed.

Offset the approved barrier system a minimum of 2' from the edge of travel on all open travelways.

TRAFFIC CONTROL DEVICES

All drums must meet the requirements of the Drum Standard Detail found on the Traffic Control Web page.

Space channelizing devices in work areas no greater than twice the posted speed limit (mph), except 10 ft on-center in radii, and 3 ft off the edge of an open travelway, when lane closures are not in effect.

Place sets of three drums perpendicular to the edge of the travelway on 500 ft centers when unopened lanes are closed to traffic. These drums shall be in addition to channelizing devices.

PAVEMENT MARKINGS AND MARKERS

Install pavement markings and pavement markers on the final surface as follows:

Road name	Marking	Marker
I-485	Polyurea with Highly Highly retroreflective elements (See Project Special Provision)	Snowplowable

Install temporary pavement markings and temporary pavement markers on the interim surface or temporary pattern as follows:

Road name	Marking	Marker
I-485	Paint	Temporary Raised

Place at least two applications of paint for temporary traffic patterns which 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.

MISCELLANEOUS

Provide portable temporary lighting to conduct night work in accordance with the NCDOT *Standard Specifications for Roads and Structures*.

Removal of the temporary pavement markings shall be accomplished by using water blasting, sand blasting or shot blasting systems to minimize damage to the road surface. All systems will be required to remove 100% of the pavement marking without removing more than 1/32" of the pavement surface.

Traffic Surveys Unit has a traffic counting station (IC5904) that is located approximately one half mile east of Exit 1 on the north side within the project limits. The station has warning signs marking the location and loops can be seen in the pavement. The work required by this project will effect the conduit and pull box located in the median, notify the Engineer in charge and the State Alternate Delivery Systems Engineer 30 days before conducting any work in the area of the counting station.

4-PROJECT SPECIAL PROVISIONS "Work Zone Signing- Fluorescent Orange sheeting"

DESCRIPTION

Furnish, install and maintain work zone signs with fluorescent orange sheeting Type VII (Seven) or higher. All work zone signing (stationary, barricade mounted and portable) along with detour signing must meet this requirement. See the following website: http://www.doh.dot.state.nc.us/preconstruct/traffic/congestion/TC/Res_Eng/WZ2005/default.htm

In addition, temporarily cover and uncover, relocate, and remove work zone signs (stationary, barricade mounted and portable) in accordance with the plans and specifications. Use work

zone signs (portable) only with portable work zone sign stands specifically designed for one another. Portable work zone signs may be roll-up or approved composite.

MATERIALS

(A) General:

Sign retroreflective sheeting requirements for Types VII (seven), VIII (eight) and IX (nine) are described in Section 1093 of the 2002 Standard Specifications. Cover the entire sign face with reflective sheeting. Apply the reflective sheeting in a workmanlike manner so that there are no bubbles or wrinkles in the material.

1. Work Zone Signs (Stationary):

   Use Type VII (seven), VIII (eight) or IX (nine) (prismatic) fluorescent orange retroreflective sheeting or better. Construct sign backing of a rigid material such as aluminum or approved composite material. Signs and sign supports must meet or exceed NCHRP 350 requirements for Breakaway Devices.

2. Work Zone Signs (Barricade Mounted):

   Use Type VII (seven), VIII (eight) or IX (nine) (prismatic) fluorescent orange retroreflective sheeting or better. Sign and barricade assembly must meet or exceed the requirements of NCHRP 350 for Work Zone Category II Devices.

3. Work Zone Signs (Portable):

   Use Type VII (seven), VIII (eight) or IX (nine) (prismatic) fluorescent orange retroreflective sheeting or better without adhesive backing for roll-up portable work zone signs. Signs and sign stand assemblies must meet or exceed the requirements of NCHRP 350 for Work Zone Category II Devices.

   Use Type VII (seven), VIII (eight) or IX (nine) (prismatic) fluorescent orange retroreflective sheeting or better for aluminum or composite portable work zone signs. Signs and sign stand assemblies must meet or exceed the requirements of NCHRP 350 for Work Zone Category II Devices.

4. Work Zone Signs (Detour):

   Use Type VII (seven), VIII (eight) or IX (nine) (prismatic) fluorescent orange retroreflective sheeting or better for aluminum or approved composite detour work zone signs.

CONSTRUCTION METHODS

The provision of Article 1110-3 of the 2002 *Standard Specifications for Roads and Structures* will apply to this special provision.

MAINTENANCE

Provide continuous and expeditious maintenance of all work zone signing throughout the life of the contract.

Prior to construction, submit for approval, a proposed maintenance schedule and maintenance checklist for all traffic control devices.

The scheduled maintenance and device inspections must be performed. Maintenance activities include the repair or replacement of work zone signs which have damaged torn sheeting, bent or deformed sign backing, deformed sign supports, displaced by traffic or other means, or deteriorated beyond effectiveness. Specific maintenance responsibilities include but are not limited to: replacement due to loss of retroreflectivity, repair or defaced sheeting and legend, replacement of broken supports, repositioning of leaning signs, cleaning of dirty signs, replacement of stolen or vandalized signs, and replacement of displaced signs.

5-PROJECT SPECIAL PROVISION POLYUREA PAVEMENT MARKING MATERIAL HIGHLY RETROREFLECTIVE ELEMENTS

Section 1205-1 DESCRIPTION:

This special provision covers machine applied "Highly Retroreflective" Polyurea pavement marking material with reflective elements. All remaining Articles in Section 1205 shall be as described in the 2002 *Standard Specification for Roads and Structures* with the exceptions below.

Section 1205-2 Materials

(A) GENERAL

Replace Article (A) with the following:

Use Section 1087-Articles 1, 3, 5 & 6 (General, Color, Packaging for Shipment, and Storage Life) as described in the 2002 *Standard Specifications for Roads and Structures*. The manufacturer may recommend any remaining information necessary for the placement of "Highly Retroreflective" Polyurea pavement markings.

(B) Material Qualification

Replace Article (B) with the following:

Use only "Highly Retroreflective" polyurea pavement markings that have been pre-approved by the Traffic Control Section prior to application. Use retroreflecting elements according to the manufacturer's recommendations in order to meet the retroreflectivity requirements as stated in Section 1205-3(G)(8) as measured by a LTL 2000, LTL-X or Department approved 30m mobile retroreflectometer.

Furnish a Type 3 Material Certification and Type 4 Material Certification in accordance with Article 106-3 as described in the 2002 Standard Specifications for Roads and Structures.

For more information, contact the Traffic Control Section at 919 250-4151.

Section 1205-3 Construction Methods

Section 1205-3(B) (1) General for all Application Equipment: Add the following sentence after the last paragraph:

Do not use handliners or any other non-truck mounted pavement marking machine to install "Highly Retroreflective" polyurea pavement markings on long-line applications.

Add the following Section immediately following Section 1205-3(G)(8)

Section 1205-3 (G) (9) "Highly Retroreflective" Polyurea Application:

Produce "Highly Retroreflective" Polyurea pavement marking lines which have a minimum dry thickness of 20 mils (0.50mm) when placed on concrete and asphalt pavements.

Using the Polyurea application equipment, apply the pavement marking materials simultaneously. Apply the Polyurea resin, mixed at the proper ratio according to the manufacturer recommendations, to the pavement surfaces within the proper application temperatures as determined by the material manufacturer. Inject reflective elements into the molten (liquid) Polyurea pavement markings.

Apply reflective elements according to manufacturer's recommendation to immediately produce a highly reflective marking.. At the time of installation, provide in-place marking with the minimum reflectance values shown below, as obtained with a LTL 2000, LTL-X or Department approved 30m mobile retroreflectometer. Maintain the retroreflectance values shown below for a minimum of 30 days from the time of placement of marking material.

WHITE: 800 mcd/lux/m2
YELLOW: 500 mcd/lux/m2

Produce marking, which upon cooling, is uniformly reflectorized and has the ability to resist deformation caused by traffic throughout its entire length.

The manufacturer of the Polyurea pavement marking material shall certify the Contractor to place the material. Provide at least one member of each crew that completed this training. Furnish the Engineer written confirmation of this training from the material manufacturer prior to the beginning of work. The manufacturer's technical representative shall be onsite during the entire installation of product.

Provide a manufacturer's technical representative that is knowledgeable and familiar with the Contractors application equipment prior to the installation of the Polyurea pavement markings.

Section 1205-3(H)(1) Observation Period for "Highly Retroreflective" Polyurea Pavement Markings:

Replace the first paragraph with the following:

Thermoplastic, epoxy, and polyurea pavement markings are subject to a 180 day observation period.

Add the following just before the last paragraph:

Provide high visibility polyurea pavement marking materials that maintain minimum retroreflectance values throughout the observation period as follows:

WHITE: 700 mcd/lux/m2
YELLOW: 400 mcd/lux/m2

In addition to the 180 day observation period, provide high visibility polyurea pavement marking materials that meet the following minimum retroreflectance values after having been snowplowed:

WHITE: 375 mcd/lux/m2
YELLOW: 250 mcd/lux/m2

These measurements will be taken within 30 days prior to the end of the Observation Period. The reflectance values will be taken using a LTL 2000, LTL-X or Department approved 30m mobile retroreflectometer.

Section 1205-3(I) Removal of Pavement Markings:

Add the following just before the last paragraph:

Do not apply Polyurea pavement marking over existing pavement marking materials having less adherence than the Polyurea. Remove existing lines according to the manufacturer's recommendations.

NOTE: The NON-DESTRUCTIVE LINE REMOVAL provision (in Draft version of RFP) has been deleted. Please refer to the revised Miscellaneous Section for removal methods.

UTILITIES COORDINATION UNIT SCOPE DETAILS

Overview: The Design Build Firm shall obtain the services of a firm pre-qualified by NCDOT and knowledgeable in the Utility Coordination Process involved with utility relocation/installation and highway construction. The Design Build Firm shall be responsible for coordinating all utility relocations. Coordination shall include any necessary utility agreements when applicable. The Firm will be responsible for non-betterment utility relocation cost when the utility company has prior rights of way/compensable interest. The utility company will be responsible for the relocation cost if they can not furnish evidence of prior rights of way or a compensable interest in their facilities.

Preparation for relocating utilities within the existing or proposed highway Rights of Way.

I. The Design Build Firm will be required to use the guide lines as set forth in the following:

(A) NCDOT *Utility Manual - Policies & Procedures for Accommodating Utilities on Highway Rights 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 Firm will be responsible for confirming the location of the utilities, type of facility and identify the utility owner 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 Firm will make the necessary arrangements with the utility owners for adjustments, relocating or removals where the Firm and Utility Company determine that such work is essential for safety measures and performance of the required construction.

-The Design Build Firm shall not commence work at points where the highway construction operations are 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 Firm 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 Firm will promptly notify the proper authority (Utility Company) and cooperate with the authority in the prompt restoration of service.

-The Design Build Firm should plan to accommodate for certain utility adjustments, reconstruction, new installation and routine maintenance work that may be underway or take place during the progress of the contract.

II. In the event of a utility conflict, the Design Build Firm will request that the utility company submit relocation plans (Highway Construction Plans to be provided by the Design Firm to Utility owners) showing existing utilities and proposed utility relocation for approval by the NCDOT.

-The Firm will be required to submit (3) three copies of the Utility Relocation Plans to the NCDOT State Utility Agent for review and approval prior to relocation work beginning. The Firm will also be responsible for submitting the appropriate agreements to be used with the relocation plans (See Agreements under line items V & VI). After the review process is complete, the NCDOT Utility Unit will submit one (1) copy of the Utility Relocation Plans, executed agreements and any necessary comments back to the Firm. The Utility Unit will also submit a copy of the approved Utility Relocation plans to the Department's Resident Engineer. If the Utility Relocation Plans are approved subject to changes, it will be the Firms responsibility to coordinate these changes with the appropriate utility company.

III. The cost in relocating utilities due to the highway construction will be the responsibility of the Design Build Firm except when the utility company does not have compensable interest in their existing facilities. A compensable interest is identified as follows:

(A) Existing or prior easement rights within the limits of the project, either by recorded right of way or adverse possession (Utility occupying the same location for twenty (20) plus years outside the existing highway rights of way).

(B) Entities covered under *General Statute* 136-27.1 and 136-27.2. Statute requires the NCDOT to pay the non-betterment cost for certain water, sewer and gas relocations.

-The cost in relocating CATV due to the highway construction will be the responsibility of the CATV Company; however, under the following conditions the Design Build Firm will bear the relocation expense:

(A) If the Company can validate a recorded easement for facilities outside the maintained NCDOT Rights 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 NCDOT will not permit CATV to place poles within the Highway Rights of Way but will allow down guys for their facilities within the Rights of Way. Under most circumstances the CATV Company will continue a joint-use attachment with the local Power and Telephone Company. If the CATV proposed relocation places buried facilities within the highway rights of way then plans and encroachment agreements will be required by the NCDOT.

IV.If the Design Build Firm elects to make arrangements with a utility company to incorporate a new utility installation or relocation as part of the highway construction, the utility work done by the firm and the associated cost for the work will be negotiated and agreed upon between the firm and the utility company.

-It is recommended that the Design Build Firm make arrangements to relocate water or sewer line facilities in which the entities are covered under *General Statute* 136-27.1 or occupying a compensable interest. The non-betterment cost associated with this work will be borne by the Firm.

-If the Design Build Firm 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 Utility Unit. Coordination shall include preparation of all plans for needed agreements and permits. The Firm would be responsible for all permit fees.

-If the Design Build Firm elects to make arrangements with a Governmental Agency for proposed utility construction, in which the Agency will participate in the cost for work to be performed by the Firm, the Firm will be responsible for negotiating all cost associated with the proposed construction. Once the Firm and the Agency agree on a plan and a lump sum estimated cost for the utility construction, the Firm will be responsible in submitting five (5) sets of 11 x 17

utility construction drawings to the State Utility Agent for further handling. Each set should include a title sheet, plan sheets, profiles and special provisions if available. Also, a letter from the Agency agreeing to the plans and lump sum cost must accompany this package. The NCDOT will reimburse the Firm the estimated lump sum cost under a supplement agreement. The necessary Utility Agreement to the Agency for reimbursement will be a two party agreement between the NCDOT and the Agency.

V. The Design Build Firm will be required to utilize the NCDOT Standard Utility Encroachment Agreements as necessary in relocating utilities. The Encroachment Agreements will 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 with the existing or proposed highway rights of way.

(B) For all new utility installations within the existing or proposed highway rights 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. If a utility company can show evidence of prior rights of way or a compensable interest in their facilities, the non-betterment utility relocation cost and the agreement will be handled between the firm and the utility company. The Design Build Firm will be required to utilize the NCDOT Three-Party Utility Relocation Agreement as necessary in relocating utilities.

-The NCDOT Assistant Branch Manager of Right of Way must execute approved agreements on Design Build highway projects. The Utility Relocation Agreements and encroachment agreements are available from the NCDOT Utility Unit. See Pages 59 and 60 of the NCDOT Utility Manual on *Policies & Procedures for Accommodating Utilities on Highway Rights of Way* for the different types of encroachment agreements available for use.

Requirements for attachments to existing and/or proposed structures

I. Attachments to structures should be avoided where feasible. Attachments should only be considered when other alternatives are cost prohibitive or not feasible due to environmental or geographical features. Attachments are prohibited under the following conditions:

(A) No attachments will be allowed to a bridge located parallel within the C/A carrying the freeway over streams, other roadways or railroads. (No parallel utility installations within the C/A)

(B) No attachments will be allowed to cored-slab bridges.

(C) No attachments will be allowed to curved bridges.

II. Attachments to structures, if allowed, shall meet the following criteria.

(A) No attachments will be allowed below the bottom of the beams and/or girders.

(B) Drilling of or attachments to beams and/or girders will not be allowed. Attachments will only be allowed to the bottom of the bridge deck.

(C) For water and sewer force mains, only restrained joint ductile iron pipe will be allowed.

(D) A minimum of 18" of clearance to beams and/or girders shall be maintained if possible.

III. Documentation of adverse conditions or cost estimates of all feasible alternatives should be submitted to the NCDOT State Utility Agent when seeking approval of a structure attachment. Cost estimates should consider all costs involved with each alternative and impacts to the utility and the highway project as a whole.

Preparation for Communication Cables/Electrical Services for Lighting, Signing & ITS Devices

I. Prior to establishing the location for new meter poles, the Design Build Firm will coordinate with the local Power Distribution Company concerning accessibility of E/C Service and safety in maintenance of the meter.

II. All service taps that require a parallel installation within the C/A will require plans for review and approval by the NCDOT prior to the installation.

-Preferably, parallel service installations within a C/A should be buried and located as close to the R/W line as practical. However, due to unusual circumstances the NCDOT may approve aerial installations.

III. The Design Build Firm will be responsible for any cost concerning service taps provided by the utility company.

Preparation for Adjusting Existing Utilities due to Proposed Traffic Management Systems Fiber Optic Communication Cables

I. See Traffic Management Scoping Outline (if included in contract)

II. The Design Build Firm will be responsible for all cost in coordinating and adjustments of utilities for any proposed ITS Communication Cable.

INTELLIGENT TRANSPORTATION SYSTEMS SCOPE OF WORK

I. GENERAL REQUIREMENTS

A. INTRODUCTION

The North Carolina Department of Transportation (NCDOT) Metrolina Regional Transportation Management Center (MRTMC) currently manages traffic along an approximate 24 kilometer (15 miles) stretch of I-77 from the South Carolina line north to the interchange of I-77 and Sunset Road (TIP Number C-3300). Projects currently underway will extend the project as follows:

- North on I-77 from the MRTMC to north of the northern interchange of I-77 and I-485 (TIP Number I-3311A)
- North on I-85 from the MRTMC to NC 49 (Speedway Boulevard) (TIP Number U-3115AA).
- North on I-85 from US 29 in Mecklenburg County to NC 49 (Speedway Boulevard) (TIP Number I-3803A).
- Southwest on I-485 from the northern interchange of I-77 and I-485 to the western interchange of I-85 and I-485 (TIP Number R-2248D)
- Southwest on I-85 from I-77 to NC 16 (Brookshire Boulevard), southeast on Brookshire Boulevard from I-85 to the northern I-77/I-277 interchange, and southeast adjacent to I-277/NC16 (Brookshire Fwy) from the northern I-77/I-277 interchange to Davidson St. (TIP Number U-4440A/B)

The project that is the subject of these functional specifications will further extend the system 21.5 kilometers (13.4 miles) south and southeast along I-485 from the western interchange of I-85 and I-485 to 3.2 kilometers (two miles) east (Westinghouse Blvd) of the southern interchange of I-77 and I-485.

This project involves the following elements:

- Installation and integration of a conduit and fiber optic cable network
- Installation and integration of active communications equipment including fiber optic transceivers, fiber optic video multiplexers and de-multiplexers, and T-1 multiplexers.
- Installation and integration of intelligent transportation system (ITS) field components including: microwave vehicle detector (MVD) units and their associated equipment, dynamic message sign (DMS) units and their associated equipment, and closed-circuit television (CCTV) cameras and their associated equipment
- Integration of communications equipment at existing communications hub buildings
- Installation and integration of head-end communications equipment at the MRTMC including T-1 multiplexers, terminal servers, video optical receiver de-multiplexers
- Integration of the newly added DMS and MVD units into their associated software server databases and system graphical user interface
- Removal of existing PK-2100 programmable logic controller units at existing CCTV camera unit locations not collocated with DMS or MVD units
- Upgrade and modifications of the central video subsystem including:
    - Replacement of the existing audio matrix switcher
    - Integration of the CCTV video inputs installed under this project with the existing video matrix switcher
    - Integration of the new CCTV control circuits with the existing video matrix switcher data inputs

- Installation/Integration of new keypad joystick video controllers with existing video switch

The Design-Build team shall organize and schedule its work such that the audio switcher replacement, the removal of the existing audio switch engine, and the replacement/installation of new keypad joystick controllers shall be completed within the first 120 days of the commencement of any Intelligent Transportation Systems construction of the project. This time shall be inclusive of material submittals and review that occur subsequent to construction.

A copy of the System User's Guide Volume 3 (Communication Subsystem) developed by Honeywell Technology Systems Incorporated for NCDOT (March 2001) document is available upon request. This document contains a detailed description of the system components installed as part of the original deployment.

Reference the Traffic Control Scope of Work for time restrictions and lane closure requirements.

B. EXISTING COMMUNICATION ARCHITECTURE

The existing MRTMC system consists of:

- On-Freeway Detection Subsystem
- On-Freeway CCTV Subsystem
- Video Subsystem
- Traffic Management System (TMS) Hardware Subsystem
- Communications Subsystem
- TMS Software

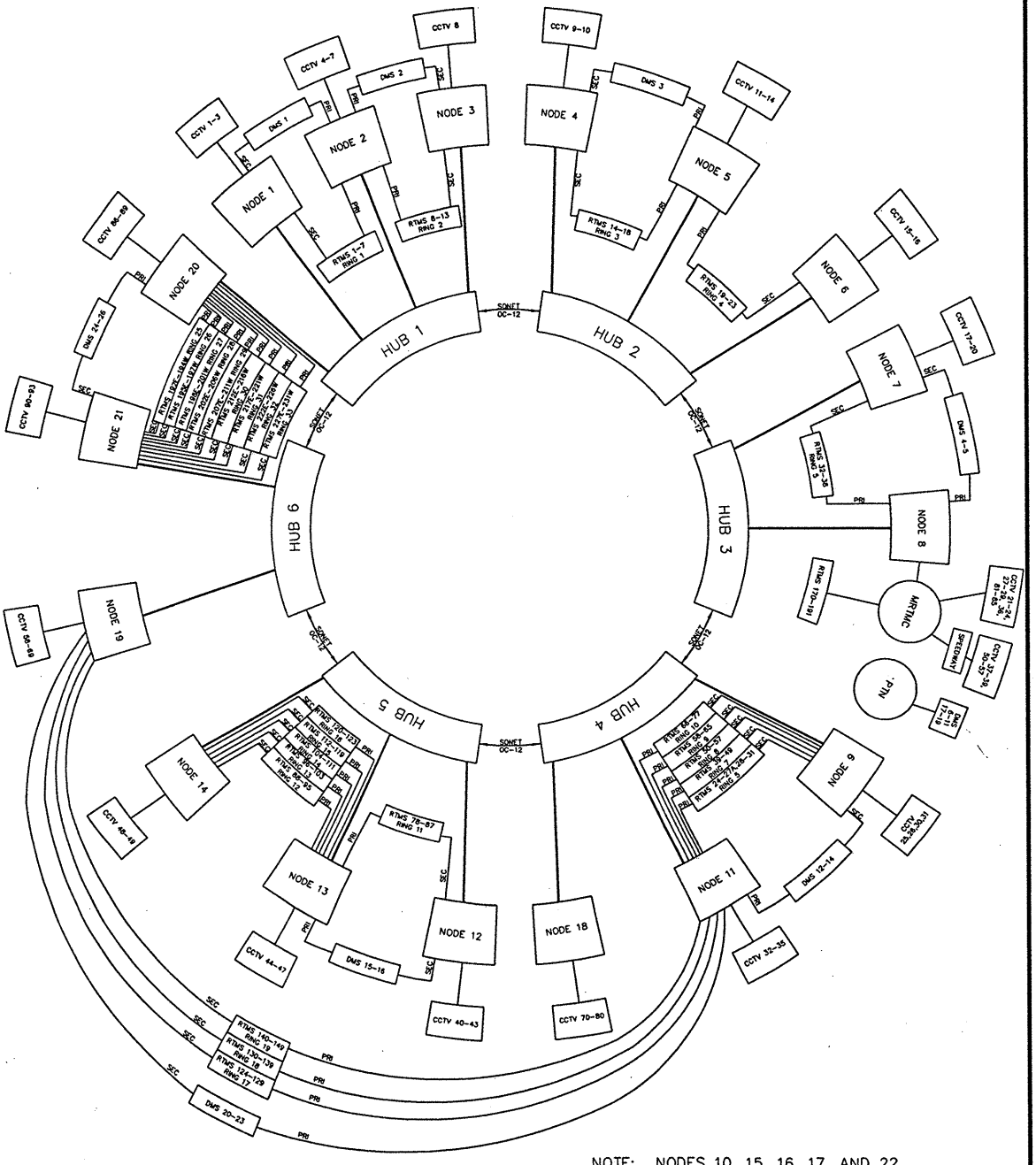
The subsystems are interfaced and incorporated into the Traffic Management System (TMS) Software. For detailed operating instructions see the Software System Users Guide.

The main elements of the MRTMC Communications Subsystem are:

- Cabletron Ethernet Hubs
- Other Ethernet Hubs
- Network Management Element
- Synchronous Optical Network (SONET)
- RFL IMUX2000s (Nodes)
- International Fiber Systems (IFS) transceivers

A high-level conceptual subsystem relation diagram of the original deployment with subsequent construction and modification proposed under this project is shown in Figure 1-1. A simplified Remote Traffic Monitoring Sensor (RTMS), also referred to as Microwave Vehicle Detectors (MVD), communication diagram is shown in Figure 1-2. A simplified DMS communication diagram is shown in Figure 1-3. A simplified CCTV communications diagram of the original system is shown in Figure 1-4. Detailed diagrams of the existing communications subsystem can be found in the System User's Guide Volume 3 (available upon request). In most cases the field data interface to T-1 multiplexer nodes are then placed on the SONET ring for transmission to the MRTMC.

In most cases, CCTV video is multiplexed in the field onto 4:1 video optical multiplexer units and the multiplexed circuits are routed back to the MRTMC. All of the devices integrated on this project are routed back to the MRTMC in this manner.



NOTE: NODES 10, 15, 16, 17, AND 22 ARE THE HEAD-ENDS AT THE MRTMC

FIGURE 1-1. HIGH-LEVEL CONCEPTUAL SUBSYSTEM RELATIONSHIP DIAGRAM.

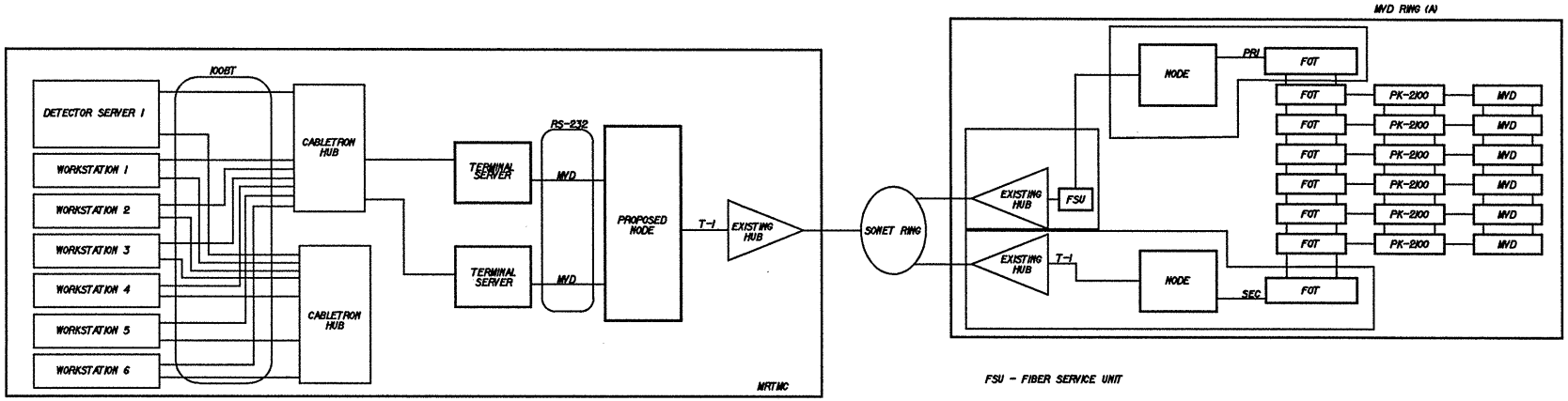


FIGURE 1-2. TYPICAL SIMPLIFIED RTMS COMMUNICATION DIAGRAM

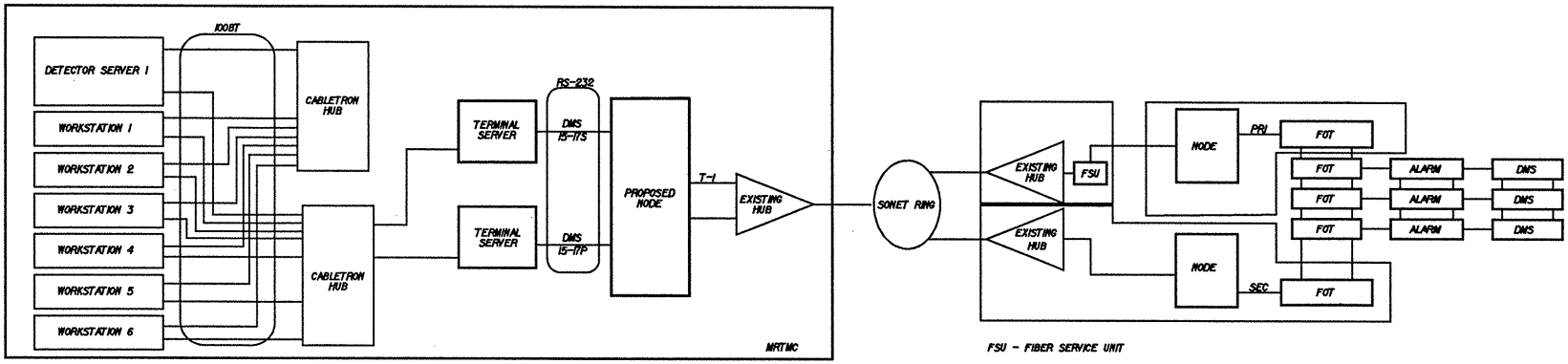


FIGURE 1-3. TYPICAL SIMPLIFIED DMS COMMIUNICATIONS DIAGRAM

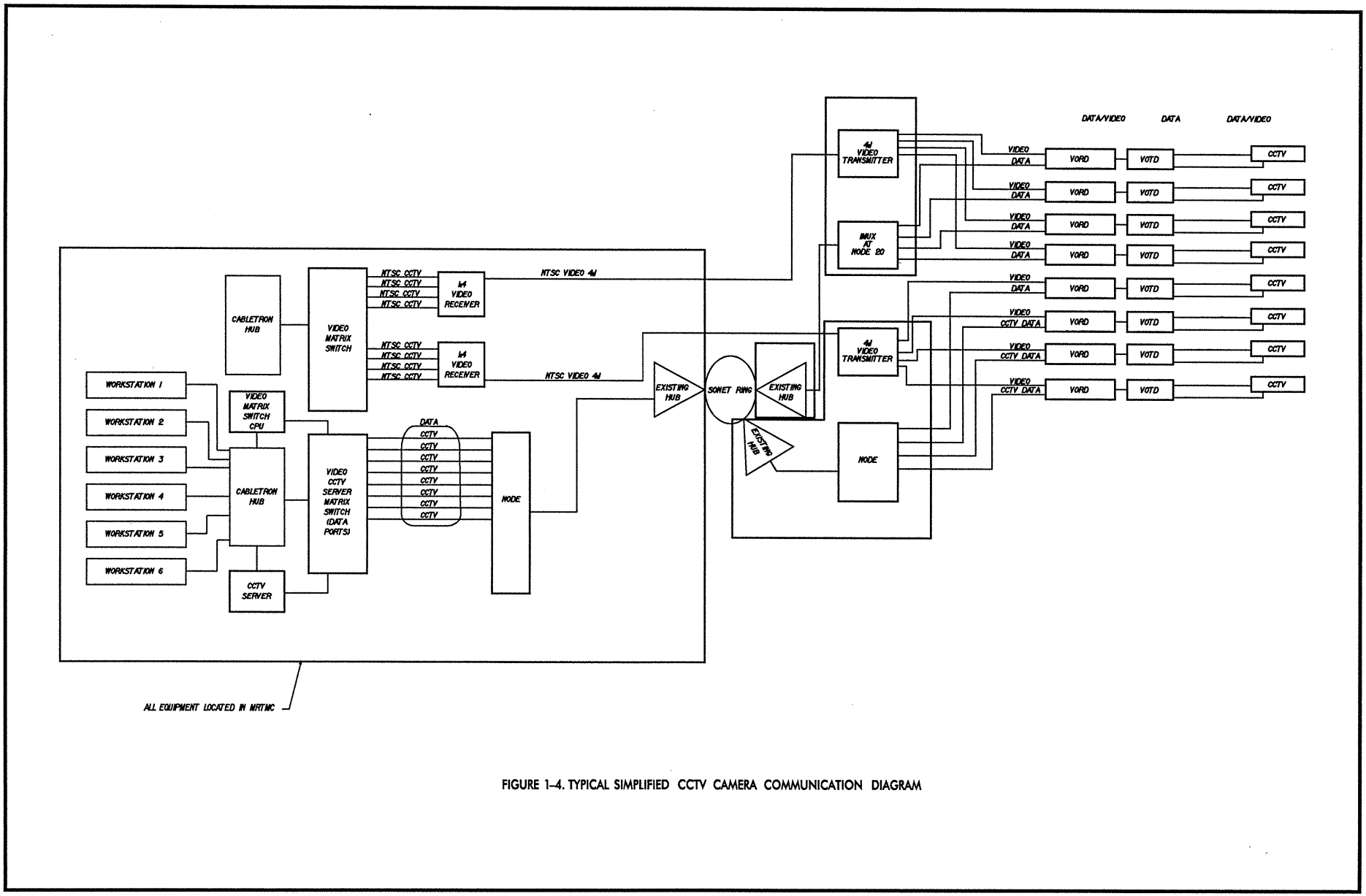


FIGURE 1-4. TYPICAL SIMPLIFIED CCTV CAMERA COMMUNICATION DIAGRAM

1. Cabletron Hubs

The Cabletron Hubs are located in the MRTMC and are used to interface the existing TMC Hardware Subsystem with other elements of the MRTMC system as shown in Figure 1-1. Interface to the field is through the field equipment hubs. Physical connections can be found in the attached System User's Guide. A patch panel system allows the function of a field equipment hub to be reassigned to the other field equipment hub in case of failure.

2. SONET

The heart of the MRTMC communications system is an ALCATEL OC-12 Dual Ring SONET. The dual ring provides a fully redundant SONET network. It is anticipated that there will be 6 hubs in place at the commencement of construction of this Project. They are depicted on sheet ITS-2U of the Functional Plans. Their approximate locations are listed as follows:

HUB	LOCATIONS	NODE
1	I-77 @ Arrowood Rd.	2
2	I-77 @ Remount Rd.	5
3	MRTMC/TOC	8, 10, 15, 16, 17, 22
4	I-77 @ I-485 (Northern Interchange)	11, 18
5	I-85 @ I-485 (Eastern Interchange)	12, 13
6	I-485 @ I-85 (Western Interchange)	19, 21
	I-77 @ Westinghouse	1
	I-77 @ Tyvola	3
	I-77 @ South Tryon & NC 49	4
	I-77 @ Freedom lane	6
	I-77 @ I-277/NC-16 Brookshire	7
	I-77 @ Cindy Lane (north of I-85)	9
	I-85 @ NC-49	14
	I-485 @ I-77 (Southern Interchange)	20

The SONET requires a precision clock reference to function properly. The MRTMC SONET uses Global Positioning System (GPS) receiver and a redundant Datum Timing system to provide this precision timing reference.

3. RFL IMUX2000

Interfaced to the SONET are RFL IMUX2000s which are associated with nodes. These devices are collocated with hubs or are located in field cabinets. These devices multiplex the DS-0 (64 kbps) channel data into DS-1 (1.544 megabits per second) data streams onto the OC-12 SONET. The DS-0 data originate in the various field equipment cabinets along the Interstate and in the MRTMC.

C. EXISTING COMMUNICATION ARCHITECTURE

Typical simplified communications data flows are shown in Figures 1-2 through Figure 1-4. The detailed data flows from the MRTMC to a field device are shown in the attached System User's Guide. The request for data originates in the MRTMC software residing on the TMS Hardware Subsystem.

1. MVD Subsystem and Data Flow

In all of the current and under-construction deployments of the MRTMC system, the MVD units in place are the RTMS X3 model devices manufactured by EIS. These units collect traffic data and transmit this data to the MRTMC for processing. The MVDs are typically pole-mounted in a side fire configuration and collect data for up to eight detection zones. The cabinets that house the communication equipment are of two different designs. The first type of installation is a pole mounted cabinet and the second type is a 332 standard traffic cabinet. The equipment used in these cabinets and the way it interfaces to the system are uniform (identical). The MVDs are arranged in equipment rings for communication purposes. The rings are addressable RS232 with redundant transceivers and operate in the "drop and insert" mode. The data circulating on the ring is "dropped" at each location. The data is examined to determine if it is applicable to that particular device. If it is not, it is "inserted" back into the ring.

A simplified sample data flow for a request for data from the first MVD located on the freeway is shown in Figure 1-2. The request will be a poll request initiated either automatically by the system server in the MRTMC or manually by an operator at a workstation. The system server sends an Ethernet packet through the Cabletron Hub to the Terminal Server where it is then converted to an RS-232 protocol data request. The MVD data request is transmitted to the TMC node RFL IMUX2000 as a DS-0 data where it is multiplexed with other DS-0 channels into a DS-1 (1.544 megabit) data stream. The DS-1 data stream is then sent to the ALCATEL SONET Hub and becomes one of the sub channels on the SONET OC-12 carrier.

The data request for MVD primary path is through SONET Hub 1, Node 20. The SONET demultiplexes the OC-12 down to the DS-1 channel and sends the data to Node 20. Node 20 demultiplexes the data into DS-0 channels. Due to its unique addressing, the data is directed to the IFS 1030 transceiver to be sent on MVD Ring A. The MVD Ring is made up of any number of

MVDs configured with FOT in a drop-insert configuration. Due to the addressing in the MVD data request, it will be only be accepted by first MVD and rejected by the other MVDs on the ring. Between the MVD and the FOT is a microprocessor controlled multiplexer, known as a PK-2100. The PK-2100 throughputs the request for data directly to the MVD. However, when the response data is sent to the PK-2100 from the MVD, the PK-2100 multiplexes in the door alarm and cabinet over-temperature alarm with the MVD data transmission to the MRTMC. This MVD data is sent back to Node 20 at the DS-0 rate to the IFS 1030 transceiver. There it is multiplexed into the DS-1 data stream for input to SONET Hub 3 at the MRTMC.

The data is received at the MRTMC and is de-multiplexed into a DS-1 stream by SONET Hub 3. The DS-1 data is de-multiplexed by the RFL IMUX2000 down to a DS-0 channel. This DS-0 data is sent to the same channel of the terminal server for a protocol change from RS-232 to Ethernet. The data is sent on the Ethernet local area network (LAN) to the Cabletron hub where it is routed to the requesting system server for processing. The server processes the data and provides the operator with an update of the system.

In the event that the first MVD did not respond in the allotted time, the system would poll first MVD on its secondary path, which uses a different terminal server through Hub 6, Node 21. Most all MVDs, DMSs, and camera control in the existing system use the SONET for communication to the MRTMC and all devices installed under this project will the SONET ring for communications.

2. DMS Subsystem and Data Flow

DMS units provide the motorist with current traffic condition and other critical information and assist in the control or rerouting of traffic during incidents. The DMS units are set up in rings similar to the MVDs. A simplified data flow diagram is shown in Figure 1-3.

3. CCTV Camera Subsystem and Data Flow

The MRTMC system CCTV cameras provide visual verification of an incident as well as monitor traffic conditions. Typically, camera control communications is conducted over the SONET network and all of the CCTV camera units installed under this project will have their communications channels routed over the SONET ring.

A simplified CCTV camera data flow diagram is shown in Figure 1-4. Video is transmitted from the camera to the MRTMC via a video optical transmitter with data (VOT-D) to a node location. At the node location, the video signal output from an optical signal back to **N**ational **T**elevision **S**ystem **C**ommittee (NTSC) video and CCTV camera control data electrical signals via a video optical receiver with data (VOR-D). The CCTV camera data is then input into the RFL IMUX2000 where it becomes one of many data streams multiplexed onto the DS-1 link to the ALCATEL SONET ring.

The NTSC video from a camera is multiplexed with up to 3 other video streams using the 4:1 video optical transmitter multiplexer (VOTMUX) at the node for transmission to the TMC. In some case, video circuits at locations adjacent to the MRTMC are routed un-multiplexed back to the MRTMC. However, all video circuits installed under this project will be node multiplexed prior to transmission to the MRTMC.

4. Central Video Subsystem

The central video subsystem is located in the MRTMC and provides the video resources to provide: display, record, annotate, switch, image capture, and quad combining of the real-time video received from the COHU CCTV cameras. In addition, the video system provides the capability to demodulate up to eight cable television signals as well as display computer monitor screen data on the video wall.

All video sources can be displayed on a 48 cube Electrosonic Video Wall, the workstation monitors, or the large monitors located in conference room and event staging room. The Electrosonic Video Wall consists of 48 monitors configured as 3 video walls of 16 video cubes per wall. The right and left walls are 16 individual video displays. The center wall receives and displays both NTSC video and RGB (Red, Green, and Blue) high–resolution graphics. The center wall has various configurations to display either video or a combination of both video and RGB inputs.

The video system also provides the general public with the ability to see single frames of video on the NCDOT web page through the use of software and video captures cards that are connected to a touring output on the video matrix switcher to "capture" static CCTV camera images.

The central video sub-system will undergo modification and integration with keypad joystick controllers and a new audio switch under this project.

5. TMS Hardware Subsystem

The TMS Hardware Subsystem consists of five workstations, eight servers, and a Redundant Array of Inexpensive Disks (RAID) system. The servers are named for the function they perform. Along with the server, the TMS Hardware Subsystem provides three black and white printers, one color printer, one scanner, four administrative computers, and one remote access computer. The remote computer is a stand-alone computer configured to support limited operator functions at a remote location. All the other computers and printers are linked together through the Ethernet LAN of the MRTMC System. Details of the TMS Hardware Subsystem can be found in the System User's Guide.

D. GENERAL REQUIREMENTS

1. Description

All new and existing field devices within the project limits shall be fully functional in the existing MRTMC subsystems or sub-systems as modified under this project. This work will include the elements described in Section I of these functional specifications.

The selected Design-Build Team will be required to submit a detailed project schedule for the ITS elements of this project in Microsoft Project (or similar software) format including a critical path method (CPM) chart. The CPM chart shall include all project submittal and approval dates

required for the project. The Design-Build Team shall submit a list of required project submittals and approvals as part of their technical proposal.

The MRTMC expansion includes: furnishing, installing, and integrating new MVD units (also referred to as RTMS units), DMS units, messenger cable, wood poles for cable installation, CCTV camera units, CCTV camera poles with CCTV camera unit lowering devices, T-1 data nodes, equipment cabinets, fiber optic cable, splice enclosures, junction boxes, and underground conduit. The Design-Build Team will be required to incorporate the new devices into the existing (and where applicable new) central database and communication system described in these functional specifications. The devices furnished and installed by the Design-Build Team shall be of the same manufacturer and model of the existing devices unless otherwise approved by the Engineer.

2. Standard Specifications

All work shall be performed to meet or exceed the requirements of these functional specifications and plans. All work shall be performed in accordance with the *2002 Standard Specifications for Roads and Structures* (also referred to herein as the "Standard Specifications"). The current edition of these specifications and publications in effect on the date of advertisement shall apply.

3. Other Codes and Standards

All electrical equipment shall conform to the latest version of the applicable standards of the National Electric Manufacturer's Association (NEMA), the National Electric Code (NEC) the Underwriters' Laboratories, Inc. (UL), the Electronic Industries Association (EIA), the International Municipal Signal Association (IMSA), and the National Electrical Safety Code (NESC). All materials and workmanship shall conform to the requirements of the NESC, standards of the American Society for Testing and Materials (ASTM); American National Standards Institute (ANSI); and any state laws and city codes and ordinances that apply.

4. Submittals and Reviews

All submittals and reviews shall comply with these Functional Specifications. Provide NCDOT with a minimum of 20 working days for reviews of conformance. The Design-Build Team shall submit 100% Intelligent Transportation Systems project plans and specifications for approval by the NCDOT prior to Intelligent Transportation Systems construction. Submittals should be made on half-size plan sheets.

a. Proposal Submittals

Submit as part of technical proposals, for NCDOT to review and approval, a block diagram that identifies (by make and model number) all portions of proposed equipment subsystems and depicts their connectivity and functional relationship.

b. Submittals for Review of Conformance

Prior to construction the Design-Build Team shall provide a detailed set of preliminary plans and project specifications, including block diagrams of all system elements, for Department review

and approval. No construction on the ITS portion of this project can begin until NCDOT has approved the 100% plans and specifications. As part of the preliminary plans, submit product information sheets for all components of each proposed subsystem.

Depict proposed device locations in the preliminary plans package. Provide detailed shop drawings for each type of device, indicating types of materials proposed for each component, assembly techniques, layout of devices, and wiring schematics. Provide parts listings with circuit and board designation, part type and class, power rating, component manufacturer, and mechanical part manufacturer.

Develop a typical detail and specification for lightning protection for each device type. At a minimum the Design-Build Team shall use NCDOT typical details, unless otherwise directed by the Engineer. Provide detailed plans and specifications for all device mountings. Develop specifications for the testing of the proposed devices that shall be included in the preliminary design package. Describe how all components of the subsystem are to be tested, the schedule of the testing, and the thresholds for acceptance. Describe how the proposed subsystems will be incorporated into the MRTMC system database and mapping.

Develop a detailed migration plan for upgrade of the central video subsystem. No existing field CCTV input shall be unavailable for viewing and control at the MRTMC for more than 10 business days and no more than 20% of the CCTV inputs shall be unavailable for viewing and control at a time at anytime during the project during MRTMC operating hours.

Use the NCDOT's existing device identification scheme for use in identifying existing and proposed devices via the system software on-screen display. The existing device identification is a follows:

RTMS 0I0077S0006.27

Where: RTMS = equipment type (RTMS, CCTV, DMS, etc.)
0I = Interstate
0077 = Route number
S = direction (southbound, northbound)
0006.27 = mile marker

The Engineer will review this information and provide comments on the proposed design and components to the Design-Build Team. Revise the design as directed by the Engineer and submit a revised design that reflects the Engineer's comments. The Engineer will advise the Design-Build Team in writing when the design is approved for construction.

c. Submittals for Information Only

Submit to the Engineer the following information:

- Manufacturer's warranty information on all devices furnished with each devise subsystem. (Present in an organized manner using ring binders with annotated section dividers.)
- All manuals (user guides, owner's manuals, etc.) furnished by the manufacturer for all devices used in each device subsystem

The Design-Build Team shall provide detailed wiring diagrams showing all input/output (I/O) addressing for each new device installed.

5. Warranty Requirements

The performance of all new and existing devices shall be warranted by the Design-Build Team for one (1) year after the final acceptance of the entire project by the NCDOT. NCDOT will operate the MRTMC during the one (1) year warranty period. A list of all new and existing field equipment to be included in the warranty is listed in Table I-1. Additional equipment included in the warranty includes all field and central equipment installed as part of the project, including all new fiber optic cable, conduits, etc. The warranty shall include all preventative and emergency maintenance. The warranty will not include existing system software unless modified by the Design-Build Team.

Investigate, diagnose and report device failures within 24 hours of the receipt of the report from NCDOT. Repair or replace failed communication devices for device subsystems within 48 hours of the diagnoses.

As part of the proposal package, the Design-Build Team shall submit to the Engineer a warranty plan for the system.

6. Electromagnetic Compatibility

Provide equipment under this Contract that resists and is not impaired by ambient electrical or magnetic fields, such as those caused by power lines, transformers, and motors. Install line filters as required by the Standard Specifications on all equipment. Equipment furnished and/or installed by the Design-Build Team shall not radiate signals that adversely affect other equipment. Provide equipment that meets Federal Communications Commission (FCC) and Bellcore GR-1089-CORE (or approved equivalent) requirements for electromagnetic compatibility.

7. Electrical Service Requirements

a. Introduction

Electrical power service, from the power service provider, shall be provided to the field equipment installed under this project. The Design-Build Team shall be responsible for all coordination with the power service provider as well as all materials, labor, trenching, horizontal directional drilling, or any other means to install electrical service to the field devices installed under this project. The installation of all electrical devices including wire sizing, conduit sizing, electrical underground splicing, and grounding/bonding shall be in accordance with the National Electric Code (NEC), the Standard Specifications, and all other applicable codes and regulations. Power service installations shall typically include a service power meter (where required), fusible disconnect switch, power distribution breaker panel, and all wire, conduit, wire splices, and all labor associated with the installation of these device.

The Design-Build Team shall install service meter and disconnect box at all locations where new power service is installed. Meter base may need to be installed at the control of access line in accordance with power company requirements.

b. Functional Requirements

(1.) Power Service Meter Base

The power service meter base shall include the meter base, mounting brackets, connecting wire and conduit, and all work, equipment and appurtenances, as required, to properly install and connect the meter base. This item does not include the actual meter, which will be provided by the power service provider.

(a.) Fusible Disconnect Switch

The fusible disconnect switch shall be a 60 ampere, 240 VAC, 3-wire disconnect switch. An approved switch shall incorporate a fusible 2 knife-blade switch and a solid neutral connection. This installation requires a NEMA 3R rated rainproof switch. The switch shall be no larger than 460mm x 255mm x 178mm (18in x 10in x 7in) (Height x Width x Depth).

(b.) Power Distribution Breaker Panel

The power distribution breaker panel shall be a 1 phase, 3 wire 120/240 panel rated for a load of at least 60 amperes. This installation requires a NEMA 3R rated rainproof enclosure and shall accommodate at least six (6) - 120 VAC circuits. An approved unit shall incorporate a one-piece copper plated bus that will handle up to 4 replaceable circuit breakers.

The power distribution breaker panel shall be fed from the fusible disconnect switch and shall directly feed the field located equipment installed under this project.

(c.) Circuit Breakers

The circuit breaker shall be approved and listed by Underwriter's Laboratories. The operating mechanism shall be enclosed, trip free from operating handle on overload, and trip indicating. Contacts shall be silver alloy enclosed in an arc-quenching chamber. Each field cabinet shall be supplied with power from a separate circuit breaker such that no single circuit breaker failure will result in loss of power to more than one cabinet. In addition, a properly rated equipment circuit breaker(s) shall be provided for the equipment complement shown on the Functional Plans for each cabinet supplied. Circuit breakers shall be sized according to the load supported and installed according to manufacturer’s recommendations.

(d.) Wire Splices

At certain locations, it may be necessary to perform underground splicing of power conductors. The Design-Build team shall submit a method of conductor splicing to the Engineer for approval. This splicing method shall be for electrical service conductors only and shall not be performed on any other electrical or signal carrying conductor. The required electrical conductor splices shall conform to the following specifications at a minimum:

- Shall be performed inside of an approved pull box/junction box.
- May be made with a mechanical or crimp type device.
- Utilize a splicing device shall be sized according to the application
- Shall be water proof and weather resistant

-

(2.) Power Service Coordination

The Design-Build Team shall coordinate all power service as required to provide power to all devices installed in the field under this project. The Design-Build Team shall not request activation of more than 10 sites in any given week to stagger the demand placed upon the power provider. The Design-Build Team shall coordinate with NCDOT to ensure that no unwarranted service costs are incurred.

8. Testing Requirements

a. Test Plan

Submit a detailed test plan to the Engineer for approval at least 45 working days prior to initiation of any testing. Identify all required testing levels for the specific equipment provided. Identify the test organization including the roles and responsibilities of the quality assurance organization. For each piece of equipment that requires testing, the test plan shall at a minimum, delineate the following:

- Submittal schedule of test procedures
- Start time of each level of testing
- Test duration including any re-tests that are required or anticipated
- Submittal of the completed and approved test report

Revisions to the test plan shall be provided to the Engineer at the monthly progress meetings. A critical path method (CPM) chart shall be developed to track the sequence and completion of test plans for each level of testing, including periodic revisions.

Notify the Engineer of the proposed date, time and location of all testing 45 working days in advance of the test being performed. All testing shall be performed by the Design-Build Team and may be observed by the Engineer. The Engineer may perform additional testing at any time during the project.

b. Test Procedures

Prepare and submit test procedures for Unit Tests and System Acceptance Tests (SATs) to be performed. Provide test procedures for review and approval by the Engineer before any tests are conducted. The review period will not exceed 20 working days from receipt of the test procedures. The test procedures shall include the following:

- A step-by-step outline of the test sequence to be followed, showing a test of every function of the equipment of system to be tested
- A description of the expected operation, output, pass/fail criteria, test results, and criteria for re-test
- A summary cross reference of test procedures to these Functional Specifications.
- An estimate of the test duration and proposed test schedule
- A data form to be used to record all data and quantitative results obtained by the test
- A failure analysis and corrective action plan as described herein, for failed equipment as a result of Unit Tests and SATs

-
- A description of any special equipment, setup, manpower, or conditions required for the test
- Provisions for logging make, model, serial number, and calibration expiration date of test equipment

Each device and subsystem shall be tested in accordance with the testing plan and procedures developed by the Design-Build Team and approved by the Engineer. Include tests of the individual components as well as a test of the overall subsystem. Test each subsystem from the field cabinet and from a workstation in the MRTMC.

c. Unit Tests

After field equipment and fiber optic cable is installed and the Unit Test plan has been approved by the Engineer, conduct Unit Tests. At a minimum, the Unit Tests shall exercise all the non-network functional requirements of the equipment being installed and demonstrate compliance with the Special Provisions. The Design-Build Team shall furnish all necessary test equipment and the means to operate it at the field site.

Failed equipment and corrective actions taken shall be summarized in a monthly progress report and presented to the Engineer for approval. If the corrective action requires redesign of a failed device, the Design-Build Team shall provide the serial number tracking documentation to prove that all units have been successfully retrofitted. Re-testing to ensure the adequacy of the corrective action shall be conducted by the Design-Build Team at no additional cost. Results of the Unit Tests shall be provided to the Engineer for approval.

d. System Acceptance Testing (SAT)

The Design-Build Team shall perform the SATs after installation of all field devices. The purpose of performing the SAT is to ensure that the system functions properly with the expanded system, and maintains its original functionality. SAT testing shall be performed in accordance with the SAT manual developed for the original MRTMC system. A copy of the SAT procedures is included in the proposal package.

When failure occurs during testing, the Design-Build Team shall repair the system and rerun the affected portions of the SAT to the Engineer's satisfaction. The SAT testing shall be performed successfully prior to interim and final acceptance of the system. NCDOT shall be present during the SAT. NCDOT will rerun the SAT during the one year extended warranty period. The Design-Build Team shall repair/replace any failed equipment as a result of this test.

9. Documentation and Software

a. General

Supply equipment with operations and maintenance manuals that comply with applicable Bellcore/Telcordia specifications. Provide documentation that includes:

- Plans of Record Engineering Drawings
- Software manuals for commercial software
- Installation plan test plan , test procedures and test report
- Architectural drawings for hub buildings
- Equipment layout

-
- Use licenses for commercial software/firmware
- Spare parts analysis and "As Supplied" inventory list
- Status Report (monthly)

Supply manuals on all equipment that include information on installation, theory of operations, troubleshooting, part replacement, and parts identification. Schematics, block diagrams, and spare parts list shall conform to delivered equipment.

b. Specific Documentation

Supply a systems-level manual and drawings that provides an overview of the system, its operation, its interconnections and troubleshooting procedures. This manual will be an update to the existing System User's Manual to include the new equipment installed as part of this project. Test equipment used in system-level test shall be provided in a tabular format. Provide a detailed system operations and maintenance plan. Provide ten (10) copies of this manual.

Provide manuals associated with the operational understanding, interconnect, and maintenance of subsystems. Apply Bellcore/Telcordia documentation requirements to contents and format. Provide ten (10) copies of each manual.

Provide detailed manuals related to functional electronic units such as optical transceivers, D4 multiplexers, video code transceivers and other related network equipment. Provide ten (10) copies of each commercial manual for each functional type of equipment (by identical part number) installed on the project.

c. Installation and Interconnect Drawings

Provide all engineering drawings associated with equipment installation and interconnection in both hard copy form and electronic format. Clearly indicate the following on drawings:

- Equipment Designations
- Equipment Locations
- Communications conduit and cable location
- Cable/wire/fiber assignments
- New/Installed software

d. Fiber Optic Splice Diagrams

At every location where fiber optic cable is to be spliced, prior to installation, develop fiber optic splice diagrams in NCDOT standard format. Develop splice diagrams in Microstation CAD software with one diagram per standard plan sized page. For each diagram, in the title block indicate that the sheet is a splice diagram and in the title block and in the upper left hand corner of the sheet, indicate the location of the splice in lay terms (e.g., splice enclosure @ DMS 16: I-485 WB West of I-85) as well as using any naming or numbering convention utilized by the design-build team approved by the Engineer. The diagram shall show all devices, all cables, all buffer tubes, and all individual fibers. The colors of the buffer tubes and fibers shall be shown. The status of each fiber shall be shown (capped, spliced, terminated to a patch panel, or passed through the enclosure without being spliced). For each cable shown, the diagram shall indicate the device at the splice location the fibers are being terminated to as well as what upstream and downstream locations or devices the cables are coming from or going to. A sample diagram is contained on the following figure.

LOCATION F
(CCTV 4 AND RTMS 7, 8)

METRIC	PROJECT REFERENCE NO.	SHEET NO.
	R-2248D	ITS-2T

LEGEND

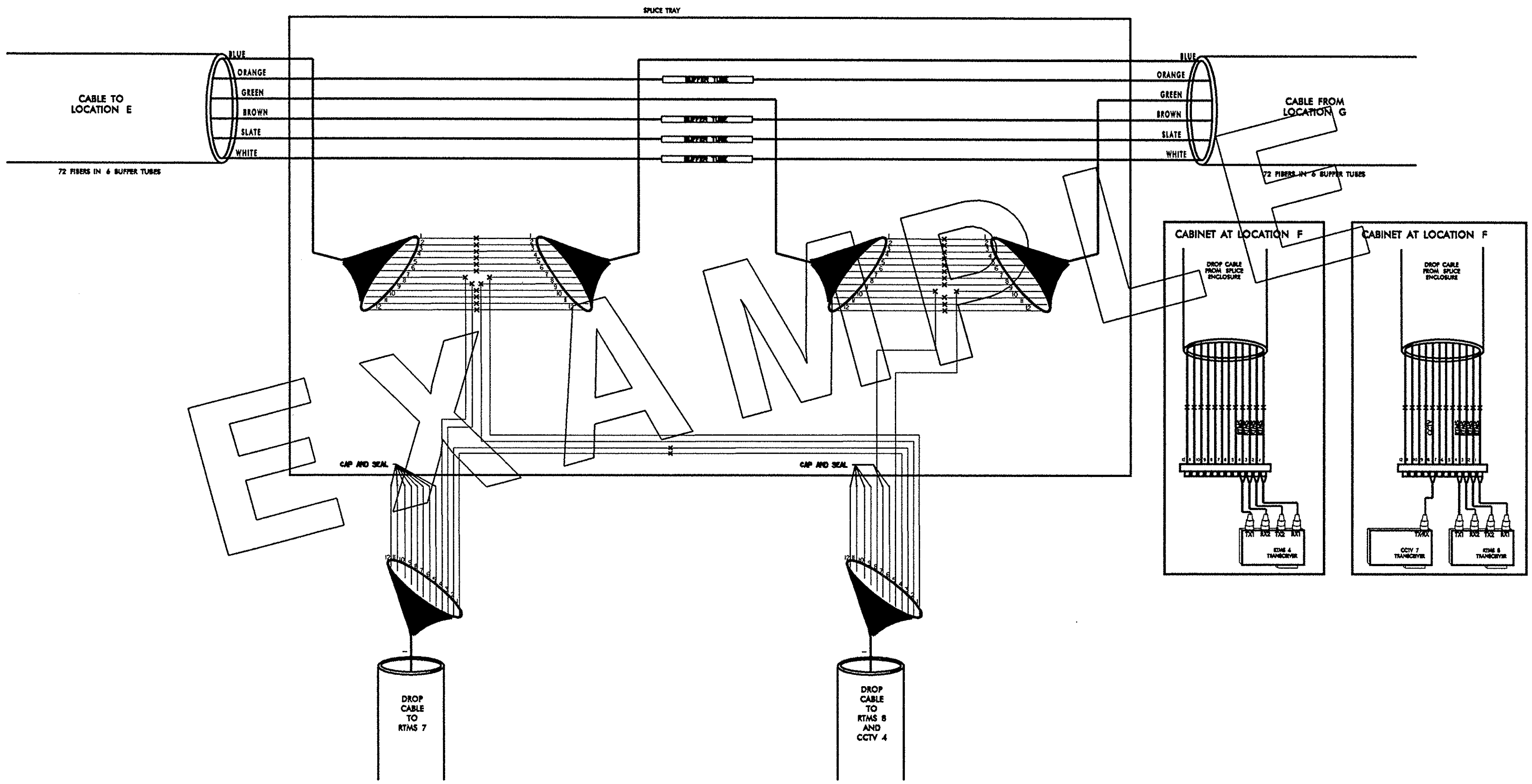
COLOR CODE TIA/EIA 598-A

(1) BLUE (7) RED
(2) ORANGE (8) BLACK
(3) GREEN (9) YELLOW
(4) BROWN (10) VIOLET
(5) SLATE (11) ROSE
(6) WHITE (12) AQUA

X - FUSION SPLICE INDIVIDUAL FIBER

BUFFER TUBE — SPLICE OR EXPRESS ENTIRE BUFFER TUBE AS NOTED

SPLICE ALL FIBERS IN ORANGE, BROWN, SLATE, AND WHITE BUFFER TUBES IN CABLE FROM LOCATION E TO SAME COLOR FIBER AND SAME COLOR BUFFER TUBE IN CABLE TO LOCATION G



PLAN PREPARED IN THE OFFICE OF:
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Raleigh N.C. 27636-3068
(919) 677-2000

LOCATION F
(CCTV 4 AND RTMS 7, 8)

DIVISION 10 — MECKLENBURG COUNTY

PLAN DATE:	FEB. 14, 2003	REVIEWED BY:	S.B. PRIVETTE
PREPARED BY:	J.C. CROSS	REVIEWED BY:	K.L. FINK
REVISIONS		INIT.	DATE

SEAL

SIGNATURE DATE

$FILE$

Table I-1

Equipment	#	Project		HUB & NODE	RING	DATE
CCTV	1	C-3300	I-77 SOUTH	Hub 1 at Node 1		~12/2000
CCTV	2	C-3300	I-77 SOUTH	Hub 1 at Node 1		~12/2000
CCTV	3	C-3300	I-77 SOUTH	Hub 1 at Node 1		~12/2000
CCTV	4	C-3300	I-77 SOUTH	Hub 1 at Node 2		~12/2000
CCTV	5	C-3300	I-77 SOUTH	Hub 1 at Node 2		~12/2000
CCTV	6	C-3300	I-77 SOUTH	Hub 1 at Node 2		~12/2000
CCTV	7	C-3300	I-77 SOUTH	Hub 1 at Node 2		~12/2000
CCTV	8	C-3300	I-77 SOUTH	Hub 1 at Node 3		~12/2000
CCTV	9	C-3300	I-77 SOUTH	Hub 2 at Node 4		~12/2000
CCTV	10	C-3300	I-77 SOUTH	Hub 2 at Node 4		~12/2000
CCTV	11	C-3300	I-77 SOUTH	Hub 2 at Node 5		~12/2000
CCTV	12	C-3300	I-77 SOUTH	Hub 2 at Node 5		~12/2000
CCTV	13	C-3300	I-77 SOUTH	Hub 2 at Node 5		~12/2000
CCTV	14	C-3300	I-77 SOUTH	Hub 2 at Node 5		~12/2000
CCTV	15	C-3300	I-77 SOUTH	Hub 2 at Node 6		~12/2000
CCTV	16	C-3300	I-77 SOUTH	Hub 2 at Node 6		~12/2000
CCTV	17	C-3300	I-77 SOUTH	Hub 3 at Node 7		~12/2000
CCTV	18	C-3300	I-77 SOUTH	Hub 3 at Node 7		~12/2000
CCTV	19	C-3300	I-77 SOUTH	Hub 3 at Node 7		~12/2000
CCTV	20	C-3300	I-77 SOUTH	Hub 3 at Node 7		~12/2000
CCTV	21	C-3300	I-77 SOUTH	DIRECT BACK TO MRTMC		~12/2000
CCTV	22	C-3300	I-77 SOUTH	DIRECT BACK TO MRTMC		~12/2000
CCTV	23	C-3300	I-77 SOUTH	DIRECT BACK TO MRTMC		~12/2000
CCTV	24	C-3300	I-77 SOUTH	DIRECT BACK TO MRTMC		~12/2000
CCTV	25	C-3300	I-77 SOUTH	Hub 4 at Node 9		~12/2000
CCTV	26	C-3300	I-77 SOUTH	Hub 4 at Node 9		~12/2000
CCTV	27	C-3300	I-77 SOUTH	DIRECT BACK TO MRTMC		~12/2000
CCTV	28	C-3300	I-77 SOUTH	DIRECT BACK TO MRTMC		~12/2000
CCTV	29	I-3311A	I-77 DBUILD	DIRECT BACK TO MRTMC		Early 2001
CCTV	30	I-3311A	I-77 DBUILD	HUB 4- NODE 9		Early 2001
CCTV	31	I-3311A	I-77 DBUILD	HUB 4- NODE 9		Early 2001
CCTV	32	I-3311A	I-77 DBUILD	HUB 4- NODE 11		Early 2001
CCTV	33	I-3311A	I-77 DBUILD	HUB 4- NODE 11		Early 2001
CCTV	34	I-3311A	I-77 DBUILD	HUB 4- NODE 11		Early 2001
CCTV	35	I-3311A	I-77 DBUILD	HUB 4- NODE 11		Early 2001

Table I-1

Equipment	#	Project		HUB & NODE	RING	DATE
CCTV	36	I-3311A	I-77 DBUILD	DIRECT BACK TO MRTMC		Early 2001
CCTV	37	U-3115AA	SPEEDWAY	MRTMC THRU SPEEDWAY CCC		
CCTV	38	U-3115AA	SPEEDWAY	MRTMC THRU SPEEDWAY CCC		
CCTV	39	U-3115AA	SPEEDWAY	MRTMC THRU SPEEDWAY CCC		
CCTV	40	I-3803A	I-85 DBUILD	HUB 5 NODE 12 (I-85 @ I-485)		
CCTV	41	I-3803A	I-85 DBUILD	HUB 5 NODE 12 (I-85 @ I-485)		
CCTV	42	I-3803A	I-85 DBUILD	HUB 5 NODE 12 (I-85 @ I-485)		
CCTV	43	I-3803A	I-85 DBUILD	HUB 5 NODE 12 (I-85 @ I-485)		
CCTV	44	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-85 @ I-485)		
CCTV	45	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-85 @ I-485)		7/30/01
CCTV	46	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-85 @ I-485)		7/30/01
CCTV	47	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-85 @ I-485)		7/30/01
CCTV	48	I-3803A	I-85 DBUILD	HUB 5 NODE 14 (I-85 @ I-485)		~4/02
CCTV	49	I-3803A	I-85 DBUILD	HUB 5 NODE 14 (I-85 @ I-485)		~4/02
CCTV	50	U-3115A	SPEEDWAY	MRTMC THRU SPEEDWAY CCC		~4/02
CCTV	51	U-3115A	SPEEDWAY	MRTMC THRU SPEEDWAY CCC		~4/02
CCTV	52	U-3115A	SPEEDWAY	MRTMC THRU SPEEDWAY CCC		~4/02
CCTV	53	U-3115A	SPEEDWAY	MRTMC THRU SPEEDWAY CCC		~4/02
CCTV	54	U-3115A	SPEEDWAY	MRTMC THRU SPEEDWAY CCC		~4/02
CCTV	55	U-3115A	SPEEDWAY	MRTMC THRU SPEEDWAY CCC		~4/02
CCTV	56	U-3115A	SPEEDWAY	MRTMC THRU SPEEDWAY CCC		~4/02
CCTV	57	U-3115A	SPEEDWAY	MRTMC THRU SPEEDWAY CCC		~4/02
CCTV	58	R-2248D	I-485	HUB 6- NODE 18 (I-485 @ I-85)		1/31/03
CCTV	59	R-2248D	I-485	HUB 6- NODE 18 (I-485 @ I-85)		1/31/03
CCTV	60	R-2248D	I-485	HUB 6- NODE 18 (I-485 @ I-85)		1/31/03
CCTV	61	R-2248D	I-485	HUB 6- NODE 18 (I-485 @ I-85)		1/31/03
CCTV	62	R-2248D	I-485	HUB 6- NODE 18 (I-485 @ I-85)		1/31/03
CCTV	63	R-2248D	I-485	HUB 6- NODE 18 (I-485 @ I-85)		1/31/03
CCTV	64	R-2248D	I-485	HUB 6- NODE 18 (I-485 @ I-85)		1/31/03
CCTV	65	R-2248D	I-485	HUB 6- NODE 18 (I-485 @ I-85)		1/31/03
CCTV	66	R-2248D	I-485	HUB 6- NODE 18 (I-485 @ I-85)		1/31/03
CCTV	67	R-2248D	I-485	HUB 6- NODE 18 (I-485 @ I-85)		1/31/03
CCTV	68	R-2248D	I-485	HUB 6- NODE 18 (I-485 @ I-85)		1/31/03
CCTV	69	R-2248D	I-485	HUB 6- NODE 18 (I-485 @ I-85)		1/31/03
CCTV	70	R-2248D	I-485	HUB 4- NODE 17 (I-485 @ I-77 (N))		1/31/03
CCTV	71	R-2248D	I-485	HUB 4- NODE 17 (I-485 @ I-77 (N))		1/31/03

Table I-1

Equipment	#	Project		HUB & NODE	RING	DATE
CCTV	72	R-2248D	I-485	HUB 4- NODE 17 (I-485 @ I-77 (N))		1/31/03
CCTV	73	R-2248D	I-485	HUB 4- NODE 17 (I-485 @ I-77 (N))		1/31/03
CCTV	74	R-2248D	I-485	HUB 4- NODE 17 (I-485 @ I-77 (N))		1/31/03
CCTV	75	R-2248D	I-485	HUB 4- NODE 17 (I-485 @ I-77 (N))		1/31/03
CCTV	76	R-2248D	I-485	HUB 4- NODE 17 (I-485 @ I-77 (N))		1/31/03
CCTV	77	R-2248D	I-485	HUB 4- NODE 17 (I-485 @ I-77 (N))		1/31/03
CCTV	78	R-2248D	I-485	HUB 4- NODE 17 (I-485 @ I-77 (N))		1/31/03
CCTV	79	R-2248D	I-485	HUB 4- NODE 17 (I-485 @ I-77 (N))		1/31/03
CCTV	80	R-2248D	I-485	HUB 4- NODE 17 (I-485 @ I-77 (N))		1/31/03
CCTV	81	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC		5/13/03
CCTV	82	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC		5/13/03
CCTV	83	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC		5/13/03
CCTV	84	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC		5/13/03
CCTV	85	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC		5/13/03
CCTV	86	R-2248F	I-485 DBUILD	Node 20 (I-485 @ I-77 south) to HUB 1 (I-77 @ Arrowood)		~2/2004
CCTV	87	R-2248F	I-485 DBUILD	Node 20 (I-485 @ I-77 south) to HUB 1 (I-77 @ Arrowood)		~2/2004
CCTV	88	R-2248F	I-485 DBUILD	Node 20 (I-485 @ I-77 south) to HUB 1 (I-77 @ Arrowood)		~2/2004
CCTV	89	R-2248F	I-485 DBUILD	Node 20 (I-485 @ I-77 south) to HUB 1 (I-77 @ Arrowood)		~2/2004
CCTV	90	R-2248F	I-485 DBUILD	HUB 6 NODE 21 (I-485 @ I-85 WEST)		~2/2004
CCTV	91	R-2248F	I-485 DBUILD	HUB 6 NODE 21 (I-485 @ I-85 WEST)		~2/2004
CCTV	92	R-2248F	I-485 DBUILD	HUB 6 NODE 21 (I-485 @ I-85 WEST)		~2/2004
CCTV	93	R-2248F	I-485 DBUILD	HUB 6 NODE 21 (I-485 @ I-85 WEST)		~2/2004
CCTV	94	U-209F	US74/Independ.			
CCTV	95	U-209F	US74/Independ.			
CCTV	96	U-209F	US74/Independ.			
CCTV	97	U-209F	US74/Independ.			
CCTV	98	U-209F	US74/Independ.			
CCTV	99	U-209F	US74/Independ.			
CCTV	100	U-209F	US74/Independ.			
CCTV	101	U-209F	US74/Independ.			
CCTV	102	U-209F	US74/Independ.			
DMS	1	C-3300	I-77 SOUTH	HUB 1 @ NODE 2		~12/2000
DMS	2	C-3300	I-77 SOUTH	HUB 1 @ NODE 2		~12/2000

Table I-1

Equipment	#	Project		HUB & NODE	RING	DATE
DMS	3	C-3300	I-77 SOUTH	HUB 2 @ NODE 5		~12/2000
DMS	4	C-3300	I-77 SOUTH	HUB 3 @ NODE 8 - MRTMC		~12/2000
DMS	5	C-3300	I-77 SOUTH	HUB 3 @ NODE 8 & 10 - MRTMC		~12/2000
DMS	6	C-3300	I-77 SOUTH	Dial-up on I-85		
DMS	7	C-3300	I-77 SOUTH	Dial-up on I-85		
DMS	8	C-3300	I-77 SOUTH	Dial-up on I-85		
DMS	9	C-3300	I-77 SOUTH	Dial-up on I-85		
DMS	10	C-3300	I-77 SOUTH	Dial-up on I-85		
DMS	11	C-3300	I-77 SOUTH	Dial-up on I-85		
DMS	12	I-3311A	I-77 DBUILD	HUB 4 Node 11		~early 2001
DMS	13	I-3311A	I-77 DBUILD	Node 7		~early 2001
DMS	14	I-3311A	I-77 DBUILD	HUB 4 Node 11		~early 2001
DMS	15	I-3803A	I-85 DBUILD	HUB 5 NODE 12 & 13 (I-85 @ I-485)		~4/02
DMS	16	I-3803A	I-85 DBUILD	HUB 5 NODE 12 & 13 (I-85 @ I-485)		~4/02
DMS	17	I-3803A	I-85 DBUILD	Dial-UP		
DMS	18	I-3803A	I-85 DBUILD	Dial-UP		
DMS	19	I-3803A	I-85 DBUILD	Dial-UP		
DMS	20	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85		1/31/03
DMS	21	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85		1/31/03
DMS	22	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85		1/31/03
DMS	23	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85		1/31/03
DMS	24	R-2248F	I-485 DBUILD	HUB 1 NODE 20 I-485 @ I-77 (s)		~2/2004
DMS	25	R-2248F	I-485 DBUILD	HUB 1 NODE 20 I-485 @ I-77 (s)		~2/2004
DMS	26	R-2248F	I-485 DBUILD	HUB 1 NODE 20 I-485 @ I-77 (s)		~2/2004
RTMS	1	C-3300	I-77SOUTH	HUB 1 @ NODE 2	RTMS RING 1	~12/2000
RTMS	2	C-3300	I-77SOUTH	HUB 1 @ NODE 2	RTMS RING 1	~12/2000
RTMS	3	C-3300	I-77SOUTH	HUB 1 @ NODE 2	RTMS RING 1	~12/2000
RTMS	4	C-3300	I-77SOUTH	HUB 1 @ NODE 2	RTMS RING 1	~12/2000
RTMS	5	C-3300	I-77SOUTH	HUB 1 @ NODE 2	RTMS RING 1	~12/2000
RTMS	6	C-3300	I-77SOUTH	HUB 1 @ NODE 2	RTMS RING 1	~12/2000
RTMS	7	C-3300	I-77SOUTH	HUB 1 @ NODE 2	RTMS RING 1	~12/2000
RTMS	8	C-3300	I-77SOUTH	HUB 1 @ NODE 2	RTMS RING 2	~12/2000
RTMS	9	C-3300	I-77SOUTH	HUB 1 @ NODE 2	RTMS RING 2	~12/2000
RTMS	10	C-3300	I-77SOUTH	HUB 1 @ NODE 2	RTMS RING 2	~12/2000
RTMS	11	C-3300	I-77SOUTH	HUB 1 @ NODE 2	RTMS RING 2	~12/2000

Table I-1

Equipment	#	Project		HUB & NODE	RING	DATE
RTMS	12	C-3300	I-77SOUTH	HUB 1 @ NODE 2	RTMS RING 2	~12/2000
RTMS	13	C-3300	I-77SOUTH	HUB 1 @ NODE 2	RTMS RING 2	~12/2000
RTMS	14	C-3300	I-77SOUTH	HUB 2 @ NODE 5	RTMS RING 3	~12/2000
RTMS	15	C-3300	I-77SOUTH	HUB 2 @ NODE 5	RTMS RING 3	~12/2000
RTMS	16	C-3300	I-77SOUTH	HUB 2 @ NODE 5	RTMS RING 3	~12/2000
RTMS	17	C-3300	I-77SOUTH	HUB 2 @ NODE 5	RTMS RING 3	~12/2000
RTMS	18	C-3300	I-77SOUTH	HUB 2 @ NODE 5	RTMS RING 3	~12/2000
RTMS	19	C-3300	I-77SOUTH	HUB 2 @ NODE 5	RTMS RING 4	~12/2000
RTMS	20	C-3300	I-77SOUTH	HUB 2 @ NODE 5	RTMS RING 4	~12/2000
RTMS	21	C-3300	I-77SOUTH	HUB 2 @ NODE 5	RTMS RING 4	~12/2000
RTMS	22	C-3300	I-77SOUTH	HUB 2 @ NODE 5	RTMS RING 4	~12/2000
RTMS	23	C-3300	I-77SOUTH	HUB 2 @ NODE 5	RTMS RING 4	~12/2000
RTMS	24	C-3300	I-77SOUTH	HUB 4 @ NODE 11 - MRTMC	RTMS RING 5	~12/2000
RTMS	25	C-3300	I-77SOUTH	HUB 4 @ NODE 11 - MRTMC	RTMS RING 5	~12/2000
RTMS	26	C-3300	I-77SOUTH	HUB 4 @ NODE 11 - MRTMC	RTMS RING 5	~12/2000
RTMS	27	C-3300	I-77SOUTH	HUB 4 @ NODE 11 - MRTMC	RTMS RING 5	~12/2000
RTMS	28	C-3300	I-77SOUTH	HUB 4 @ NODE 11 - MRTMC	RTMS RING 4	~12/2000
RTMS	29	C-3300	I-77SOUTH	HUB 4 @ NODE 11 - MRTMC	RTMS RING 5	~12/2000
RTMS	30	C-3300	I-77SOUTH	HUB 4 @ NODE 11 - MRTMC	RTMS RING 5	~12/2000
RTMS	31	C-3300	I-77SOUTH	HUB 4 @ NODE 11 - MRTMC	RTMS RING 5	~12/2000
RTMS	32	C-3300	I-77SOUTH	HUB 3 @ NODE - MRTMC	RTMS RING 6	~12/2000
RTMS	33	C-3300	I-77SOUTH	HUB 3 @ NODE - MRTMC	RTMS RING 6	~12/2000
RTMS	34	C-3300	I-77SOUTH	HUB 3 @ NODE - MRTMC	RTMS RING 6	~12/2000
RTMS	35	C-3300	I-77SOUTH	HUB 3 @ NODE - MRTMC	RTMS RING 6	~12/2000
RTMS	36	C-3300	I-77SOUTH	HUB 3 @ NODE - MRTMC	RTMS RING 6	~12/2000
RTMS	37	C-3300	I-77SOUTH	HUB 3 @ NODE - MRTMC	RTMS RING 6	~12/2000
RTMS	38	C-3300	I-77SOUTH	HUB 3 @ NODE - MRTMC	RTMS RING 6	~12/2000
RTMS	39	C-3300	I-77SOUTH	HUB 4 @ NODE 9	RTMS RING 7	~12/2000
RTMS	40	C-3300	I-77SOUTH	HUB 4 @ NODE 9	RTMS RING 7	~12/2000
RTMS	41	C-3300	I-77SOUTH	HUB 4 @ NODE 9	RTMS RING 7	~12/2000
RTMS	42	C-3300	I-77SOUTH	HUB 4 @ NODE 9	RTMS RING 7	~12/2000
RTMS	43	C-3300	I-77SOUTH	HUB 4 @ NODE 9	RTMS RING 7	~12/2000
RTMS	44	C-3300	I-77SOUTH	HUB 4 @ NODE 9	RTMS RING 7	~12/2000
RTMS	45	C-3300	I-77SOUTH	HUB 4 @ NODE 9	RTMS RING 7	~12/2000
RTMS	46	C-3300	I-77SOUTH	HUB 4 @ NODE 9	RTMS RING 7	~12/2000

Table I-1

Equipment	#	Project		HUB & NODE	RING	DATE
RTMS	47	C-3300	I-77SOUTH	HUB 4 @ NODE 9	RTMS RING 7	~12/2000
RTMS	48	C-3300	I-77SOUTH	HUB 4 @ NODE 9	RTMS RING 7	~12/2000
RTMS	49	C-3300	I-77SOUTH	HUB 4 @ NODE 9	RTMS RING 7	~12/2000
RTMS	24A	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 5	~early 2001
RTMS	25A	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 5	~early 2001
RTMS	26A	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 5	~early 2001
RTMS	27A	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 5	~early 2001
RTMS	50	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 8	~early 2001
RTMS	51	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 8	~early 2001
RTMS	52	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 8	~early 2001
RTMS	53	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 8	~early 2001
RTMS	54	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 8	~early 2001
RTMS	55	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 8	~early 2001
RTMS	56	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 8	~early 2001
RTMS	57	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 8	~early 2001
RTMS	58	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 9	~early 2001
RTMS	59	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 9	~early 2001
RTMS	60	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 9	~early 2001
RTMS	61	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 9	~early 2001
RTMS	62	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 9	~early 2001

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Equipment	#	Project		HUB & NODE	RING	DATE
RTMS	63	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 9	~early 2001
RTMS	64	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 9	~early 2001
RTMS	65	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 9	~early 2001
RTMS	66	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 10	~early 2001
RTMS	67	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 10	~early 2001
RTMS	68	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 10	~early 2001
RTMS	69	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 10	~early 2001
RTMS	70	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 10	~early 2001
RTMS	71	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 10	~early 2001
RTMS	72	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 10	~early 2001
RTMS	73	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 10	~early 2001
RTMS	74	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 10	~early 2001
RTMS	75	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 10	~early 2001
RTMS	76	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 10	~early 2001
RTMS	77	I-3311A	I-77 DBUILD	HUB 4 Node 11 (I-77 @ I-485) &NODE 9 (I-77 @ CINDY LN)	RTMS RING 10	~early 2001
RTMS	78	I-3803A	I-85 DBUILD	HUB 5 NODE 12 & 13 (I-485 @ I-85)	RTMS RING 12	~4/02
RTMS	79	I-3803A	I-85 DBUILD	HUB 5 NODE 12 & 13 (I-485 @ I-85)	RTMS RING 12	~4/02
RTMS	80	I-3803A	I-85 DBUILD	HUB 5 NODE 12 & 13 (I-485 @ I-85)	RTMS RING 12	~4/02
RTMS	81	I-3803A	I-85 DBUILD	HUB 5 NODE 12 & 13 (I-485 @ I-85)	RTMS RING 12	~4/02
RTMS	82	I-3803A	I-85 DBUILD	HUB 5 NODE 12 & 13 (I-485 @ I-85)	RTMS RING 12	~4/02
RTMS	83	I-3803A	I-85 DBUILD	HUB 5 NODE 12 & 13 (I-485 @ I-85)	RTMS RING 12	~4/02
RTMS	84	I-3803A	I-85 DBUILD	HUB 5 NODE 12 & 13 (I-485 @ I-85)	RTMS RING 12	~4/02

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Equipment	#	Project		HUB & NODE	RING	DATE
RTMS	85	I-3803A	I-85 DBUILD	HUB 5 NODE 12 & 13 (I-485 @ I-85)	RTMS RING 12	~4/02
RTMS	86	I-3803A	I-85 DBUILD	HUB 5 NODE 12 & 13 (I-485 @ I-85)	RTMS RING 12	~4/02
RTMS	87	I-3803A	I-85 DBUILD	HUB 5 NODE 12 & 13 (I-485 @ I-85)	RTMS RING 12	~4/02
RTMS	88	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 12	~4/02
RTMS	89	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 12	~4/02
RTMS	90	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 12	~4/02
RTMS	91	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 12	~4/02
RTMS	92	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 12	~4/02
RTMS	93	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 12	~4/02
RTMS	94	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 12	~4/02
RTMS	95	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 12	~4/02
RTMS	96	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14(I-85 @ NC-49)	RTMS RING 13	~4/02
RTMS	97	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14(I-85 @ NC-49)	RTMS RING 13	~4/02
RTMS	98	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14(I-85 @ NC-49)	RTMS RING 13	~4/02
RTMS	99	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14(I-85 @ NC-49)	RTMS RING 13	~4/02
RTMS	100	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14(I-85 @ NC-49)	RTMS RING 13	~4/02
RTMS	101	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14(I-85 @ NC-49)	RTMS RING 13	~4/02
RTMS	102	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14(I-85 @ NC-49)	RTMS RING 13	~4/02
RTMS	103	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14(I-85 @ NC-49)	RTMS RING 13	~4/02
RTMS	104	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 14	~4/02

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Equipment	#	Project		HUB & NODE	RING	DATE
RTMS	105	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 14	~4/02
RTMS	106	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 14	~4/02
RTMS	107	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 14	~4/02
RTMS	108	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 14	~4/02
RTMS	109	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 14	~4/02
RTMS	110	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 14	~4/02
RTMS	111	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 14	~4/02
RTMS	112	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 15	~4/02
RTMS	113	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 15	~4/02
RTMS	114	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 15	~4/02
RTMS	115	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 15	~4/02
RTMS	116	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 15	~4/02
RTMS	117	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 15	~4/02
RTMS	118	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 15	~4/02
RTMS	119	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 15	~4/02
RTMS	120	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 16	~4/02
RTMS	121	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 16	~4/02
RTMS	122	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 16	~4/02
RTMS	123	I-3803A	I-85 DBUILD	HUB 5 NODE 13 (I-485 @ I-85) & 14 (I-85 @ NC-49)	RTMS RING 16	~4/02

Table I-1

Equipment	#	Project		HUB & NODE	RING	DATE
RTMS	124	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 17	1/31/03
RTMS	125	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 17	1/31/03
RTMS	126	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 17	1/31/03
RTMS	127	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 17	1/31/03
RTMS	128	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 17	1/31/03
RTMS	129	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 17	1/31/03
RTMS	130	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 18	1/31/03
RTMS	131	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 18	1/31/03
RTMS	132	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 18	1/31/03
RTMS	133	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 18	1/31/03
RTMS	134	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 18	1/31/03
RTMS	135	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 18	1/31/03
RTMS	136	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 18	1/31/03
RTMS	137	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 18	1/31/03
RTMS	138	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 18	1/31/03
RTMS	139	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 18	1/31/03
RTMS	140	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 19	1/31/03
RTMS	141	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 19	1/31/03
RTMS	142	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 19	1/31/03
RTMS	143	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 19	1/31/03
RTMS	144	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 19	1/31/03
RTMS	145	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 19	1/31/03
RTMS	146	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 19	1/31/03
RTMS	147	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 19	1/31/03
RTMS	148	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 19	1/31/03
RTMS	149	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 19	1/31/03
RTMS	150	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 20	1/31/03
RTMS	151	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 20	1/31/03
RTMS	152	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 20	1/31/03
RTMS	153	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 20	1/31/03
RTMS	154	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 20	1/31/03
RTMS	155	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 20	1/31/03
RTMS	156	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 20	1/31/03
RTMS	157	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 20	1/31/03
RTMS	158	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 20	1/31/03
RTMS	159	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 20	1/31/03

Table I-1

Equipment	#	Project		HUB & NODE	RING	DATE
RTMS	160	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 21	1/31/03
RTMS	161	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 21	1/31/03
RTMS	162	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 21	1/31/03
RTMS	163	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 21	1/31/03
RTMS	164	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 21	1/31/03
RTMS	165	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 21	1/31/03
RTMS	166	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 21	1/31/03
RTMS	167	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 21	1/31/03
RTMS	168	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 21	1/31/03
RTMS	169	R-2248D	I-485	HUB 6 NODE 18 I-485@I-85	RTMS RING 21	1/31/03
RTMS	170	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC	RTMS RING 22	1/31/03
RTMS	171	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC	RTMS RING 22	1/31/03
RTMS	172	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC	RTMS RING 22	1/31/03
RTMS	173	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC	RTMS RING 22	1/31/03
RTMS	174	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC	RTMS RING 22	1/31/03
RTMS	175	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC	RTMS RING 22	1/31/03
RTMS	176	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC	RTMS RING 22	1/31/03
RTMS	177	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC	RTMS RING 22	1/31/03
RTMS	178	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC	RTMS RING 22	1/31/03
RTMS	179	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC	RTMS RING 22	1/31/03
RTMS	180	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC	RTMS RING 23	1/31/03
RTMS	181	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC	RTMS RING 23	1/31/03
RTMS	182	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC	RTMS RING 23	1/31/03
RTMS	183	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC	RTMS RING 23	1/31/03
RTMS	184	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC	RTMS RING 23	1/31/03
RTMS	185	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC	RTMS RING 23	1/31/03
RTMS	186	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC	RTMS RING 23	1/31/03
RTMS	187	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC	RTMS RING 23	1/31/03
RTMS	188	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC	RTMS RING 23	1/31/03
RTMS	189	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC	RTMS RING 23	1/31/03
RTMS	190	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC	RTMS RING 24	1/31/03
RTMS	191	U-4440A/B	CHAR. INT	DIRECT BACK TO MRTMC	RTMS RING 24	1/31/03
RTMS	192E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 25	~2/2004
RTMS	192W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 25	~2/2004
RTMS	193E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 25	~2/2004
RTMS	193W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 25	~2/2004

Table I-1

Equipment	#	Project		HUB & NODE	RING	DATE
RTMS	194E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 25	~2/2004
RTMS	194W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 25	~2/2004
RTMS	195E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 26	~2/2004
RTMS	195W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 26	~2/2004
RTMS	196E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 26	~2/2004
RTMS	196W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 26	~2/2004
RTMS	197E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 26	~2/2004
RTMS	197W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 26	~2/2004
RTMS	198E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 27	~2/2004
RTMS	198W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 27	~2/2004
RTMS	199E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 27	~2/2004
RTMS	199W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 27	~2/2004
RTMS	200E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 27	~2/2004
RTMS	200W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 27	~2/2004
RTMS	201E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 27	~2/2004
RTMS	201W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 27	~2/2004
RTMS	202E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 28	~2/2004
RTMS	202W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 28	~2/2004
RTMS	203E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 28	~2/2004
RTMS	203W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 28	~2/2004
RTMS	204E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 28	~2/2004
RTMS	204W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 28	~2/2004
RTMS	205E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 28	~2/2004
RTMS	205W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 28	~2/2004
RTMS	206E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 28	~2/2004
RTMS	206W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 28	~2/2004
RTMS	207E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 29	~2/2004
RTMS	207W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 29	~2/2004
RTMS	208E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 29	~2/2004
RTMS	208W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 29	~2/2004
RTMS	209E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 29	~2/2004
RTMS	209W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 29	~2/2004
RTMS	210E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 29	~2/2004
RTMS	210W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 29	~2/2004

Table I-1

Equipment	#	Project		HUB & NODE	RING	DATE
RTMS	211E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 29	~2/2004
RTMS	211W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 29	~2/2004
RTMS	212E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 30	~2/2004
RTMS	212W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 30	~2/2004
RTMS	213E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 30	~2/2004
RTMS	213W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 30	~2/2004
RTMS	214E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 30	~2/2004
RTMS	214W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 30	~2/2004
RTMS	215E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 30	~2/2004
RTMS	215W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 30	~2/2004
RTMS	216E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 30	~2/2004
RTMS	216W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 30	~2/2004
RTMS	217E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 31	~2/2004
RTMS	217W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 31	~2/2004
RTMS	218E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 31	~2/2004
RTMS	218W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 31	~2/2004
RTMS	219E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 31	~2/2004
RTMS	219W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 31	~2/2004
RTMS	220E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 31	~2/2004
RTMS	220W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 31	~2/2004
RTMS	221E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 31	~2/2004
RTMS	221W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 31	~2/2004
RTMS	222E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 32	~2/2004
RTMS	222W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 32	~2/2004
RTMS	223E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 32	~2/2004
RTMS	223W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 32	~2/2004
RTMS	224E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 32	~2/2004
RTMS	224W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 32	~2/2004
RTMS	225E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 32	~2/2004
RTMS	225W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 32	~2/2004
RTMS	226E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 32	~2/2004
RTMS	226W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 32	~2/2004
RTMS	227E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 33	~2/2004
RTMS	227W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 33	~2/2004

Table I-1						
Equipment	**#**	**Project**		**HUB & NODE**	**RING**	**DATE**
RTMS	228E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 33	~2/2004
RTMS	228W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 33	~2/2004
RTMS	229E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 33	~2/2004
RTMS	229W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 33	~2/2004
RTMS	230E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 33	~2/2004
RTMS	230W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 33	~2/2004
RTMS	231E	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 33	~2/2004
RTMS	231W	R-2248F	I-485 DBUILD	NODE 19 I-485 @ I-77S	RTMS RING 33	~2/2004

e. Plans of Record Documentation

Prior to final acceptance, the Design-Build Team shall provide one complete set of plans of record, in both reproducible and digital format, and product information spreadsheets. The spreadsheet format should be Microsoft Excel. The product information spreadsheets should include the following: item description, manufacturer, part number, and date installed. A notebook containing up-to-date manufacturers catalog cut sheets of each item installed shall accompany the product information spreadsheets.

The plans of record drawings prepared by the Design-Build Team shall designate the spare and occupied multi-ducts.

The plans of record drawings shall include splicing details that include information on spare fiber quantities, identifying fibers by buffer tube and fiber color.

Splice points, branch circuits, fiber number and patch panel connector assignment shall be included on engineering and plans of record drawings.

During the final testing, the Design-Build Team shall record the sequential meter markings at each splice point in the cable on the plans of record provided to the Department.

Plans of record shall include field and central connection details for all new and relocated devices. The Design-Build Team shall submit plans of record to the Engineer for review and approval.

f. Delivery of Documentation

Provide all documentation in preliminary form for review by the Engineer. For documentation specifically created for this project, the Engineer may disapprove the submittal if not in compliance with these specifications. For standard product documentation, provide examples for the Engineer's review prior to construction to verify compatibility with Bellcore/Telcordia Standards. All documentation shall represent as delivered and as-installed equipment and interconnects. System acceptance shall not be considered until all documentation has been delivered and conditionally accepted.

g. Software

Provide two copies of all commercial-off-the-shelf (COTS) software used in the system with associated documentation and user licenses. Supply two copies in a digital form readily usable in the system for Design-Build Team-generated software. Designate one copy as a master and one as a working copy each with a user license. Document and fully test Design-Build Team developed software. Institute of Electrical and Electronics Engineers (IEEE) Standard 1063 "Standard for Software User Documentation," Bellcore ST-STS-000050, "Software Systems for Telecommunications," and referenced Bellcore software reliability and quality specifications shall apply to Design-Build Team-developed software.

10. Geographical Information Systems (GIS) Supplement

Append the following to Article 1098-1(G) of the NCDOT Standard Specifications:

Provide real world coordinates for all field devices (including but not limited to controller cabinets, closed circuit television cameras, dynamic message signs, and oversized junction boxes) installed and/or modified under this project. Provide the coordinates in feet units using the North Carolina State Plane coordinate system (1983 North American Datum also known as NAD '83). Furnish coordinates that do not deviate more than 1.7 feet (1/2 meter) in the horizontal plane and 3.3 feet (1 meter) in the vertical plane. Global positioning system (GPS) equipment able to obtain the coordinate data within these tolerances may be used. Submit cut sheets on the GPS unit proposed to collect the data for approval by the Engineer. For equipment cabinets, obtain and provide the location of the cabinet.

Provide both a digital copy and hard copy of all information regarding the location (including to but not limited to manufacturer, model number, and NCDOT inventory number) in the Microsoft spreadsheet provided by the Department, shown by example below.

NCDOT Inv #	Name	Location	Latitude	Longitude	Manufacturer	Model #	Comm Media	Destination
05-7009	Cam 1	I-540/I-40	-78.8123	35.8625	Pelco	Spectravision	60 SMFO	TRTMC
05-7010	Cam 2	NC 54/I-40	-78.7631	35.8523	Pelco	Spectravision	60 SMFO	TRTMC
05-7030	HAR 1 - Johnston County	I-40 at NC 42 (mp 312)	-77.952	35.2456			Dial-up	TRTMC
05-7001	CMS # 1	I-85 N/I-40 E, mp 159.1			Mark IV		Dial-Up	TRTMC
05-7003	CMS # 3	I-40 W, mp 307.7			Mark IV		Dial-Up	TRTMC
05-7004	CMS # 4	I-40 E, mp 286.0			Mark IV		60 SMFO	TRTMC

11. Requirements for Cables Crossing Railroads

a. Railroad Crossings

Do not commence cable routings over or under railroad-owned facilities until notification and coordination with Engineer and the appropriate railroad company has occurred. All affected railroad facilities on this project are owned by the North Carolina Railroad Company and operated by Norfolk Southern Railway Company herein called the Railroad Company. Install fiber optic communications cable as shown on the plans.

It is the responsibility of the Design-Build firm to make contact with the Railroad Company or any party acting on their behalf regarding any wireline agreements necessary for crossing over or

under any railroad facilities at the address and phone number given below. This contact is not limited to any fees required by either HNTB North Carolina P.C., North Carolina Railroad Company or the Norfolk Southern Railway Company.

HNTB North Carolina P.C.
343 East Six Forks Road, Suite 200
Raleigh, NC 27609
(919) 546-8997
(919) 546-9421 fax
website: www.hntb.com

b. Requirements for Insurance

In addition to any other forms of insurance or bonds required elsewhere in the contract documents and prior to commencing any work, the Contractor will be required to provide coverage conforming to the requirements of the Federal-Aid Policy Guide outlined under 23 CFR 646A for all work to be performed on the Railroad right of way under the terms of the contract by carrying insurance of the following kinds:

CONTRACTOR'S GENERAL LIABILITY AND PROPERTY DAMAGE INSURANCE
Furnish a copy of the certificate of insurance to the Department of Transportation as evidence that, with respect to the operations performed on railroad right of way, Contractor's General Liability Insurance providing for limits of liability as follows:

COVERAGE	MINIMUM COMBINED LIMITS OF LIABILITY
Bodily Injury Liability	$2,000,000 Per Occurrence
Property Damage Liability	$2,000,000 Aggregate

If any part of the work is sublet, similar insurance and evidence thereof in the same amounts as required of the Prime Contractor shall be provided by the subcontractor to cover his operations on railroad right of way. As an alternative, the Prime Contractor may provide for the subcontractor by means of separate and individual policies.

Certificates of Insurance holders are to be the addresses given below. Certificates shall make reference to the project, milepost and county.

North Carolina Railroad Company
Property Manager
2809 Highwoods Blvd., Suite 100
Raleigh, North Carolina 27604-1000

Norfolk Southern Railway Company
Real Estate and Contract Services
Suite 1650, One Georgia Center
600 West Peachtree Street, N.W.
Atlanta, GA 30308-3603

RAILROAD PROTECTIVE LIABILITY INSURANCE
Furnish to the Department of Transportation two originals and one duplicate of the Railroad Protective Liability Insurance Policy with limits of liability as follows:

COVERAGE	MINIMUM COMBINED LIMITS OF LIABILITY
Bodily Injury Liability	$2,000,000 Per Occurrence
Property Damage Liability	$6,000,000 Aggregate Per Annual Policy Period
Physical Damage to Property	

The Railroad Protective Liability Policy is to be written on the ISO/RIMA Form No. CG 00 35 10 93 (or updates thereof) including Endorsements CG 28 31 11 85 and IL 00 21 or their equivalents.

The named insured, description of the work and designation of the job site to be shown on the Policy are as follows:
Names Insured:

North Carolina Railroad Company
2809 Highwoods Blvd., Suite 100
Raleigh, North Carolina 27604-1000

Norfolk Southern Railway Company
Suite 1650, One Georgia Center
600 West Peachtree Street, N.W.
Atlanta, GA 30308-3603

Description and Designation: Installation of fiber optic communications cable over/under tracks of the North Carolina Railroad Company/Norfolk Southern Railway Company, xxx County near Railroad Milepost xxx identified as State Project xxxx (xxxx) and Federal Project xxxx.

The Railroad Protective Liability Policy, all other policies and certificates shall contain a clause requiring that thirty (30) days written notice be given the Department of Transportation and the Railroad Company prior to cancellation or change. The notices shall make reference to the project, milepost and county.

<u>NOTICE TO:</u>
North Carolina Railroad Company
2809 Highwoods Blvd., Suite 100
Raleigh, North Carolina 27604-1000

Norfolk Southern Railway Company
Suite 1650, One Georgia Center
600 West Peachtree Street, N.W.
Atlanta, GA 30308-3603

COPY NOTICE TO:
Division of Highways
Department of Transportation
c/o State Contractual Services Engineer
1509 Mail Service Center Raleigh, NC 27699-1509

Carry all insurance herein specified until the final inspection and acceptance of the project, or that portion of the project within railroad right of way, by the Department of Transportation or, in the case of subcontractors, until the Contractor furnishes a letter to the Engineer stating that the subcontractor has completed his subcontracted work within railroad right of way to the satisfaction of the Contractor and the Contractor will accomplish any additional work necessary on railroad right of way with his own forces. It is understood that the amounts specified are minimum amounts and that the Contractor may carry insurance in larger amounts if he so desires. As to "aggregate limits", if the insurer establishes loss reserves equal to or in excess of the aggregate limit specified in any of the required insurance policies, immediately notify the Department of Transportation and cease all operations until the aggregate limit is reinstated. If the insurer establishes loss reserves equal to or in excess of one/half of the aggregate limit, arrange to restore the aggregate limit to at least the minimum amount stated in these requirements. Any insurance policies and certificates taken out and furnished due to these requirements shall be approved by the Department of Transportation and the Railroad Company as to form and amount prior to beginning work on railroad right of way.

No extra allowance will be made for the insurance required hereunder. The entire cost shall be included in the unit contract bid price for other pay items.

Furnish evidence of insurance as required above for review to the Department of Transportation at the address shown below after which it will be forwarded by the Department of Transportation to the Railroad.

Send to Department:
Division of Highways
Department of Transportation
c/o State Contractual Services Engineer
1509 Mail Service Center Raleigh, NC 27699-1509

c. Delays Caused By Operations of Others

Neither the Department of Transportation nor the Railroad Company assumes any responsibility for any work performed by others in connection with the construction of the project, and the Contractor shall have no claim whatsoever against the Department of Transportation, or the Railroad Company for any inconvenience, delay, or additional cost incurred by him on account of such operations by others.

d. Cooperation with Others

Cooperate with others participating in the construction of the project to the end that all work may be carried on to the best advantage.

e. Authority of Railroad Engineer

The authorized representative of the Railroad Company hereinafter referred to as the Railroad Engineer, shall have the final authority in all matters affecting the safe maintenance of railroad traffic of his company.

f. Interference with Railroad Operations

Arrange and conduct work so that there will be no interference with railroad operations, including train, signal, telephone and telegraphic services, or damage to the property of the Railroad Company or to the poles, wire, and other facilities of tenants on the rights of way of the Railroad Company. Wherever work is liable to affect the operations or safety of trains, the method of doing such work shall first be submitted to the Railroad Engineer for approval, but such approval shall not relieve the Contractor from liability.

Should conditions arising from or in connection with the work, require that immediate and unusual provisions be made to protect train operations and property of the Railroad Company, it shall be a part of the required services by the Contractor to make such provisions and if, in the judgment of the Railroad Engineer such provisions is insufficient, the Railroad Engineer or the Department of Transportation, may at the expense of the Contractor, require or provide such provisions as may be deemed necessary.

g. Storage of Materials

Materials and equipment shall not be stored where they will interfere with railroad operations, nor on the rights of way of the Railroad Company without first having obtained permission from the Railroad Engineer, and such permission will be with the understanding that the Railroad Company will not be liable or damage to such material and equipment from any cause and that the Railroad Engineer may move or require the Contractor to move, at the Contractor's expense, such material and equipment.

h. Flagging Protection or Watchman Service

The Contractor shall give 72 hours advance notice to the Railroad Company in order that flagging service can be arranged and provided. No work shall be undertaken until the flagman is at the job site.

i. Completion and Acceptance of Work

Upon completion of the work, remove from within the limits of the railroad right of way all machinery, equipment, surplus materials, or rubbish and leave said rights of way in a neat and orderly condition. After the final inspection has been made and work found to be completed in a satisfactory manner acceptable to the Department of Transportation and the Railroad Company, the Department of Transportation will be notified of the Railroad Company's acceptance in writing by the Railroad Company.

II. 2002 STANDARD SPECIFICATIONS FOR ROADS & STRUCTURES – SECTION 1098 REVISIONS

The *2002 Standard Specifications* are revised as follows:

A. GENERAL REQUIREMENTS (1098-1)

Page 10-220, Subarticle 1098-1(A)

In the last paragraph, sentence 1, revise "by the date of advertisement of the project" to "by the date of equipment installation."

Pages 10-222, 3 Subarticle 1098-1(H)

Replace paragraphs 2, 3, and 4 with the following paragraphs:

Except for grounding conductors, provide signal cable conductors of size Number 16 AWG that are fabricated from stranded copper. **Number 16 AWG cable can only be used with an all LED traffic signal intersection.** Repairs to a non-LED traffic signal intersection must use Number 14 AWG cable.

Provide either 0.05 x 0.30 inch (1.3 x 7.6 mm) aluminum wrapping tape or 0.06 inch (1.5 mm) stainless steel lashing wire for the purpose of lashing cables, except fiber-optic communications cables, to a messenger cable. Use 0.045-inch (1.14-mm) stainless steel lashing wire for the aerial installation of fiber-optic communications cable to messenger cable.

B. WOOD POLES (1098-6)

Page 10-228, Article 1098-6

Replace the entire article with the following:

Provide poles of treated southern pine or treated Douglas fir that meet the requirements of ANSI 05.1. Provide Class 3 or better wood poles that are a minimum length of 40 feet (12.2 meters) unless otherwise shown on the plans and are of a sufficient length to maintain minimum required distances above the roadway, obstructions and affected railroad tracks. Mark each pole in accordance with ANSI 05.01. First roof and bore poles and then give them a full-length preservative treatment.

Provide poles with pentachlorophenol or chromated copper arsenate (CCA) preservative, in accordance with AWPA Standard C4-99. Ensure the retention of preservative is a minimum of 0.45 lb. per cubic foot (7.2 kg per cubic meter) for pentachlorophenol and 0.6 lb. per cubic foot (9.6 kg per cubic meter) for CCA.

C. FIBER-OPTIC CABLE (1098-11)

Page 10-233, Subarticle 1098-11(A)

In paragraph 3, sentence 5, delete "Construct buffer tubes with an inner layer made of polycarbonate and an outer layer made of polyester."

D. METAL POLES (1098-15)

Page 10-236, Subarticle 1098-15(A)

In paragraph 1, sentence 2, delete the phrase "(AASHTO Specifications) in effect on the date of advertisement" and insert the words "Fourth Edition, 2001, including the latest interim specifications."

Page 10-238, Subarticle 1098-15(B)

In paragraph 1 (partial), sentence 2, delete the phrase "6 x 6 x 3/4 inches (150 x 150 x 18 mm)" and insert the words "circular anchor bolt lock."

In the first full paragraph, add the following sentence:

Where splicing is necessary, use butt splice and heat shrink tubing.

E. TYPE 170E CABINETS (1098-19)

Page 10-241, Subarticle 1098-19(B)

Add the following paragraph:

If additional surge protected power outlets are needed to accommodate fiber transceivers, modems, etc.; install a UL listed, industrial, heavy-duty type power outlet strip with a maximum rating of 15 A / 125 VAC, 60 Hz. Provide a strip that has a minimum of 3 grounded outlets. Ensure the power outlet strip plugs into one of the controller unit receptacles located on the rear of the PDA. Ensure power outlet strip is mounted securely; provide strain relief if necessary.

F. NEMA TS-2 TYPE 1 CABINETS (1098-22)

Page 10-251, Subarticle 1098-22(B)

In paragraph 1, sentence 3, revise "latching plate at least 1/8 inch (4.5 mm) thick" to "latching plate at least 3/16 inch (4.5 mm) thick."

III. 2002 STANDARD SPECIFICATIONS FOR ROADS & STRUCTURES – SECTION 1700 REVISIONS

The *2002 Standard Specifications* are revised as follows:

A. GENERAL REQUIREMENTS (1700)

Page 17-2, Subarticle 1700-3 (D), add the following paragraph

In the event the contractor fails to perform in accordance with the plans and specifications within the time frame specified, the Department reserves the right to perform the maintenance and emergency service necessary to assure continuous traffic signal operation. Further, all expenses incurred by the Department in implementing this option shall be deducted from the payment due the contractor, plus a $250 liquidated damage per occasion, per day, or any portion thereof, until corrected. The liquidated damages are due to increased public hazard resulting from the malfunction.

Page 17-2, Subarticle 1700-3 (F)

In paragraph 2, sentence 2, delete “type 1.”

Page 17-3, Subarticle 1700-3 (J)

In paragraph 2, sentence 2, revise “detectable metallic burial tape” to “marker tape.”

B. UNDERGROUND CONDUIT (1715)

Page 17-8, Subarticle 1715-3(A)

Add the following paragraph:

Install metallic conduit at all locations where conduits traverse railroad tracks or as shown on the plans. For all other locations, install nonmetallic conduit unless otherwise shown on the plans. Backfill with excavated material and compact to 95% of its original density. Remove any rock and debris from backfill material.

Page 17-8, Subarticle 1715-3(C)

Delete the first paragraph.

Page 17-8, Subarticle 1715-3(D)

Replace reference to Article 342-3 with reference to Article 1540-3 (A&B).

C. WOOD POLES (1720)

Page 17-10, Article 1720-3

Replace the fourth paragraph with the following paragraph:

On joint use poles and NCDOT owned poles, at signal and traffic management systems equipment installations (i.e. controller cabinets, CCTV cabinets, DMS cabinets, etc.), bond the messenger cable(s) to the existing pole ground using burndy clamps at each end and at 1300-foot intervals. On multiple messenger cable arrangements, connect all messenger cable ends with #6 solid bare copper wire and bond with split bolt connectors or burndy clamps (UCG25RS) or equivalent. On joint use and NCDOT owned poles, if an existing pole ground does not exist, install a grounding system consisting of a #6 AWG bare copper wire that is exothermically welded to a ground rod.

In the last paragraph, last sentence, revise “5/8 inch x 8 foot (16 mm x 2.4 m) ground rod” to “5/8 inch x 10 foot (16 mm x 3.0 m) ground rod.”

IV. CLOSED CIRCUIT TELEVISION (CCTV) CAMERA UNITS

A. DESCRIPTION

Furnish and install eight (8) new CCTV camera units as shown on the Functional Plans. Locations shown are approximate only and final locations will be determined by the Design-Build team and approved by the engineer. The Design-Build team shall verify and revise as necessary the general CCTV camera locations shown on the Functional Plans. The Design-Build team will be responsible for determining the final installation height of each CCTV camera unit. To determine the final installation height and position, at a minimum, the Design-Build team shall perform a bucket-truck based survey to verify that the proposed height and position will enable the installed CCTV camera unit to permit users at the MRTMC to observe the intended field of view shown in the plan package on the video output devices. The portion of the roadways intended for view by each proposed CCTV is shown in the Functional Plans package on sheets ITS-2R through ITS-2T. CCTV units installed under this project shall use VOT-D, VOR-D, VOTMUX, and VORDEMUX units meeting the requirements described in these documents for transmission of the video signal.

B. FUNCTIONAL REQUIREMENTS

Provide dual-mode day-time color, low-light monochrome integrated CCTV dome system (dome enclosure, CCTV camera, CCTV camera positioning unit, motorized zoom lens, and integrated controller/driver unit) units that meet or exceed the following standards.

1. Physical and Environmental

Furnish CCTV dome systems meeting or exceeding NEMA 4X standards for resistance to incidental contact, weather, dust, ice, and water.

Furnish CCTV units that can operate continuously between 0% and 100% relative humidity and -34 Degrees C and +50 Degrees C

Provide a dome camera system will not sustain damage or experience any lapse in operation when subjected up to a 145 kilometers per hour (km/h) (90 miles mph) wind with a 1.3 gust factor.

Provide a housing that is keyed so that, after being removed from the camera connection box for service, it can be reinstalled with exactly the same orientation.

Provide dome system that is compatible and completely interoperable electrically, electronically, and mechanically with the CCTV camera unit pole lowering system provided under this project.

Have a diameter in the horizontal plane of no more than 305 mm (12 inches) and a vertical dimension from bottom to top of connection socket of no more than 356 mm (14 inches).

2. Electrical/Power

Furnish CCTV camera units with the following characteristics:

- Output impedance: 75 ohms ± 5%.

- Operating voltages less than 115 ± 20 VAC, 60 Hz ± 3 Hz and 24 to 30 VDC.
- Ability to withstand power interruptions without interruption in operation in accord with NEMA TS-2 standard 2.1.4.
- Ability to withstand power transients and surges without damage in accord with NEMA TS-2 standard 2.1.6.

3. Mechanical/Optical/Electronic

Furnish CCTV dome system camera units meeting or exceeding the following mechanical and optical requirements:

Cameral and Lens

Image Sensor:	6.35mm
Scanning System:	Progressive scan or 2:1 interlaced output
Horizontal Resolution :	Minimum NTSC 470 TVL
Video Output Format:	NTSC composite color video output, 1-volt peak to peak.
Zoom:	3.6-82.8 mm optical (23X optical zoom), 10X electronic zoom
Synchronization System	Phase adjust line lock
Focus:	Automatic with manual override
White Balance:	Automatic with manual override
Iris Control:	Automatic with manual override
Gain Control:	Automatic/ off
Signal to noise ratio:	50-dB minimum.
Sensitivity:	NTSC, color: 3 lux at 1/60 sec shutter speed B-W: 0.3 lux at 1/60 sec shutter speed
Day (color)/Night (B-W) Switchover:	User selectable
Shutter Speed	NTSC – ½ sec-1/30,000 sec

Pan-Tilt Drive System

Manual Pan Speed:	Variable from 0.1° per second-80° per second
Pan Speed to Preset:	250° per second
Pan Range:	360° continuous pan
Vertical Tilt Range:	Unobstructed tilt of +2° to -92° with automatic flip at -92° (bottom of hemisphere)
Manual Vertical Tilt Speed:	Variable from 0.1° per second-40° per second
Vertical Tilt Speed to Preset:	80° per second
Preset Accuracy:	+/- 0.1°

The pan-and-tilt unit shall have seals and gaskets to protect the motors, gears and cables

Presets, Tours, Titling, Memory/Configuration

Presets:	Sixty-four presets
Tours:	Four user programmable tours including presets and dwell times for up to 32 unique positions
Privacy Zones/Blanking:	8 user-defined zones
Titles:	20 Character label for each CCTV camera unit; labeling for each preset and tour
Memory:	Non-volatile/flash memory capable of maintaining all programmed parameters, settings, tours, IDs, and presets in the event of an absence of power
Configuration:	Manual entry via laptop computer connected to serial communications port on CCTV camera unit or remotely via central CCTV software located remotely. All commands available on a computer connected locally to a CCTV camera unit in the field shall be available to user accessing the unit remotely from the MRTMC or other control facility that is connected to the CCTV camera unit via the system communications system.

4. Reliability

Furnish CCTV units with a Mean Time Before Failure (MBTF) of at least 20,000 hours.

5. Interface/Protocols/Connection

Provide a multipoint RS-232 communication interface compatible with the video matrix switcher, CCTV server, and CCTV camera unit control joysticks furnished under this project.

If the CCTV uses another type of digital communication, such as RS-422, provide the appropriate converter. Provide each camera with a unique, easily changeable ID, with the range of permissible IDs encompassing at least the values 1 through 256.

C. CONSTRUCTION REQUIREMENTS

Provide coaxial video cables with Bayonet Nut Connector (BNC) connector terminations. A minimum of two meters (6.5 feet) of slack coaxial cable for each camera lead shall be provided in the base of the camera support pole and in the associated controller cabinet (4 meters (13 feet) minimum total slack per CCTV pole).

Surge Suppression/Bonding: Install coaxial cables with surge suppressors that meet or exceed the following minimum characteristics:

- The clamping voltage shall be 11 volts between the shield and center conductor signal line.
- The response time shall be five nanoseconds or less.

- Bipolar silicon avalanche diode technology shall be used in a single stage device.
- The module shall dissipate a minimum of 50 Joules.
- The module shall have BNC connectors.

Electrically bond each CCTV camera unit housing to the CCTV camera unit pole grounding assembly. Ground equipment as shown in the Plans and the Standard Specifications.

Integrate CCTV camera unit with equipment cabinet, and equipment cabinet power supply.

Install surge protectors on all ungrounded conductors entering the CCTV camera unit. House the protectors in a small, ventilated weatherproof cabinet attached near the CCTV camera unit attachment point in a manner approved by the Engineer. The air terminal ground wire shall not pass through this cabinet.

Install RS-232/RS-422 converters as required. Provide the camera control lead-in cables with in-line surge suppression in accordance with manufacturer recommendations.

Integrate CCTV video circuit in field equipment cabinets with VOT-D unit as shown in the block diagram in the plans. Ensure that all connections are tight and fully secure.

Integrate CCTV data circuits in field equipment cabinets with VOT-D unit as shown in the block diagram in the plans. Do not integrate CCTV control data circuit through the PK-2100 microprocessor where present.

Integrate CCTV camera unit equipment cabinet and equipment cabinet power supply.

Develop and install a minimum of 16 presets for each camera that will be approved by the Engineer prior to final acceptance. Perform stand-alone and system testing as described in the General Requirements section.

Route video output from CCTV camera units labeled 86, 87, 88, and 89 in the plans to the Node at the I-485/I-77 interchange labeled Node 20 via the fiber optic communications network as depicted on the CCTV schematic diagram in the Functional Plans.

Route video output from CCTV camera units labeled 90, 91, 92, and 93 in the plans to the Node at the I-485/I-85 interchange labeled Node 21 via the fiber optic communications network as depicted on the CCTV schematic diagram in the Functional Plans.

Route control data circuits from CCTV camera units labeled 86, 87, 88, and 89 in the plans to Node 20 at the I-485/I-77 interchange via the fiber optic communications network as depicted on the CCTV schematic diagram in the Functional Plans.

Route control data circuits from CCTV camera units labeled 90, 91, 92, and 93 in the plans to Node 21 at the I-485/I-85 interchange via the fiber optic communications network as depicted on the CCTV schematic diagram in the Functional Plans.

V. INTEGRATE DYNAMIC MESSAGE SIGNS

A. DESCRIPTION

Integrate three (3) new DMSs into the existing DMS subsystem.

The DMS units (labeled 24, 25, and 26 in the plans) are shown in their approximate locations in the Functional Plans. The Design-Build Team will propose the precise location for the DMS for approval by the Department. The Design-Build Team will provide and install signs and assemblies and establish power and phone service for the DMS units. Reference the Signing Scope of Work for station locations and structure line drawing requirements.

B. MATERIALS

Furnish an interconnect center, patch panel and jumpers into each new DMS controller cabinet.

C. CONSTRUCTION METHODS

At the locations identified above, provide a twelve fiber drop cable to the DMS controller cabinet at each location and install interconnect centers and communications equipment as shown on the functional plans and described in these functional specifications.

Integrate drop cables with the proposed interconnect centers.

Integrate the DMS controllers through their RS-232 serial ports with communications equipment as specified in these documents for communication with the central system software.

Fully configure the DMS controllers to operate over the communication system and within the existing DMS control application software.

The DMSs provided shall meet the interface requirements for Dynamic Message Signs of the NCDOT Signing Section. The DMSs shall interface with the MRTMC communications system as detailed in the Functional Plans and Functional Specifications.

VI. DYNAMIC MESSAGE SIGNS

A. DESCRIPTION

To ensure compatibility with existing DMS equipment deployed in the Region, furnish NTCIP compliant DMS(s) that are fully compatible and interoperable, and interchangeable with the existing permanent DMS units on I-77 manufactured by Mark IV and the existing DMS subsystem equipment. Any substitution of vendor must be approved by the Department. Add and configure the new DMSs into the system using the existing control software. Demonstrate that all functions and features of the existing control software are fully operational on the new DMSs. Do not make any hardware or software changes or modifications to the existing DMS system. The Contractor will be responsible for all damages that may be inflicted on the new or existing system as a result of the integration process.

Furnish an operating Dynamic Message Sign system consisting of, but not limited to, the following:

- LED Dynamic Message Sign (DMS)
- Overhead DMS structure and mounting hardware
- DMS controller, Uninterruptible Power Supply (UPS), cabinet and accessories with interconnect and power cabling and conduit
- Service Equipment
- All other equipment and incidentals required for furnishing, installing, and testing system components

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

Provide an installation that meets latest NEC requirements and all applicable local and state codes.

These Functional Specifications references the following:

- Latest edition of National Transportation Communications for ITS Protocol (NTCIP) Joint Standards Committee Recommended Standards applicable to DMS system and requirements of these Functional Specifications
- *ASSHTO 2001, 4th Edition* and *2002 Interim to Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals*

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, controller, cabinet, and accessories for a nominal performance through an ambient temperature range of -30^{o} F to 165^{o} F (-34^{o}C to 74^{o}C) with up to 95% relative humidity. Add fans and / or heaters and thermostats to the DMS enclosure to meet the operating requirements above. Add a thermostatically controlled fan and thermostat to the cabinet that is approved by the Department. Provide equipment that does not suffer any damage when temporarily operating at 10^{o} F (5^{o} C) above or below the ambient temperature above. Design the system so that interior condensation does not occur and result in reduced visibility or legibility of the DMS elements.

Construct the DMS and housing so that it can withstand AASHTO 2002 standard fifty (50) years wind speed.

Design the DMS, controller, and associated equipment so that continuous vibration due to wind or traffic do not damage or affect system performance or reduce the legibility of the DMS message.

Transient voltages, surges and sags normally experienced on commercial power lines must not affect the operation of the equipment. Check with the local power and telephone companies to determine if any special design is needed.

The presence of ambient electromagnetic fields such as those produced by overhead transmission lines, transformers, and motors must not hinder the performance of the system.

If a DMS or communications line fails, it must not affect the operation of any other non-associated DMS on the system.

Furnish DMS field equipment that meets the latest NEMA Standards for Power Interruption and Transients, Power Service for Traffic Control Systems.

C. LED DYNAMIC MESSAGE SIGN (DMS)

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’ (275m) in advance of the DMS at an eye height of 3.5’ (1m) along the axis.

When displaying three lines, each line must display at least fifteen (15) equally spaced and equally sized alphanumeric individual characters. Each character must be at least 18” (457 mm) in height and composed from a luminous dot matrix.

1. DMS Enclosure

Construct the DMS with a metal walk-in enclosure excluding the face. Provide an aluminum walking platform inside the enclosure that is at least 28” (711 mm) wide. The width of the walking platform shall be free of obstructions to a height of 7’ (2 m). Construct the enclosure of welded aluminum type 6061-T6, 5052-H38, 5052-H34, or of an Engineer approved alternate at least 1/8” (3.175mm) 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 exterior and interior DMS enclosure surfaces shall be natural, mill-finish aluminum. All grind marks and discoloration shall be removed from the surfaces. The sign face excluding the front panel shall be covered with a flat black, UV treated, colorfast material such as 3M™ Scotchcal™ non-reflective sheeting. Prior to the application of the sheeting, all surfaces shall be prepared for application per the sheeting manufacturer’s recommendation.

All nuts, bolts, washer, and other mounting and bonding parts and components used on the exterior of the DMS enclosure shall be sealed against water intrusion.

Design and construct the enclosure to resist torsional twist and warp, to present a clean and neat appearance, and to protect the equipment within from moisture, dust, and corrosion.

Provide one key lockable, hinged, gasket-sealed inspection door for service and maintenance along each side of the enclosure. Install one appropriately sized fire extinguisher within 12" of each maintenance door. Provide a maintenance walkway that extends from the DMS inspection door to 3 feet (0.9 m) over the edge of shoulder. Leave no gap between the walkway and the inspection door. Install safety handrails on both sides of the walkway. Equip the DMS enclosure with internal fluorescent lighting which is switched on and off by opening and closing the 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. Equip the door with a door-hold-open device. Install duplex utility receptacles installed every 6' (1.8m) along the width of the DMS in convenient locations for powered service tools.

Surround the DMS face with a flat black aluminum border to provide contrast and enhance readability, with no light visible between the two. UV-treat the border and make it colorfast. Construct the border with a minimum width of 18" (457mm).

Do not place a manufacturer name, logo, or other information on the front face of the DMS or shield visible to the motorist.

Provide three photoelectric sensors mounted on the DMS and / or DMS support structure.

Install an EIA/TIA-232E port inside the DMS enclosure to enable a maintenance technician to communicate with the DMS controller that is installed in the roadside cabinet.

A shielded voice communications circuit from the DMS to the DMS controller cabinet shall be provided. A telephone jack shall be provided at an Engineer approved location in the CMS accessible from the inspection doors. A telephone headset with a boom mounted, noise canceling microphone shall be stored in the CMS in a convenient location as approved by the Engineer. The headset shall have sound dampening earphones, a 50 feet (15 m) (extended) coiled cord with strain relief terminated in a standard 310 style phone plug, and hands off operation. The circuit shall provide an audible and clear signal over the noise level of interstate traffic.

Provide power supply monitoring circuitry to detect power failure in the DMS and to automatically report this fault to the Control Software. This requirement is in addition to reporting power failure at the controller cabinet.

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

2. DMS Interior Environment Control

Design the local field controller to monitor and control the interior DMS environment. Design environmental control to maintain the internal DMS temperature within +/- 10o F of the outdoor

ambient temperature. Provide the DMS environmental control system with four primary subsystems as follows:

Internal Temperature Sensors – Provide the DMS with two internally mounted temperature sensors which are equipped with external thermocouples and which the Field Controller continuously monitors. Design the Field Controller to use this temperature information to determine when to activate and deactivate the environmental control systems described herein. Locate sensors on opposite ends of the upper 1/3 of the LED display matrix with their external thermocouples attached to and making contact with an LED pixel circuit board. Design the thermocouple and LED board to be easily detachable, in the event that one of the units requires removal and replacement. Provide sensors capable of measuring temperatures from -40° F to +185° F (-40° C to +85° C). 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.

- **Housing Cooling System** – Provide the DMS housing with a cooling system which circulates outside air into the DMS housing whenever 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 4 times per minute. Provide 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. Initially program the Field Controller to activate the DMS housing cooling system whenever the LED board temperature exceeds +90° F (+32° C) and to turn the cooling system off whenever LED board temperature falls below +85° F (+29° C). 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 four (4) hours, and locate it just inside the DMS housing door, within easy reach of a maintenance technician standing outside the DMS doorway.
- **LED Display Cooling System** – Provide the DMS with an LED display cooling system which directs air across the LED display modules whenever LED board temperature exceeds a user-programmable threshold. Direct fan-forced air vertically across the backside of the entire LED display matrix using multiple ball-bearing fans. Initially program the Field Controller to activate the LED cooling fan system whenever LED board temperature exceeds +90° F (+32° C) and to deactivate the system whenever LED board temperature falls to +85° F (+29° C). Locate cooling fans so as not to hinder removal of LED display modules and driver boards.

- **Front Face Panel Defog/Defrost System** – Provide the DMS with a defog/defrost system which circulates warm, fan-forced air across the inside of the polycarbonate front face whenever LED board temperature falls below a user-programmable threshold. Provide multiple ball-bearing fans that provide uniform airflow across the face panel. Initially program the Field Controller to activate the defog/defrost system whenever LED board temperature falls below +40° F (+4° C) and to deactivate the defog/defrost system whenever LED board temperature exceeds +106° F (+41° C). 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).

3. 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 ¼" (6 mm) thick. For substitutes, submit one 12" x 12" (300 mm x 300 mm) sample of the proposed material together with a description of the material attributes to the Engineer for review and approval.

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. Cover the areas of the panels between characters and lines with a flat black, UV-treated, colorfast material to reduce glare.

Install the panels so that a maintenance person can easily remove or open them for cleaning.

4. Display Modules

Manufacture each display module with a standard number of pixels, not to exceed an array of 9 x 5 and be easily removable. 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.

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 case letters.
- All punctuation marks.
- All numerals 0 to 9.
- Special user-created characters.

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

5. Discrete LEDs

Provide LEDs that are untinted, non-diffused, high output solid state lamps utilizing indium gallium aluminum phosphide (InGaAlP) technology manufactured by Toshiba or Hewlett-Packard. No substitutions will be allowed. Provide T1 ¾, 5mm size LEDs that emit a true amber color at a wavelength of 590 ± 5 nm.

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

Obtain the LEDs used in the display from a single LED manufacturer that have a single part number. Obtain them from batches sorted for luminous output, where the highest luminosity LED is not more than fifty percent more luminous than the lowest luminosity LED when the LEDs are driven at the same forward current. Do not use more than two successive and overlapping batches in the LED display. Document the procedure to be used to comply with this requirement as part of the catalog cut submittal.

Provide discrete LEDs with a half-power viewing angle of 15 degrees. Half-powering viewing angle is defined as follows: an LED which has a center-axis luminous intensity of calculated candelas at a distance of one foot from the LED while driven at 20 mA forward current is considered to have a 15 degree half-power viewing angle if its luminous intensity is at least half the calculated candelas at a distance of one foot from the LED and at an angle of 7.5 degrees off the LED's center axis while driven with a 20 mA forward current.

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

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

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

Supply the LED manufacturer's technical specification sheet with the catalog cuts.

If a superior LED or construction method becomes available between the period that the sign assembly is procured and prior to the actual construction of a given sign assembly, the Engineer has the option to direct the manufacturer to utilize the new technology. At such time, the number of

populated pixels may be re-evaluated. Any cost increase or decrease associated with such an order will be restricted to documented changes in material and labor cost.

6. 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 minimum of 2" (50 mm) in diameter.

Pixels shall be constructed with two strings of LED's. The number of LEDs in each string shall be determined by the manufacturer to produce the candela requirement as stated herein.

Each pixel shall produce a luminous intensity of 40 Cd when driven with an LED drive current of 20 mA per string.

LED pixels shall be driven with direct-drive pulse width modulation. Maximum pulse amplitude shall not exceed 30 mA.

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.

7. 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. Use Pulse Width Modulation (PWM) to dim the sign to achieve the proper brightness for a given condition. 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.

8. Display Capabilities

Design the DMS with at least the following message displays:

- Static display

- Flashing display with Dynamic flash rates
- At least two alternating Static and / or Flashing sequences (multi-page messages)

D. DMS ENCLOSURE STRUCTURE MOUNTING

Mount the DMS enclosure and interconnect system securely to supporting structures of the type specified in the Plans. Design the DMS enclosure supports and structure to allow access to the DMS enclosure inspection door.

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

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

Design the DMS structure to conform to the applicable requirements of the Standard Specifications for Structural Supports for Highway Signs, Luminaires, and the section of these Functional Specifications, titled “Overhead Dynamic Message Sign Assembly”.

E. 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.

Ensure the controller is able to communicate with the DMS when installed at the separation distance shown on the Signing project plans.

F. DMS CONTROLLER AND CABINET

Furnish and install one DMS controller with accessories per DMS in a protective cabinet at locations approved by the Engineer.

Mount the controller cabinet on a concrete base at ground level close to and in advance of the DMS support structure. Locate the cabinet so that a person working at the cabinet can see the face of the DMS.

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

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

- Power supply and distribution with back panel
- Power line filtering hybrid surge protectors
- Radio Interference Suppressor
- Communications surge protection devices

- Industrial-Grade UPS system and local disconnect
- Microprocessor-based controller
- Lamp driver and control system (unless integral to the DMS)
- Ethernet interface assembly
- Serial interface port for local laptop computer
- Local control panel with Remote / Local control switch
- Interior lighting and duplex receptacle
- Adjustable shelves as required for components
- Temperature control system
- All interconnect harnesses, connectors, and terminal blocks
- All necessary installation and mounting hardware

Furnish the DMS controller and associated equipment completely housed in a NEMA 3R cabinet made from 5052-H32 sheet aluminum at least 1/8" (3.175 mm) thick. Use natural aluminum cabinets and apply an anodized finish after welding. 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 restrictions. 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, 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 ten (10) keys to the Engineer. In addition, design the handle to permit padlocking.

Provide the interior of the cabinet with ample space for housing the controller and all associated equipment and wiring; use no more than 50% of the useable space in the cabinet. Leave a minimum of 20% of all shelf space free for future expansion after all required equipment is installed. Provide

ample space in the bottom of the cabinet for the entrance and exit of all power, communications, and grounding conductors and conduit. Provide an additional 2" (50mm) conduit entrance for future use.

Arrange the equipment so as to permit easy installation of the cabling through the conduit so that they will not interfere with the operation, inspection, or maintenance of the unit. Provide adjustable metal shelves, brackets, or other support for the controller unit and auxiliary equipment. Leave a 3" (75 mm) minimum clearance from the bottom of the cabinet to all equipment, terminals, and bus bars.

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

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

Mount and wire a 120V (+10%) GFI duplex receptacle of the 3-wire grounding type in the cabinet in a location that presents no electrical hazard when used by service personnel for the operation of power tools and work lights.

No cabinet resident equipment shall utilize the GFI receptacle. There shall be one spare non-GFI receptacle for future addition of equipment.

A shielded voice communications circuit from the DMS controller cabinet to the DMS enclosure shall be provided. A telephone jack shall be provided at a location inside the cabinet approved by the Engineer. A telephone headset shall be stored in a convenient, Engineer-approved location in the cabinet. The head-set shall have sound dampening earphones, a boom mounted, noise canceling microphone, a 10' (3 m) (extended) coiled cord with strain relief terminated in a standard 310 style phone plug, and hands-off operation.

Mount a bug-proof and weatherproof thermostatically controlled fan and safety shield in the top of the cabinet. Size the fan to provide at least for two air exchanges per minute. Fuse the fan at 125% of the capacity of the motor. The magnetic field of the fan motor must not affect the performance of the control equipment. Use a fan thermostat that is manually adjustable to turn on between 80° F and 160° F (26° C and 72° C) with a differential of not more than 10 F (4° C) between automatic turn-on and turn-off. Mount it in an easily accessible location, but not within 6" (150 mm) 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).

1. Wiring

The requirements stated herein shall apply whenever and wherever electrical wiring is needed for any DMS system assemblies and subassemblies such as controller cabinet, DMS enclosure, electrical panel boards and 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" (150 mm) 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 support by fasteners that support work surfaces. All connectors, devices and conductors shall be installed in accordance to manufactures guidelines. All wiring shall compile 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 three complete sets 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.

2. Panels and Terminal Blocks

Include a fully wired equipment back panel(s) mounted on the lower rear inside of the wall of each cabinet below the equipment backs and shelves. Provide a detailed layout for approval by the Engineer.

Locate terminal blocks on the back panel so they are accessible to the extent that it is not necessary to remove the electronic equipment from the cabinet to make an inspection or connection, and so they do not upset the entrance, routing, and connection of incoming field conductors. Use two-position multiple pole barrier-type terminal blocks. Identify all terminals by permanent legends attached to the blocks. Do not allow electrically live parts to extend beyond the barriers.

3. Power Supply and Circuit Protection

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

Blackout, brownout, 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 damaging defects do not interrupt its 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.

4. Circuit Breakers

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

5. Surge Suppressor

Install and clearly label filtering hybrid power line surge protectors on the load side of the branch circuit breakers in a manner that permits easy servicing. Ground and electrically bond the surge protector to the cabinet within 2" (50 mm).

Design the power line surge protector to meet the following requirements:

Peak surge current occurrences:	20 minimum
Peak surge current for an 8 x 20 microsecond waveshape:	20,000 amperes
Clamp voltage:	280 volts @ 20KA
Response time:	Voltage never exceeds 250 volts during surge
Maximum current for filtered output:	20 amperes for 120VAC*
Temperature range:	-10°F to +150°F (-40°C to +85°C)

Capable of handling the continuous current to the equipment

6. Radio Interference Suppressor

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

Provide RIS that are hermetically sealed in a substantial metal case which is filled with a suitable insulating compound and have nickel-plated 10/24 brass stud terminals of sufficient external length to provide space to connect #8 AWG wires. Mount them so that the studs cannot be turned in the case. Properly insulate ungrounded terminals from each other, and maintain a surface linkage distance of not less than 1/4" (6.3 mm) 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.

7. Communications Surge Protector

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

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

8. 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

Protective devices may share a common neutral bus line from their point of attachment to the back panel neutral bus.

9. Uninterruptible Power Supply (UPS)

Provide the cabinet with an industrial grade UPS unit with AC line voltage conditioning capability, operating on a 120 volts AC, 60 Hz commercial line voltage. The unit must 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 twenty (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 a sufficient number of outlets for supplying conditioned AC voltage to the DMS controller and Ethernet interface assembly. Equipment connected to the UPS must operate without interruption during line voltage variations of 88 volts AC to 140 volts AC. Mount backup batteries external to the UPS on 1/2" (15 mm) thick plywood to separate them from concrete floor and aluminum cabinet structure. Provide an UPS capable of operating within an ambient temperature range from -40° F to +185° F (-40° C to +85° C) and at up to 95% humidity, non-condensing.

Provide a **Clary SP 1000U** or an approved equivalent UPS unit with a minimum rating of 1250VA, 865 Watts.

10. 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 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° F.

Provide power supplies to operate within a minimum input voltage range of +90 to +135 volts AC and within a temperature range of –22° F to 140° F (-30° C to +60° C). Power supply output at 140° F must not deteriorate to less than 65% of its specified output at 70° F. Provide power supplies that are overload protected by means of circuit breakers, 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.

11. Communications Interface

The controller will have the following interface ports:

- An EIA/TIA-232E serial interface port to drive a fiber optic transceiver or an asynchronous industrial-grade modem for communications with the Server, Client, or Laptop Computer over private, leased, cellular, or dial-up lines, on point-to-point or multi-point network.

- An EIA/TIA-232E serial interface port to allow onsite access by an operator with a Laptop Computer. Permanently install a cable for communications between the two in an easily accessible location inside the DMS controller cabinet.
- Provide each DMS controller with error detection and reporting features that guard against incomplete or inaccurate transmission, including:
- Validating the contents of all received transmissions for logic or data errors.
- Monitoring the status of communication lines to detect a malfunction or break.

12. Local Control Panel

Provide a Local Control Panel (LCP) with waterproof switches for at least the following functions:

- On / Off Switch: controls power to the DMS and the DMS controller.
- You may locate this switch elsewhere in the cabinet with the approval of the Engineer.
- Control Mode Switch: for setting the DMS operation mode to either Remote (Server/Client) Mode or Local Mode.
- Message Selection Switch: Selects either a blank message or any of the EEPROM messages stored in the DMS controller when in the Local Control Mode. There shall be a LCD display allowing EEPROM messages to be previewed prior to activation. While a message is being previewed, any failed pixel within the message or outside the message area shall be flashing so they would be repaired prior to the message activation.
- Message Activation Switch: to activate the message selected.

The LCP displays at least the following:

- Controller On
- Number of message displayed
- Error or fault detected along with indication of error type

13. Controller Address

Assign each DMS controller a unique address that is set by hard wiring to ground the appropriate conductors in the controller cabinet or by an Engineer-approved alternate method. Preface all commands from the Control Software with a particular DMS controller address. The DMS controller compares its address with the address transmitted; if the addresses match, then the controller processes the accompanying data.

14. 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
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.

15. Controller Functions

Design the DMS controller to continuously control and monitor the DMS independent of the Control Software.

Link the DMS controller to the Control Software; it will decode the address of every transmission made to it from the Control Software and reject any transmission that does not begin with its unique address.

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.

Include the following functions in the controller and software:

- The DMS controller acknowledges all transmissions from the Control Software; sending a negative response if an error is detected, or a confirming response if it receives a valid transmission
- The DMS controller is able to start up the DMS
- Message Creation: The DMS Control Software is able to write and erase messages to the DMS remotely, and store the messages in the EEPROM remotely
- Display one of three message types: static, flashing, or a multi-page message of at least two pages
- Display any message stored in the EEPROM
- Change existing messages in the EEPROM
- Enter new messages into the EEPROM

For each message, the operator may define a display time in minutes (65,000 minutes max.). When this display time has expired, the controller will blank the sign and extinguish all LEDs.

For alternating or multi-page messages, the operator may define a display time for each message and a blank-out time (from 0.3 sec to 25 sec in 0.1sec increments) between messages.

For flashing messages, the operator may define a flash rate with a minimum range of 0.5 seconds to 3 seconds, adjustable in half-second increments.

a. Error and Failure Reports:

- Power failure
- Data transmission error
- Receipt of invalid data
- Communications failure recovery
- DMS controller failure
- Power recovery
- LED and module status

b. Error and Failure Responses:

- Power Failure: The controller initiates a report of the event to the Control Software. The controller automatically resumes normal operation after the AC power restoration and reports this to the Control Software
- LED, LED Driver, or Power Supply Failure: The controller detects the failure and automatically reports it to the Control Software

- Communications Failure with the Control Software while in the remote Mode: the controller displays a pre-programmed message unless the link has been restored before a user-selectable period (between 0 and 24 hours) has elapsed

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.

16. DMS Controller Commands

Include these commands at a minimum in the controller:

1. Displays the last command from Control Software.
2. Status request: Provides status report including:

- DMS ID or address
- DMS operational mode: Remote or Local
- Pixel status: Shows operational status of all pixels on the DMS
- Power supply status

3. Message display command: Shows text and display parameters of the message currently displayed on the DMS.
4. Light level switching command: Selects Dim, Normal, or Bright Light level control in two modes: automatic (photoelectric sensor control), Control Software override.
5. Program command: Programs the display of a message in memory at a selected date and time.
6. Abort and / or Sign off command.

17. DMS Controller Memory

Design each DMS controller with its own local memory (EEPROM). Use the EEPROM 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 EEPROM. The Control Software can upload messages into and download messages from each controller EEPROM remotely.

Messages uploaded and stored in the controller EEPROM may be erased or edited using the Control Software or the controller. New message may be uploaded to and stored in the controller EEPROM using the Control Software or the controller. These actions shall be accomplished without removing the EEPROM from the controller or installing another EEPROM in the controller.

18. Photo-Electric Sensors

Install three photoelectric sensors with 1/2” (13mm) minimum diameter photosensitive lens on the DMS and/or DMS structure. Use sensors that will operate normally despite continual exposure to direct sunlight. Place the sensors so they are accessible and field adjustable. Point one sensor north to measure the "dim" and "normal" threshold. Place the other two perpendicular to and pointed away from the front and rear of the DMS, respectively, to measure the "bright" threshold.

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.

19. Circuit Breakers, Panels, and Enclosures

Use circuit breakers and panels that meet the requirements of UL Standard 489 "Molded-Case Circuit Breakers and Circuit-Breaker Enclosures, and UL Standard 67 "Electric Panelboards". Provide corrosion resistant enclosures that meet UL Standard for Safety for Cabinets and Boxes, and UL Standard for Safety for Industrial Control Equipment and sections 1098 and 1700 of the NCDOT Standard Specifications and applicable addenda and typical drawings.

Use only molded case, thermal magnetic trip type breakers. Use circuit breaker panelboard enclosures, marked as suitable for use as service equipment, and neatly and permanently label them as shown on the plans. Use circuit breaker panelboard enclosures that are lockable with padlocks without modifying the enclosure. Provide enclosures marked as suitable for service equipment.

20. Service Poles

Use service poles for this project that conform to Article 1097-7 in the Standard Specifications. Install separate conduits on the service pole for telephone and electrical service. The Engineer must approve the locations of service poles.

21. Equipment List

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

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

22. Character Set Submittal

Submit an engineering drawing of the DMS character set including 26 upper case letters, 10 numerals, 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.

23. Wiring Diagrams and Theory of Operation

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

Provide the theory of operation of the system components in a clear, concise manner supported by detailed and complete schematics to component level, logic and data flow diagrams, one-function diagrams, and voltage levels. Include timing and waveform diagrams of the column and row driving signals, the enable signals, and other pertinent output signals. Provide schematic and pictorial diagrams that are complete and accurate as required to supplement the text material and which make the books a self-contained technical information source. Use a logical development starting with a system block level and proceeding to a circuit analysis. Include details in these analyses whenever circuits are not normally found in standard textbooks. Fully describe the application of new theoretical concepts. Where the design allows for operation in several different modes, include an operational description of each mode. Include a pictorial diagram of all components on circuit boards. Document procedures to program the DMS controller memory, including conversion tables of message characters to the codes stored in memory.
Complete and detailed schematic diagrams to component level shall be provided for all DMS assemblies and subassemblies such as driver boards, control boards, DMS controller, power supplies, and etc. Such schematics shall enable an electronics technician to successfully identify any component on a board or assembly and trace its incoming and outgoing signals.

G. Construction Methods

1. Description

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

Provide electrical equipment described in this specification that conforms to the standards of NEMA, UL, or Electronic Industries Association (EIA), wherever applicable. Provide connections between controllers and electric utilities that conform to NEC standards. Express wire sizes according to the American Wire Gauge (AWG).

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

2. Layout

The Design-Build Team will propose the precise locations for each DMS units for final approval by the Engineer. Provide the proper elevation, offset, level, and orientation of all DMS assemblies. The location of service poles and controller cabinets as well as conduit lengths as shown in the plans are approximate based on available project data. 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.

3. Construction Submittal

When the work is complete, submit "as built" plans, inventory sheets, and any other data required by the Engineer to show the details of actual construction and installation and all changes made during installation.

The "as built" plans will show: the DMS, controller, and service pole locations; DMS enclosure and controller cabinet wiring layouts; and wire and conduit routing. Include detailed drawings that identify the routing of all conductors in the system by cable type, color code, and function. Clearly label all equipment in the DMS system, controller cabinet, and DMS enclosure.

4. Conduit

Install the conduit system in accordance with NEC requirements for an approved watertight raceway.

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

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

Attach the conduit system to and install along the structural components of the DMS structure 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 4’ (1.2m) for conduit 1.5” (40mm) and larger, or 6’ (1.8 m) for conduit 1.25” (30 mm) and smaller. Place fasteners no more than 3’ (900 mm) from the center of bends, fittings, boxes, switches, and devices.

Locate underground conduit as shown in the plans in a trench with essentially vertical walls no wider than necessary for easy installation of the conduit and at a minimum depth of 24” (600 mm).

Where conduit is required beneath pavement, bury it at the required depth prior to laying new pavement, or bore and jack it beneath existing pavement. "Water jetting" is not an acceptable installation method. Plug any abandoned opening for bored or jacked conduit as directed by the Engineer.

Extend conduit stubs for controller cabinets at least 6” (150 mm) upward and at least 3’ (900 mm) downward from the top of the foundation.

Provide caps or plugs made of the same material as the conduit on stub-outs for future use.

Clean conduit after installation by "snaking" with a mandrel of a diameter not less than 85% of the nominal diameter of the conduit. Ensure all conduit runs are free of moisture, trash, and debris before pulling cable. Seal the ends of underground conduit with temporary caps and, after installation of circuits, plug the ends with oakum. Coat field-cut threads and other uncoated metal or damaged galvanizing with 2 coats of zinc-rich paint meeting the requirements of Article 1080-9 of the Standard Specifications. Ream the ends of rigid conduit.

Do not exceed a 40% fill rate on all cable installed in conduit as specified in the NEC.

5. Wiring Methods

Do not pull permanent wire through a conduit system until the system is complete and has been cleaned.
Color-code all conductors per the NEC (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 a 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" (75mm) of sand or earth back-fill free of rocks and debris. Compact backfill in 6" (150mm) layers. Do not splice underground circuits unless specifically noted in the plans.

6. Equipment and Cabinet Mounting

Mount equipment securely at the locations shown in the 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.

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

Provide cabinets with all mounting plates, anchor bolts, and any other necessary mounting hardware in accordance with the Standard Specifications and the project plans.

Furnish and install Class-A concrete in conformance with Article 1000-4 of the Standard Specifications.

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

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

7. Cabinet and System Grounding

Ground the controller cabinet, DMS enclosure, DMS structure, and service entrance equipment per sections 1098 and 1700 of the NCDOT Standard Specifications and applicable addenda and typical

drawings. 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 of 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" (16mm) minimum diameter, 10' (3m) long, and made of copper-clad steel.

Make connections between ground electrodes and the ground wire using an exothermic welding process, cadwell or equivalent.

Ensure completed cabinet grounds have a resistance to ground of not more than 20 Ohms.

8. Excavating and Backfilling

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.

9. Power and Telephone Service

When power and telephone service are required at a DMS location, contact the power and telephone companies, make application, and pay all costs, including the installation charge and monthly usage bills, to assure the ability to complete all work. Pay all power and telephone company charges incurred until the date of acceptance of the project by the Department. Upon acceptance of the project and upon request, the Department will reimburse the actual verified cost of power and telephone company charges, including monthly usage bills.

Provide a power service connection that is a single-phase 120/240 volt 3 wire 60 Hz alternating current supply furnished from the local electric utility to a service pole close to the controller cabinet. Provide a main disconnect switch in a lockable NEMA 3R enclosure located on the service pole. Use a main-disconnect that is 120/240V, double pole, bolt-in circuit breaker sized according to the NEC to protect the above equipment.

Install a service pole in a location approved by the Engineer and deliver power and telephone service to it. Run power and telephone service to the controller cabinet through separate conduits.

H. DMS Testing Requirements

1. General Test Procedure

Test the DMS system in a series of design approved 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 the Department, to incorporate all design changes necessary to pass the required tests.
Provide 4 copies of all test procedures and requirements to the Engineer for review and approval at least 40 days prior to the testing start date.

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

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

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

The Contractor shall notify the Engineer forty days in advance of factory tests.

Failure to conform to the requirements of any test and these specifications shall be counted as a complete failure, and the equipment shall be rejected. Rejected equipment/tests may be retested after all deviations have been corrected. After successful completion of all factory tests, the DMS for this contract will be accepted for shipment to the installation site. The Contractor shall provide the documentation to the Engineer of all test and results.

The approval of test procedures and the Engineers acceptance of DMS tests shall not relieve the Contractor of his responsibility to provide a completely acceptable operating DMS system that meets the requirements as stated herein.

Provide 4 copies of the quantitative test results and data forms containing all data taken, highlighting any non-conforming results and remedies taken, to the Engineer for approval before the next project stage is started. An authorized representative of the manufacturer must sign the test results and data forms.

2. Design Approval Tests

a. Procedure and Requirements:

Perform the following Design Approval Tests at the manufacturer's facility on the DMS modules, controller, controller cabinet, communications, and all other associated equipment before beginning full production on the units supplied for this Contract.

PROTOTYPE – Manufacture a prototype Dynamic Message Sign and controller of the type and size described in the Functional Specifications. Test the prototype according to the Design Approval and Operational Tests. When all corrections and changes (if any) have been made, the Department

may accept the prototype DMS and controller as the physical and functional standard for the system furnished under this contract. You may use the prototype units on this project if, after inspection and rework (if necessary), they meet all physical and functional specifications. In the case of standard product line equipment, if the Contractor can provide test results certified by an independent testing facility as evidence of prior completion of successful design approval tests, then the Engineer may choose to waive these tests. If the Engineer so chooses, reduce the contract price by the amount bid for these tests.

In each Design Approval Test designated below, successfully perform the tests described in the Check Test below, under the conditions described. Apply the extreme conditions to all associated equipment unless stated otherwise in these Functional Specifications.

Perform the following Check Tests as a minimum:

- Start-up and operate the DMS locally using the Control Software.
- Use automatic (photoelectric sensor controlled), remote control using Control Software, and local control using Control Software to switch between "dim", "normal", and "bright" light levels.
- Operate the DMS with all display elements flashing continuously for 15 minutes at the maximum flash rate.
- Exercise the DMS by displaying static messages, flashing messages, and alternating static and flashing message sequences.
- Automatically poll the DMS using Control Software at various intervals and verify data received by the Control Software from the DMS.
- Download and edit messages.
- Execute status request on the DMS controller.
- Normal operations during uploading and downloading.
- Display a two-phase flashing message sequence of 45 characters.
- Select messages from the sign controller's local control panel.
- Activate the test sequence at chosen intervals.
- Display and verify several stored messages.
- Display a 2 page diagonal test pattern with half the pixel on and half off, alternating pixels on each page. Display this pattern for 1 hour.

b. Environmental Tests

(1.) Temperature

Stabilize the equipment -10^{o} F (–23^{o} C). After stabilization at this temperature, perform the Check Tests without degradation or failure at both the low and high ends of the input power voltages.

Stabilize the equipment at 140^{o} F (60^{o} C) and operate it as per Part A above.

(2.) Humidity

Maintain the equipment at 140^{o} F (60^{o} C) with a relative humidity of 95% for 48 hours. At the conclusion of the 48 hours period, perform the Check Tests without degradation or failure at both the low and high ends of the input power voltages.

(3.) Primary Power Variation

Voltage: Operate the field equipment with the input line voltage set first at 132V and then at 108V (120V +/- 10%). Operate the equipment for at least 15 minutes at each of these voltages while successfully performing the Check Tests.

Frequency: Operate the field equipment with the input line frequency set first at 63 Hz and then at 57 Hz (60Hz +/- 3Hz). Operate the equipment for at least 15 minutes at each of these frequencies while successfully performing the Check Tests.

High Frequency: Check Test the field equipment when subjected to the high frequency and voltage transient interference specified in the Transients, Power Service section of the NEMA Standards for Traffic Control Systems while successfully performing the Check Tests.

(4.) Vibration and Shock:

Subject the field equipment to the vibration and shock tests described in the Vibration Test and Shock Test sections of the NEMA Standards for Traffic Control Systems. This test must not cause degradation of mechanical structure, soldered components, or plug-in components. Successfully perform the Check Tests immediately after completing the Vibration Test.

(5.) Water Spray Test (Controller Cabinet Only):

Perform the following water spray test on an empty controller cabinet. Spray water from a point directly overhead at an angle of 60^{o} from the vertical axis of the cabinet. Repeat this procedure for each of eight equally spaced positions around the cabinet for a period of not less than two minutes in each position. Spray the water using a domestic type sprinkling nozzle at a rate of not less than 1 gallon (3.78 liters) per minute per 1 sq. ft. (.09 sq. m) of surface area. Then check the cabinet for leakage. Reject or repair the cabinet if there is any evidence of leakage and repeat the test.

(6.) LED Pixel Light Output Test:

Perform a test to confirm that the light output intensity conforms to the requirements of “LED Pixels”.

3. Operational Factory Tests

Perform Operational Factory Tests on the assembled DMS system at the manufacturer's facility prior to shipping. Perform Operational Field Test on each system after it is shipped, installed, and operational.

a. Physical Examination

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

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.

b. Continuity

Check the wiring to assure it conforms with the requirements of the appropriate paragraphs of this Specification.

c. Functional Tests

Operate each unit of equipment in the system long enough to permit the equipment temperature to stabilize, and to check and record performance characteristics to ensure compliance with the latest edition of NTCIP Standards as required in these Functional Specifications.

Conduct approved DMS functional tests on the equipment with the Control Software. Exercise all remote and local monitoring and control functions required by these specifications and display the return status codes from the controller for a period of 72 hours.

Include the following functional tests as a minimum:

- NTCIP exerciser/other testing on the assembled DMS system
- Verification of all memory requirements
- Start-up and operation of the DMS locally using the Control Software
- Use automatic (photoelectric sensor controlled), remote control using Control Software, and local control using Control Software to switch between “dim”, “normal”, and “bright” light levels
- Operation of the DMS with all display elements flashing continuously for one hour at the maximum flash rate
- Exercise the DMS by displaying static messages, flashing messages, and alternating static and flashing message sequences
- Automatically poll the DMS using Control Software at various intervals and verify data received by the Control Software from the DMS
- Demonstration of the writing speed to meet specified requirements.
- Downloading and editing messages
- Execute status request on the DMS controller
- Normal operations during uploading and downloading
- Display two-phase flashing message sequence of 45 characters
- Selection of messages from the sign controller’s local control panel
- Test sequence activation at chosen intervals
- Display and verification of all stored messages
- Resumption of standard operation upon interruption of electrical power
- Demonstrate no loss of RAM memory during a 24 hour electrical power outage
- Demonstration of the Failure Detection and Response functions
- Demonstrate proper operation of the Failure Log

- Watchdog timer detection of microprocessor failures and the resetting of the microprocessor
- EEPROM reprogramming requirements
- Set controller clock using the Control Software
- Execute system shut-down using first the Control Software emulator device, and local control panel
- Detection of power failure in the DMS enclosure and reporting of such failure to the Control Software
- Detection of UPS overload. Logging and reporting of such event to the Control Software

Approval of Operational Factory Test does not relieve the Contractor of the requirements to conform to the specifications in these Functional Specifications.

d. NTCIP Requirements

This portion of the specification defines the detailed NTCIP requirements for the Dynamic Message Signs covered by the procurement package.

(1.) Definitions

The following terms shall apply within the scope of this procurement specification:

DMS - A Dynamic Message Sign, includes the sign display, controller, cabinet, and other associated field equipment. The specific type of dynamic message sign (i.e., blank-out sign, changeable message sign, character matrix sign, full-matrix sign, etc.) for this procurement is specified elsewhere within this procurement specification.

FSORS - Full, Standardized Object Range Support for, and proper implementation of, all valid values of an object as defined within the object's OBJECT-TYPE macro in the subject NTCIP standard; this is further defined in two distinct sub-requirements. (1) If the ACCESS of the object is read-write, a Management System shall be able to set the object to any valid value as defined by the SYNTAX and DESCRIPTION fields (except that the value of 'other' need not be supported when such a value is defined) and the indicated functionality shall be provided. (2) The value indicated by the object (e.g., in response to a ‘get’), regardless of the ACCESS, shall reflect the current condition per the rules specified in the object’s DESCRIPTION.

Management System – A computer system used to control an NTCIP component. This includes any laptop software used for field control as well as the control software.

NTCIP Component – A DMS or a Management System.

NTCIP System – A Management System plus the various ASCs and DMSs controlled by the Management System.

Response Time – The time to prepare and begin transmission of a complete response containing the requested Application Layer information. This is measured as the time from receipt of the closing flag of the request to the transmission of the opening flag of the response when the device has immediate access to transmit.

(2.) 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. In many cases, the standard is more widely known by its original NEMA assigned number; in these cases, the NEMA number is also identified. The content of the NEMA standard is identical to that of the NTCIP standard.

Each NTCIP Component covered by these project specifications shall implement the most recent version of the standard that is at the stage of Recommended or higher as of Sunday, October 01, 2000, including any and all Approved or Recommended Amendments to these standards as of the same date. It is the ultimate responsibility of the VENDOR to monitor NTCIP activities to discover any more recent documents.

Table 1: NTCIP Standards

Abbreviated Number	Full Number	Title	Known Amendments
NTCIP 1101	**NTCIP 1101:1997** (NEMA TS 3.2-1996)	*Simple Transportation Management Framework*	Amendment #1 dated November 2, 1998
NTCIP 1201	**NTCIP 1201:1997** (NEMA TS 3.4-1996)	*Global Object Definitions*	Amendment #1 dated November 2, 1998
NTCIP 1203	**NTCIP 1203:1997** (NEMA TS 3.6-1997)	*Object Definitions for Dynamic Message Signs*	Amendment #1 dated July 3, 2001
NTCIP 2001	**NTCIP 2001:1997** (NEMA TS 3.3-1996)	*Class B Profile*	Amendment #1 dated November 2, 1998
NTCIP 2101	**NTCIP 2101**	*SP-PMPP/232* *Subnet Profile for PMPP over RS-232*	Amendment #1 dated November 2, 1998
NTCIP 2102	**NTCIP 2102**	*SP-PMPP/FSK* Subnet Profile for PMPP over FSK Modem	
NTCIP 2103	**NTCIP 2103**	*SP-PPP/232* *Subnetwork Profile for PPP over RS232 (Dial Up)*	
NTCIP 2104	**NTCIP 2104**	*SP-Ethernet* *Subnet Profile for Ethernet*	
NTCIP 2201	**NTCIP 2201**	*TP-Null* *Transport Profile*	
NTCIP 2202	**NTCIP 2202** (NEMA TS 3.Internet	*TP-Internet* *Internet Transport Profile*	

	v99.01.03)	*(TCP/IP and UDP/IP)*	
NTCIP 2301	**NTCIP 2301**	AP-STMF AP for Simple Transportation Management Framework	

(3.) General Requirements

(a.) Subnet Level

Each serial port on each NTCIP Component shall support NTCIP 2103 over a dial-up connection with data rates of 28.8 kbps, 19.2 kbps, 14.4 kbps, 9600 bps, 4800 bps, 2400 bps, 1200 bps, 600 bps, and 300 bps. The NTCIP Component shall be able to make outgoing and receive incoming calls as necessary and support the following modem command sets:

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

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

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

Additionally, NTCIP components shall support NTCIP 2102 and 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. The NTCIP Component shall be configurable to allow the field technician to activate the desired Subnet Profile and shall provide a visual indication of the currently selected Subnet Profile.

(b.) Transport Level

Each NTCIP Component shall comply with NTCIP 2201 and 2202.
NTCIP Components may support additional Transport Profiles at the manufacturer's option. Response datagrams shall use the same Transport Profile used in the request. Each NTCIP Component shall support the receipt of datagrams conforming to any of the identified Transport Profiles at any time.

(c.) Application Level

Each NTCIP Component shall comply with NTCIP 1101 and 2301 and shall meet the requirements for Conformance Level 1 (NOTE - See Amendment to standard).
Each NTCIP Component shall support SNMP traps. An NTCIP Component may support additional Application Profiles at the manufacturer's option. Responses shall use the same Application Profile

used by the request. Each NTCIP Component shall support 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 Time for any object or group of objects shall be 200 milliseconds.
The DMS shall support all mandatory objects of all mandatory Conformance Groups as defined in NTCIP 1201 and NTCIP 1203. Table 2 indicates the modified object requirements for these mandatory objects.

Table 2: Modified Object Ranges for Mandatory Objects

Object	Reference	Project Requirement
ModuleTableEntry	NTCIP 1201 Clause 2.2.3	Shall contain at least one row with moduleType equal to 3 (software). The moduleMake shall specify the name of the manufacturer, the moduleModel shall specify the manufacturer's name of the component and the modelVersion shall indicate the model version number of the component.
MaxGroupAddresses	NTCIP 1201 Clause 2.7.1	Shall be at least 1
CommunityNamesMax	NTCIP 1201 Clause 2.8.2	Shall be at least 3
DmsNumPermanentMsg	NTCIP 1203 Clause 2.6.1.1.1.1	Shall be at least 1*
DmsMaxChangeableMsg	NTCIP 1203 Clause 2.6.1.1.1.3	Shall be at least 21
DmsFreeChangeableMemory	NTCIP 1203 Clause 2.6.1.1.1.4	Shall be at least 20 when no messages are stored.
DmsMessageMultiString	NTCIP 1203 Clause 2.6.1.1.1.8.3	The DMS shall support 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	Shall support at least the following modes: Local, External, Central CentralOverride

* The Permanent Messages shall display the content shown in Table 3.
The sign shall blank if a command to display a message contains an invalid Message CRC value for the desired message.

Table 3: Content of Permanent Messages

Perm. Msg. Num.	Description
1	Permanent Message #1 shall blank the display (i.e., consist of an empty MULTI string). It shall have a run-time priority of one (1).

Table 4: Required MULTI Tags

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

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

i. Time Management, as defined in NTCIP 1201
ii. 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	Shall be at least 28
maxDayPlans	NTCIP 1201 Clause 2.4.4.1	Shall be at least 14

maxDayPlanEvents	NTCIP 1201 Clause 2.4.4.2	Shall be at least 10

iii. Report, as defined in NTCIP 1201. The following list indicates the modified object requirements for this conformance group.

iv. PMPP

Table 6: Modified Object Ranges for the Report Conformance Group

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

v. 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	Shall be at least 4*
MaxFontCharacters	NTCIP 1203 Clause 2.4.1.1.1.3	Shall be at least 127**

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

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

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

vi. VMS Configuration, as defined in NTCIP 1203.

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

viii. Default Message Control, as defined in NTCIP 1203

ix. Pixel Service Control, as defined in NTCIP 1203

x. Multi Error Control, as defined in NTCIP 1203

xi. 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 shall support the following illumination control modes: photocell timer manual
dmsIllumNumBrightLevels	NTCIP 1203 Clause 2.8.1.1.1.4	Shall be at least 16

xii. Auxiliary I/O

xi. Illumination/Brightness Control, 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	Shall be at least 21

xiv. Sign Status, as defined in NTCIP 1203
xv. Status Error, as defined in NTCIP 1203
xvi. Pixel Error Status, as defined in NTCIP 1203
xvii. Fan Error Status, as defined in NTCIP 1203
xviii. Power Status, as defined in NTCIP 1203
xix. Temperature Status, as defined in NTCIP 1203

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

Table 11: Some Optional Object Requirements

Object	Reference	Project Requirement
DefaultFlashOn	NTCIP 1203 Clause 2.5.1.1.1.3	The DMS shall support the full range of these objects with step sizes no larger than 0.5 seconds
DefaultFlashOff	NTCIP 1203 Clause 2.5.1.1.1.4	The DMS shall support the full range of these objects with step sizes no larger than 0.5 seconds
DmsMultiOtherErrorDescription	NTCIP 1203 Clause 2.7.1.1.1.20	If the vendor implements any vendor-specific MULTI tags, the DMS shall provide meaningful error messages within this object whenever one of these tags generates an error.

e. Documentation

Software shall be supplied 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. The filename of this file shall be identical to the standard MIB Module, except that it will have the extension ".man".
- A MIB Module in ASN.1 format containing any and all manufacturer-specific objects supported by the device with accurate and meaningful DESCRIPTION fields and supported ranges indicated in the SYNTAX field of the OBJECT-TYPE macros.

- A MIB containing any other objects supported by the device.

The manufacturer shall allow the use of any and all of this documentation by any party authorized by the Procuring Agency for systems integration purposes at any time initially or in the future, regardless of what parties are involved in the systems integration effort.

4. NTCIP Acceptance Testing

The NTCIP requirements outlined above shall be tested thoroughly by one of the firms listed in section titles "Testing". The Contractor shall submit to the Engineer for approval a portfolio of the selected firm. This shall include the name, address, and a history of the selected firm in performing NTCIP testing along with references. The Contractor shall also provide a contact person's name and phone number. The Contractor shall submit detailed NTCIP testing plans and procedures including a list of hardware and software to the Engineer for review and approval forty (40) days in advance of a scheduled testing date. These test documents shall be developed by the selected firm based on the NTCIP requirements of these Functional Specifications. The acceptance test will use the NTCIP Exerciser, and/or other authorized testing tools and will follow the guidelines established in the ENTERPRISE Test Procedures. The test shall be conducted by the firm in North Carolina on the installed system at the presence of the Engineer. The results of the test shall be documented and certified by the firm and submitted by the Contractor to the Engineer for review and approval. In case of failures, the Contractor shall remedy the problem and the Firm retest in North Carolina. This process will continue until all failures are resolved. The Department reserves the right to enhance these tests as deemed appropriate to ensure device compliance.

5. NTCIP Submittal

Project-specific NTCIP manual shall be included in the list of deliverables that thoroughly documents the details associated with the various NTCIP options and features in the system.

6. Operational field Test

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

a. Physical Examination

Test per section "Physical Examination" in above.

b. Continuity Tests

Test per section "Continuity Tests" above.

c. Functional Tests

Perform the following functional tests:

- NTCIP exerciser/other testing on the assembled DMS system.
- 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.
- Display two-phase flashing message sequence of 45 characters.
- Selection of messages from the sign controller’s local control panel.
- 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 control panel.
- Detection of power failure in the DMS enclosure and reporting of such failure to the Control Software.

Approval of Operational Field Test results does not relieve the Contractor to conform to the specifications in these Functional Specifications. If a system does not pass its test, either document a correction or substitute a new unit as approved by the Engineer. Re-test the system until it passes all requirements.

Approval of the Operational Test results does not relieve the Contractor of the requirement to conform to these Functional Specifications.

7. Construction Methods

Conduct and provide test for approval by the Engineer. The Engineer or a designated representative reserves the right to witness all tests.

VII. OVERHEAD DYNAMIC MESSAGE SIGN ASSEMBLY

A. Description

This section includes all design, fabrication, furnishing, and erection of each overhead Dynamic Message Sign (DMS) assembly; maintenance walkway for access to the DMS inspection door; and attachment of the DMS enclosure to the structure in accordance with the requirements of the plans and the provisions of this specification. Fabricate the supporting DMS assembly from tubular steel.

The DMS assembly shall be a span type (minimum of two vertical supports) with a boxed truss. The proposed DMS assembly shall extend from the median to the shoulder and span all northbound lanes. Furnish and install guardrail as required for motorist protection.

Design the overhead DMS assembly including footings and submit shop drawings for approval.

Where the Standard Specifications or plans require the design of an overhead sign assembly, including footings, submit design computations and shop drawings to the Engineer for acceptance. A Professional Engineer that is registered in the state of North Carolina will prepare such computations and drawings. These must bear his signature, seal, and date of acceptance.

The provisions of Section 900 apply to all work covered by this section.

B. Material

Use materials that meet the requirements of Division 10 of the NCDOT Standard Specifications shown below:

Structural steel	Section 1072 and 1096
Class A concrete	Section 1000
Steel bar reinforcement	Section 1070
Anchor bolts	Article 1072-6
Joint sealer	Article 1028-2
Zinc-rich paint	Article 1080-9
High strength bolts, nuts, and washers	Sub-article 1094-1 (A)

C. Construction methods

1. General

Fabricate the overhead DMS assembly in accordance with the details shown in the approved shop drawings and the requirements of these specifications.

Do not weld, cut, or drill in any manner in the field unless approved by the Engineer.

Drill bolt holes and slots to finished size or you may punch them to finished size, provided the diameter of the punched holes is at least twice the thickness of the metal being punched. Do not flame cut bolt holes and slots.

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

2. Shop drawing

Submit to the Engineer for approval a complete design for each overhead DMS assembly, including footings, sign assembly hardware, brackets for supporting the signs and the maintenance walkway. Base the design on the line drawings and wind speed shown in the plans and in accordance with the *"Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals".*

The manufacturer of the overhead DMS assembly must coordinate with the manufacturer of the DMS to ensure that the sign and the sign structure are totally compatible, operational, and functional as a working unit.

To ensure the correct attachment of the DMS enclosure, submit plans and designs for both the DMS system and the DMS assembly to the Engineer to transmit to the Signing Engineer and Structures Engineer for approval and acceptance. Resolve discrepancies and conflicts arising from non-compatibility of either the assembly or the DMS enclosure through coordination between the structure designers and the sign designers.

Submit thirteen copies of completely detailed shop drawings and one copy of the design computations for the overhead DMS assembly to the Structures Engineer for approval prior to fabrication. Show in the shop drawings complete design and fabrication details including foundations, provisions for attaching DMS and walkway to supporting structures, applicable material specifications, and any other information necessary for procuring and replacing any part of the complete overhead Dynamic message sign assembly.

The Signing Engineer is responsible for evaluation, approval, and final acceptance of all DMS System, software, testing, and training submittals.

Allow a minimum of 50 days for shop drawing approval after the Engineer receives them. If revised drawings are necessary, allow appropriate additional time for review and approval of final shop drawings.

Approval of shop drawings by the Engineer will not relieve the Contractor of his responsibility for the correctness of drawings, or for the fit of all shop and field connections and anchors.

3. Design and Fabrication

a. Overhead Dynamic Message Sign Assembly

Fabricate the overhead DMS assembly in accordance with the details shown in the approved shop drawings and with the requirements of these Functional Specifications.

Overhead DMS assembly dimensions shown in the plans were estimated from available project data for bid purposes. The Engineer will determine the actual dimensions from field measurements and DMS enclosure dimensions provided by the enclosure fabricator and will furnish revised plans. You

may use a truss design for horizontal components of the supporting structures for the DMS enclosure. Provide permanent camber in addition to dead load camber in accordance with the "Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals". Indicate on the shop drawings the amount of camber provided and the method used in the fabrication of the assembly to obtain the camber.

Attach the overhead DMS assembly to concrete foundations by the use of galvanized anchor bolts. Furnish anchor bolts with galvanized nuts, flat washers and lock washers. Provide anchor bolts that have a right angle bend or anchor plate with a nut at the end you embed in concrete.

Fabricate the attachment assembly for mounting signs in a manner that will ensure easy removal of the signs for repair.

b. Maintenance Walkway

Provide a maintenance walkway, a minimum of 36" (914mm) wide with an open skid-resistant surface and safety railings, on the overhead DMS assembly for access to the DMS inspection door unless specifically stated otherwise in the plans. Provide a maintenance walkway that extends from the DMS inspection door to 3 feet (0.9m) over the edge of shoulder. Position the walkway so that there is no opening greater than 10" (254mm) that is unprotected. Provide walkways with fixed safety railings along both sides from the beginning of the walkway to the inspection door. When not in use, the safety railing may remain in a permanent upright position.

Connect the walkway sections rigidly where sections join to avoid an uneven walking surface. Attach the walkway directly to the walkway brackets.

Install a 4" x 4" (100 mm x 100mm) safety angle parallel to and along both sides of the walkway and extend it the entire length of the walkway. Design the safety angle to withstand loading equivalent to the walkway.

Provide a walkway in which the open ends have a galvanized steel coil safety chain attached on one end near the top of the safety railing, and on the other end to the walkway hanger, or other fixed member of the structure.

c. Footings for Overhead Dynamic Message Sign Assembly

Design footings for the combined effects of dead and wind loads; use either spread type or pole type as specified in the project plans. Design spread footings for a maximum soil bearing of 3 ksf (145 Kpa) unless otherwise allowed by the Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals. If, in the judgment of the Engineer, the soil in a given footing excavation is not adequate for 3 ksf (145 Kpa) bearing pressure, or any other bearing pressure noted on approved footing drawings, the Contractor may be required to change his footing design to meet actual soil conditions at no cost to the Department.

Perform all excavation and backfill necessary for footing construction to the elevations and dimensions shown in the plans or as directed by the Engineer.

Thoroughly compact all backfill in 6" (150mm) layers. Remove all unneeded excavated material from the site.

Construct footing excavations for overhead DMS assemblies that conform to the applicable provisions of Section 410 of the Standard Specifications. Make sure the sides of the excavation for pole type footings conform as nearly as practicable to the required dimensions. Place concrete for pole-type footings against undisturbed soil unless otherwise permitted by the Engineer. If, in the judgment of the Engineer, significant discontinuities in the required configuration of the excavation for pole-type footings are created by the removal of boulders or as a result of other causes, backfill the excavation and compact as provided for in Section 410. Re-excavate the footings to the proper dimensions. The Engineer must approve shoring prior to use, if used to stabilize the sides of excavation for pole-type foundations.

Construct footings for overhead DMS assembly in accordance with Section 825. Construct all footings of Class A concrete. Where rectangular forms are used, use forms with a chamfer strip at all corners for at least that distance protruding above ground level. Use a chamfer which measures 1" (25mm) along the diagonal face. Securely brace anchor bolts positioned in the form, and hold them in proper position and alignment. Provide a rubbed finish on concrete surfaces exposed above finished ground in accordance with Sub-article 825-6(D). Do not erect overhead DMS assembly on footings until the concrete has reached a minimum compressive strength of 3000 psi (20.64 Mpa). Determine concrete compressive strength by non-destructive test methods, or by compressive strength tests made in accordance with AASHTO 2001, 4th edition. Furnish equipment used for non-destructive tests and obtain Engineer approval.

VIII. DMS DIRECT TENSION INDICATORS

A. General

Use direct tension indicators on all ASTM A325 high strength bolt connections in overhead and cantilever sign structures.

Provide direct tension indicators that conform to these Functional Specifications, the requirements of ASTM F959 and the manufacturer's recommendations.

B. Material Requirements

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.

C. Test Documents

Furnish the Engineer with a copy of 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 a copy of the manufacturer's instructions for installing the direct tension indicators before installation begins along with at least 1 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.

D. 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.

E. Construction Methods

1. Installation

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 (690 Kpa) at the wrench.

Perform any heating of structural steel required for corrections in the vicinity of fasteners before direct tension indicators are installed.

2. Inspection

The Engineer will inspect for correct tightening of bolts by inserting a 0.005” (0.125 mm) 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 can not 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 Contractor.

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 are 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.

IX. TRAINING

A. Description

Provide training courses covering the operation and maintenance of the equipment being supplied as part of the system. Train Department personnel to properly operate, maintain, and troubleshoot each piece of equipment and software within the system. Provide training for a minimum of thirty (30) Department personnel. Provide training for DMS field and central equipment, CCTV field and central equipment, MVD field and central equipment the central video subsystem, and the new and modified central software. Provide training for each of the following categories and for the minimum number of hours shown:

- DMS operation 4 Hours
- DMS troubleshooting and repair 12 Hours
- CCTV operation 8 Hours
- CCTV troubleshooting and repair 16 Hours
- MVD operation 4 Hours
- MVD troubleshooting and repair 12 Hours
- Central video subsystem operation 24 Hours
- Central video subsystem trouble shooting 24 Hours
- New and modified central software 16 Hours

Each category shall consist of demonstration and hands-on activities. All training courses shall be conducted at a Contractor provided location within the time mutually agreed upon by the Engineer and the Contractor. Provide documentation for up to 30 attendees. Provide 30 copies of the approved course materials at least 14 days in advance of the scheduled course. Training course shall not exceed 8 hours on any given day.

B. Material

The Contractor shall provide qualified instructors and training material in order to present formal classroom as well as “hands-on” user training in the operation, maintenance, and troubleshooting of the equipment being supplied as part of the system. Manufacturer’s representatives, or personnel approved by the Engineer, shall conduct the training course. Particular attention shall be given to precautions that must be observed in operating the equipment. Training courses shall be required for both the control center elements and field elements of the system.

The training material generated for each course shall contain “hand-outs” for each attendee, which shall serve not only as subject guidance, but also as quick reference material for future use by the students. All course material, in reproducible form, shall be delivered to the Engineer immediately following course completion. In addition to on-site training, provide the required training on VHS videotape. All tape shall be labeled, noting at a minimum the date of the course and title of the course.

At least 40 days prior to commencement of the training course submit to the Engineer detailed course curricula, draft manuals and materials, and resumes of the instructor(s).

Under each category, address the following topics as a minimum:

- Theory of operation
- Installation
- Operation
- Preventative maintenance of equipment
- Trouble shooting and equipment diagnostics
- Integration of equipment with the network.

X. EMERGENCY RESTORATION EQUIPMENT

A. Description

Furnish emergency restoration equipment with all necessary hardware in accordance with the Functional Plans and Functional Specifications. Comply with the provisions of Section 1700 of the *2002 Standard Specifications*.

B. Material

Furnish new, unused emergency restoration equipment to the Engineer in the quantities shown below:

- One (1) DMS controller
- Five (5) MVDs
- Two (2) CCTV camera assemblies
- Two (2) VOR-D Units
- Two (2) VOT-D Units
- One (1) VOTMUX Unit
- One (1) VORDEMUX Unit
- One (1) Pole-mounted field equipment cabinet
- One (1) Base-mounted field equipment cabinet with a base adapter
- One (1) Fiber Service Unit
- Two (2) T-1 multiplexer nodes

C. Construction Methods

Prior to starting any system testing or training, furnish all emergency restoration equipment.

XI. MICROWAVE VEHICLE DETECTORS (MVD)/REMOTE TRAFFIC MONITORING SENSORS (MVD)

A. Description

The MRTMC includes a detection subsystem. Under this project, this subsystem will be expanded. Preliminary locations of MVD units are shown on the functional plans.

The detectors shall generally be located as shown on the functional plans set at approximately 1/3 mile spacing. Final placement of the MVD units shall be the responsibility of the Design-Build Team. In general, MVD unit detection zones should be placed in areas where traffic is in non-merge conditions as the ability of most microwave based detection devices to accurately detect volumes, speed, and occupancy at low travel speeds (travel speeds less than 10 miles per hour) deteriorates at lower speeds.

Furnish and install MVD units and integrate with PK-2100 microprocessor units, FOT units, the Intelligent Multiplexers and optical transceivers as specified in these documents for communication of the collected data to the central detection server and subsystem.

It is the intent of the detection sub-system to provide system operators, and ultimately the motoring public travel information regarding congestion levels, speeds, volumes, and ultimately segment travel time estimates. It is not the intention of the detection system to automate incident detection.

All equipment and component parts furnished shall be new, of the latest design and manufacture, and in an operable condition at the time of delivery and installation. All parts shall be of high quality workmanship, and no part or attachment shall be substituted or applied contrary to the manufacturer's recommendations and standard practices.

The design shall be such as to prevent reversed assembly or improper installation of connectors, fasteners, etc. Each item of equipment shall be designed to protect personnel from exposure to high voltage during equipment operation, adjustments, and maintenance.

The designed mean time between failures (MTBF) of the MVD unit, operating continuously in their application, shall be 10 years or longer.

The manufacturer of the MVD must provide references to show that it has been deployed in operational systems for over three years in at least three locations in a similar application to that intended for this project.

B. Functional Requirements

1. Capabilities

The MVD shall be a true presence detector, which can provide presence, volume, lane occupancy, long vehicles and speed information on up to eight (8) discreet detection zones. This information shall be available to existing controllers via contact closure pairs and to other systems via serial communications lines (RS-232).

2. Data Transmission

Each microwave radar detector shall transmit on a frequency band of 10.525 GHz +/-25 MHz or another approved spectral band. The detector shall comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules or the appropriate Spectrum Management Authority. The MVD shall not interfere with any known equipment.

Transmitter power shall not exceed 10 milliwatts.

3. Area Coverage

The MVD's field of view shall cover an area defined by an oval shaped beam and its maximum detection range shall be as follows:

- Elevation Beam Width 45 degrees
- Azimuth Beam Width 15 degrees
- Range 3 to 60 meters (10 to 200 feet)

4. Detection Zones

The maximum number of detection zones defined shall be no less than eight (8). The range limits of each zone shall be user defined in 2 meters (6.5 feet) resolution.

5. Measurement Accuracy

The detector shall identify vehicle presence within each detection zone with a 95% accuracy or greater, independent of the vehicle's direction of travel through the detection zone.

The maximum permissible error shall be 5% in the detection of the direction and magnitude of radial speed and 10% in the case of transverse speed.

6. Environmental Characteristics

Except as stated otherwise herein, the equipment shall meet all its specified requirements during and after subjecting to any combination of the following:

- Ambient temperature range of -37 to +74 degrees C
- Relative humidity from 5 to 95 percent, non-condensing
- Power surge of ±1kV surge (rise time = 1.2 μsec, hold = 50μsec) applied in differential mode to all lines, power and output, as defined by International Electrotechnical Commission (IEC) standard IEC 1000-4-5 and European Committee for Electrotechnical Standardization (CENELEC) standard EN 61000-4-5.

The circuit design shall include such compensation as is necessary to overcome adverse effects due to temperature in the specified environmental range.

Except as may be otherwise stated herein for a particular item, no item, component, or subassembly shall emit a noise level exceeding the peak level of 55 dBa when measured at a distance of one meter (3.3 feet) away from its surface.

The microwave vehicle detector shall be resistant to vibration in accordance with the National Electrical Manufacturers Association (NEMA) TS-1 (Section 2.1.12), or approved equivalent.

The microwave detector shall be resistant to shock in accordance with NEMA TS-1 (Section 2.1.13), or approved equivalent.

7. Mechanical Characteristics

The MVD shall be enclosed in a rugged weatherproof box and sealed to protect the unit from wind up to 145 mph, dust and airborne particles, and exposure to moisture (NEMA type 4X enclosure).

Max. overall dimensions, including fittings: 240 x 155 x 175 mm (9.5 x 6.25 x 7 in.)

Max. weight of the microwave radar detector assembly: 2.2 kg (5 pounds)

The mounting assembly shall have all painted steel, stainless steel, or aluminum construction, and shall support a load of 9 kilograms (20 pounds). The mounting assembly shall incorporate a ball-joint, or other approved mechanism, that can be tilted in both axes and then locked into place to provide the optimum area of coverage.

8. Electrical Characteristics

The MVD unit shall be operable from either 12 - 24 VAC/DC dissipating 6W, or 95 - 135 VAC @ 60 Hz. Power supply shall be obtained from the power distribution assembly within the controller cabinet, or any convenient power source.

The interface consists of a single MS connector which provides power to the unit, output contact closure wire pairs for each of the required detection zones rated at 200V AC/DC 100 mA, and serial communication lines for programming, testing or modem interface at 9600 Baud rate. Data format of the serial port shall be standard binary NRZ 8 bits data, 1 stop bit, no parity.

Furnish a UV-resistant cable of multiple twisted pairs of stranded AWG #20 or #22 wires with a common shield rated at 300V with a temperature rating of 104 degrees C (Belden #9516 or approved equal) will provide connection between the MVD and the cabinet equipment. Furnish cables that furnish power and contact-closure feeds at the distances shown in the plans.

The MS connector pins must be crimped to the cable conductors and assembled and tested prior to installation and pulling of cable on site.

The junction box or cabinet to house the RS-232 connector must be located within sight of the desired detection zones in order to initially set up the sensor or to alter the set-up at a later date.

9. Compatibility Requirements

For compatibility purposes, furnish MVD units that are the same as those currently in the field (RTMS X3 by Electronic Integrated Systems, Inc.) or latest version that is fully compatible, interchangeable, and interoperable with the existing units deployed in the field as well as the central detection subsystem at the MRTMC, meet the specification herein, and approved by the Engineer.

10. Lead-In Cable

Furnish detector lead-in cable that meets or exceeds the following requirements:

- Complies with IMSA 50-2 or REA PE-22
- #18 AWG stranded, shielded copper cable
- conductors with different colors of insulation

C. CONSTRUCTION REQUIREMENTS

1. Microwave Vehicle Detector

The MVD shall be mounted in a side-fired configuration. It shall be mounted on new steel poles at the specified locations, using the manufacturer -supplied mounting brackets. The brackets shall be attached with approved 19 mm (0.75 inch) wide, 0.6 mm (0.025 inch) thick, stainless steel bands or to a concrete wall/bridge using 2 stainless steel expansion bolts of sufficient length and diameter to support 45 kg (100 pounds).

The Design-Build team shall install the detector unit on a pole at a minimum height of 5 meters (17 feet) above the road surface so that the masking of vehicles is minimized and that all detection zones are contained within the specified elevation angle as suggested by the manufacturer.

The MVD detection zones shall be set up using the provided software and a Notebook PC.

2. Interface Requirements

Integrate MVD units with equipment cabinet, PK-2100 microprocessor unit, cabinet power supply, cabinet and equipment grounding system, and FOT unit via PK-2100 unit. Arrange installed MVD units in rings (fault-tolerant multi-drop channels) as shown in the Functional Plans. Each ring shall have, in addition to its drop and insert FOT units at each MVD unit, a drop and insert unit that is connected to each T-1 multiplexer node as shown in the Plans. No ring shall have more than ten MVD units.

Calibrate each MVD according to manufacturer calibration procedures. Calibration should provide appropriate adjustments for adjusting a zone's reference speed. Perform stand-alone and system testing as described in the General Requirements section.

XII. CONDUIT PLANT

A. Description

For the project, a new conduit plant consisting of a 4-way duct system of 31.75 mm (1.25 inch) nominal inside diameter polyethylene conduit shall be installed to house the trunk fiber optic cabling to be installed under this project as well as to provide spare duct for future system expansion.

At locations where a spur is introduced into the conduit route to service a field device, the spur routing shall consist of a 2-way system of 2-31.75 mm (1.25 inch) nominal inside diameter polyethylene conduit.

At locations where the conduit systems are to be installed in railroad company right-of-way, all requirements for installation method and material required by the Owner of the railroad facility shall be followed. It is the responsibility of the Design-Build team to identify the location of railroad facilities on the project, identify the owner of the facilities, and obtain all required agreements, permits, and install conduit plant to the specifications of the railroad owner.

Furnish and install underground polyethylene conduit systems with all necessary hardware in accordance with the plans and specifications. Comply with the provisions of Section 1700 of the *2002 Standard Specifications*.

B. Functional Requirements

Furnish factory lubricated, low friction, coilable, conduit constructed of virgin high-density polyethylene (HDPE). Furnish conduits with nominal diameter as required by the plans. Provide individual conduits with smooth outer walls and ribbed inner walls and ensure the conduit is capable of being coiled on reels in continuous lengths, transported, stored outdoors, and subsequently uncoiled for installation without affecting its properties or performance.

Provide conduit that is suitable for underground use in an ambient temperature range of -35 to 55 degrees C (-30 to 130 degrees F) without degradation of material properties.

Provide conduit that is resistant to benzene, calcium chloride, ethyl alcohol, fuel oil, gasoline, lubricating oil, potassium chloride, sodium chloride, sodium nitrate, and transformer oil, and is protected against degradation due to oxidation and general corrosion.

Provide conduit(s) with an outer diameter to minimum wall thickness ratio that complies with ASTM-D3035, Standard Dimension Ratio (SDR) 13.5.

Provide conduit(s) that meets or exceeds the following:

ASTM-D638	Tensile Strength - 20 Mpa (3,000 psi), minimum Elongation - 400 percent, minimum
ASTM-D1238	Melt Index - 0.4 maximum
ASTM-D1505	Density - (0941-0955 g/cc)
ASTM-D1693	Condition B - 20 percent failure, maximum
ASTM-D2444	Impact - NEMA Standards Publication Number TC7

ASTM-D3350 Cell classification - 334420 or 344420

Furnish conduits with a coefficient of friction of 0.09 or less in accordance with Bellcore GR-356.

Dependent upon the number of conduits required, furnish conduits in black, orange, blue and white colors. Provide conduits that are factory extruded with the appropriate colors.

Furnish conduit organizers at all points where multiple conduits enter and exit a junction box or cabinet. Furnish conduit organizers that are appropriately sized with regards to the conduits. Provide conduit organizers that are removable.

Furnish duct plugs that provide a watertight barrier when installed in an unused conduit. Furnish duct plugs sized in accordance with the conduit furnished. Provide duct plugs that are removable.

Furnish mechanical sealing devices that provide a watertight barrier between the conduit and communications cable. Furnish mechanical sealing devices sized in accordance with the conduit furnished and with appropriately sized penetration holes for the communications cable. Provide mechanical sealing devices that are removable.

Furnish conduit spacers to bind the individual conduits together when installed in a common trench. Furnish conduit spacers that are appropriately sized with regards to the conduits.

Furnish 12.7-mm (½-inch), prelubricated, woven polyester tape, pull line with a minimum rated tensile strength of 11 kN (2,500 lb) in all conduit(s).

Furnish non-detectable underground marker tape with the wording “WARNING -- Fiber Optic Cable” in all trenches.

C. Construction Requirements

1. General:

Pull the tracer wire simultaneously with the fiber-optic communications cable in a continuous length. When multiple pulls of fiber-optic cable are required, only one tracer wire is required. Where tracer wire is spliced, provide waterproof butt splices. Splicing is allowed only in cabinets and junction boxes. Label and connect the tracer wire(s) to the equipment ground bus bar in all cabinets.
In non-used/spare conduits, seal each end of the conduit with a duct plug. Secure each end of the pull line to the duct plug prior to installing the duct plug. Ensure that the placement of the pull line does not interfere with the installation of the duct plug and provides a watertight seal.

In conduits containing communications cable, seal the conduit with an approved mechanical sealing device. Ensure the installation provides a watertight seal.

For underground polyethylene conduit installations (trenched or plowed), backfill in accordance with Article 300-7 of the *2002 Standard Specifications*.

2. Underground Polyethylene Conduit Installation in Trench:

Install underground polyethylene conduit system along the route of the trench. Install conduit organizers at points where multiple conduits enter or exit the junction box or cabinet, etc.

Maintain a minimum trench depth of 760 mm (30 inches) below finished grade or 150 mm (6 inches) below roadway subgrade, whichever is deeper.

Install longitudinal runs of conduit at a minimum of 300 mm (1 foot) from the back of curb or 1.8 m (6 feet) from the edge of pavement in the absence of curb.

Use one common trench with approved conduit spacers to bind the individual conduits together at no more than every 15 meters (50 feet). Install the non-detectable marker tape approximately 380 mm (15 inches) below the finished grade.

Extend the ends of the conduits such that upon completion of the installation the conduits will extend a minimum of 50 mm (2 inches) above concrete surfaces and 100 mm (4 inches) above crushed stone bases.
Remove all rock and debris from backfill material. Remove excess material from the site and compact the excavation according to Article 300-7 of the *2002 Standard Specifications*.

Finish unpaved areas flush with the surrounding natural ground. Restore damaged grassed areas. Seed and mulch area within 7 days of the occurrence of the damage.

Finish paved areas with materials matching the damaged area within 7 days of the occurrence of the damage. Cut neatly and replace only the width of the trench for damages caused by trenching. Place graded stone material to temporarily maintain traffic where repairs cannot be performed immediately. Comply with Section 545 of the *2002 Standard Specifications.*

Backfill the trench at locations along the trench path where non-movable objects, such as rocks and boulders, cannot be avoided, thus causing a deviation in the elevation height of the underground polyethylene conduit system. The purpose of the backfill is to provide a gradual change in the elevation of the trench, from the bottom elevation to the highest point of the obstruction such that excessive bending and stress will not be transferred to the conduits once the underground polyethylene conduit system is installed.

After the installation of the conduits and upon completion of the tamping and backfill process, perform a mandrel test on each individual conduit to ensure that no conduit has been damaged. Furnish a non-metallic mandrel having a diameter of approximately 50% of the inside diameter of the conduit in which it is to be pulled through. If damage has occurred replace the entire length of conduit.

3. Underground Polyethylene Conduit Installation by Plowing:

Direct plow the number of HDPE ducts called for in the plans simultaneously using chute plow method. Direct plow ducts at a minimum depth such that the top of the highest duct is 30 inches (760 mm) deep unless otherwise approved by the Engineer.

Use equipment that is of a sufficient size and horsepower to accommodate the chute plowing of up to four (4) reels of duct to the depth called for in these Project Special Provisions. Do not exceed reel dimensions, burial depths, and weight limits called for by the equipment manufacturer. Follow all procedures required or recommended by the equipment manufacturer.

Provide sufficient personnel to feed chute, operate prime mover and equipment carrying reels (if separate equipment is used), observe chute feeding, observe plowing, and observe reel payout. Use chute with adequate dimensions to allow for passage of duct and cable without damage to either.

During the plow operation, continuously check the chute opening and path to be sure there are no obstructions and monitor the payout reels to be sure that the reels are turning at a steady rate.

4. Splicing of Underground Polyethylene Conduits:

Splicing or joining of underground polyethylene conduits is prohibited. With the Engineer's approval, install a junction box at all locations where splicing or coupling of the underground polyethylene conduits is necessary due to problems encountered with the installation method.

5. Pre-Approvals and Minimum Dept Requirements

Obtain the Engineer's approval prior to beginning drilling operations.

At all points where the proposed conduit will traverse under city streets, state roads, driveways, sidewalks, and/or "Controlled Access Areas" including entrance/exit ramps, ensure the conduit(s) maintains a minimum depth of 1.2 meters (4 feet) or 8 times the back reamer's diameter, whichever is deeper. For an installation that runs parallel to a controlled access area or entrance and exit ramps ensure the conduit maintains a minimum depth of 760 mm (30 inches) below grade. Maintain a minimum clearance of 760 mm (30 inches) below grade when crossing ditch lines. For the following man-made structures, the minimum clearance requirements are shown in the table below:

Man-made Structure	**Minimum Clearance Requirement**
Bridge foundation	1.5 m (5 feet) horizontal & 1.2 m (4 feet) vertical (clearances greater than minimum horizontal should continue to use the 4V:5H ratio, i.e., 3 m horizontal should be no deeper than 2.4m)
Drainage pipes less than 60"	0.3 m (1 foot) above or below [while maintaining a minimum depth of 760 mm (30 inches) below grade]
Drainage pipes greater than 60"	0.3 m (1 foot) above or 1.2 m (4 feet) below [while maintaining a minimum depth of 760 mm (30 inches) below grade]
Box Culverts	0.3 m (1 foot) above or 1.2 m (4 feet) below [while maintaining a minimum depth of 760 mm (30 inches) below grade]
Slope protection	0.6 m (2 feet) below
Slope protection foundation footing	1.5 m (5 feet) below

Guarantee the drill rig operator and digital walkover locating system operator are factory-trained to operate the make and model of the equipment provided and have a minimum of one year's experience operating the make and model of drill rig. Submit written documentation of the operators' training and experience for review by the Engineer at least two weeks prior to commencing directional drilling operations.

Provide a means of collecting and containing drilling fluid/slurry that returns to the surface such as a slurry pit. Provide measures to prevent drilling fluids from entering drainage ditches and storm sewer systems. Prevent drilling fluid/slurry from accumulating on or flowing onto sidewalks, other pedestrian walkways, driveways or streets. Immediately remove any drilling fluids/slurry that is accidentally spilled.

6. Directional Drill Operations:

Provide grounding for the drill rig in accordance with the manufacturer's recommendations.

Place excavated material near the top of the working pit and dispose of as required. Backfill pits or trenches excavated to facilitate drilling operations immediately after the drilling has been completed.

Utilize a drill head suitable for the type of material being drilled and sized no more than 50 mm (2 inches) larger than the outer diameter of the conduit to be installed. Direct the drill head as needed to obtain the proper depth and desired destination. Pressure grout with an approved bentonite/polymer slurry mixture to fill any voids. Do not jet alone or wet bore with water.

During each drilling operation, locate the drill head every 3 meters (10 feet) along the drill path and prior to traversing any underground utility or structure. Use the digital walkover locating system to track the drill head during the directional drilling operation. Ensure the locating system is capable of determining the pitch, roll, heading, depth and horizontal position of the drill head at any point. Unless otherwise approved, do not deviate from the proposed line and grade by more than two percent.

Once the drill head has reached its final location, remove the head, and install a reamer of appropriate size (no more than 50 mm (2 inches) larger than the outer diameter of the ducts) to simultaneously facilitate back drilling of the drill hole and installation of the conduit. The reamer is sized larger than the actual conduits to ensure the conduits are not subjected to extraneous deviations caused by the original drill operation and are as straight as possible in their final position.

The intent of these specifications is to limit the diameter of the actual drill shaft/hole such that it is no more than 50 mm (2 inches) larger than the conduit(s) outer diameter. 50 mm (2 inches) larger diameter can be accomplished during the original bore or during the back reaming/conduit installation process.

Once the physical installation of the conduit has started, continue performing the installation without interruption to prevent the conduit from becoming firmly set. Ensure the bentonite/polymer slurry mixture is applied as the conduit installation process is occurring.

Upon completion of the conduit installation perform a mandrel test on the conduit system to ensure that no conduit(s) has been damaged. Furnish a non-metallic mandrel having a diameter of

approximately 50% of the inside diameter of the conduit in which it is to be pulled through. If damage has occurred, replace the entire length of conduit.

Extend the ends of the conduit such that upon completion of the installation the conduit will extend a minimum of 50 mm (2 inches) above concrete surfaces and 100 mm (4 inches) above crushed stone bases.

7. Drilling Fluids:

Furnish and use lubrication for subsequent removal of material and immediate installation of the pipe. The use of water and other fluids in connection with the directional drilling operation will be permitted only to the extent necessary to lubricate cuttings. Do not jet alone or wet bore with water. Use a drilling fluid/slurry consisting of at least 10 percent high-grade bentonite to consolidate excavated material and seal the walls of the drill hole.

Transport waste drilling fluid/slurry from the site and dispose of such slurry in a method that complies with Local, State and Federal laws and regulations.

8. Splicing of the Conduit:

Do not splice or join sections of conduit(s). Upon approval, a junction box may be installed at locations where splicing or coupling of the conduit is necessary due to problems encountered with the installation.

9. Duct Plugs and Mechanical Devices:

Following the installation of the conduit(s) where the communications cable is not immediately installed use a duct plug to seal the ends of the conduit. Secure the pull line to the duct plug in such a manner that it will not interfere with the installation of the duct plug and provide a watertight seal.

In conduits containing communications cable, seal the conduit with an approved mechanical sealing device. Ensure the installation provides a watertight seal.

10. Plan of Record Drawings:

Upon completion of the drilling operation and conduit installation furnish the Engineer with a plan of record profile drawing and a plan drawing for the drilled conduit showing the horizontal and vertical locations of the installed conduit.

XIII. JUNCTION BOXES

A. DESCRIPTION

Furnish junctions boxes in accord with the Standard Specifications and as noted in these Functional Specifications.

Modify Section 1716-3 of the NCDOT Standard Specifications as follows:

Replace the third paragraph with the following paragraph:

Install oversized junction boxes at maximum intervals of 457 meters (1500 feet).

B. FUNCTIONAL REQUIREMENTS

Comply with Section 1716-2 of the NCDOT Standard Specifications with the following exceptions.

C. OVERSIZED JUNCTIONS BOXES

Provide oversized junction boxes with minimum inside dimensions of 914 (l) x 610 (w) x 610 (d) mm [36(l) x 24(w) x 24(d) inches].

D. OVERSIZED HEAVY DUTY JUNCTION BOXES

Provide oversized heavy duty junction boxes with minimum inside dimensions of 914 (l) x 610 (w) x 610 (d) mm [36(l) x 24(w) x 24(d) inches] that can withstand an H-20 loading in accordance with AASHTO *Standard Specifications for Highways and Bridges*, H520-44. Provide a concrete collar as required by the manufacturer when the oversized heavy-duty junction box is installed in earth or sub-base.

E. CONSTRUCTION REQUIREMENTS

Install oversized junction boxes on the conduit run installed to house the fiber optic cable at the intervals indicated.

Install oversized junction boxes at locations in the conduit run when the conduit material changes. Install oversized junction boxes at the beginning and end of direction drill segments.

Install oversized junction boxes at the intersection of trunk conduit runs and at trunk to spur locations in the conduit run.

Install oversized junction boxes at locations where cable routing is transitioned from underground to overhead via a riser and pole.

Install oversized junction boxes adjacent to the foundation of base mounted equipment cabinets and the base of poles that have pole mounted equipment cabinets attached.

Install standard junction boxes in accord with the Standard Specifications as needed to facilitate run of non-fiber optic cabling. Do not co-locate power service cable in the same junction boxes as fiber optic cable.

At locations where junction boxes will bear vehicle traffic loads such as in paved roadway shoulders, use oversized heavy duty junction boxes as described in these Functional Specifications.

XIV. FIBER OPTIC COMMUNICATIONS CABLE SYSTEM

A. DESCRIPTION

The communication system shall use single mode fiber optic cable as the communications backbone and for branch circuit communication with on-freeway devices. The cable shall be supplied in the optical fiber counts shown on the plans.

B. FUNCTIONAL REQUIREMENTS

1. General

Fiber optic cable, jumper cables, and distribution equipment shall be fabricated by a certified ISO 9001 manufacturer. All fiber cable provided under this Contract shall be from the same manufacturer utilizing identical specifications and shall be compatible with the exiting fiber optic cable. All fiber cables shall be dielectric.

Fiber optic cable shall contain single mode optical fibers, loose tube, filled with a water-blocking material, and shall be suitable for installation in underground conduit and field cabinets. Fiber optic cable shall comply with the requirements of RUS 1755.900.

Optical fiber physical and performance requirements for all optical fibers in the cable shall, as a minimum, comply with the following requirements:
Maximum attenuation: 0.4dB/km at 1310nm; 0.3dB/km at 1550nm
Attenuation uniformity: no point discontinuity greater than 0.1 dB at either 1310nm or 1550nm
All connectors shall be ST connectors.

Information accompanying the reel shall include the following either stenciled or lettered on the reel, or provided on a weatherproof tag firmly attached to the reel:

- Factory order number
- Job number
- Ship date
- Manufacturer's cable code
- Type of cable (single mode, outdoor, indoor)
- Beginning and ending length markings
- Measured length and attenuation

Provide fiber optic in the counts called for on the functional plans, unless otherwise approved by the Engineer or required to support compatibility with fiber-optic cables and components.

2. Interface Requirements

Provide fiber-optic connectors compatible with existing and proposed optical communication equipment. The measured attenuation of the connector (inclusive of coupler and mated test connector) shall not exceed 0.5 dB for all connectors provided.

3. Physical Environmental Requirements

Cable length and shipping requirements: Cable shall be furnished in one continuous length per reel, and shall be free from optical splices.

Buffer tubes: Optical fibers shall be contained inside a loose buffer tube. Each buffer tube shall contain 6 or 12 fibers as required for cable size. The buffer tubes shall allow free movement of the fibers without fiber damage during installation or normal operation, including expansion and contraction of the buffer tubes.

When less than 5 buffer tubes are required in the loose tube cable, filler rods shall be included in the cable core to lend symmetry to the cable cross-section. The diameter of the filler rods shall match the diameter of the buffer tubes.

The cable shall have a central member designed to prevent buckling of the cable. The cable core interstices shall be filled with a non-nutritive to fungus, electrically non-conductive, water-blocking material such as water-swellable tape that is dry to the touch. The water blocking material shall be free from dirt and foreign matter. The cable shall contain at least 1 ripcord under the sheath for easy sheath removal. Provide cables that operate under the following environmental conditions:

- Minimum storage temperature range: -40 °C to +70 °C
- Minimum operating temperature range: -20 °C to +70 °C

C. CONSTRUCTION REQUIREMENTS

1. General

Communications fiber assignment sheets shall show the use of each fiber for each cable segment between splice locations, thereby defining the communications path between the MRTMC and all field devices. These sheets shall be prepared and submitted to the Engineer for review in hard copy and electronic format prior to installations of the cable plant.

The fiber optic cable shall be installed in conduit, field cabinets, hub buildings, and the MRTMC in quantities and locations shown in the Plans and in accordance with manufacturer's installation techniques and procedures.

Furnish and install all jumper cables and termination equipment that are functionally necessary to connect fiber optic cable to the required end equipment.

Install fiber optic cable as a continuous run, splicing as necessary between controller cabinets and/or hubs. Determine the length of fiber optic cable necessary to reach from one end of the cable run to the other end of the cable run, including cable slack requirements.

Label all fiber optic cables at each end of the cable run, at the point the cable enters a cabinet and at the point the cable exits the cabinet and in all junction boxes. Identify the cable number and the string numbers of the fibers contained within all fiber optic cables. Cable names/identifiers shall be placed on all cables. The Design-Build Team shall follow the existing cable naming and labeling convention used in the MRTMC.

Installation of fiber optic cable and jumper cable indoors shall meet the minimum requirements of local building codes and NEC Article 770, inclusive of the Fine Print Notes (FPN). Optical cable shall not be pulled over edges or corners, over or around obstructions, or through unnecessary curves or bends. Bend radius criteria of 10 times the cable diameter under no stress and twenty times cable diameter under stress shall not be exceeded.

Manufacturer approved pulling grips, cable guides, feeders, shoes, and bushings shall be used to prevent damage to the cable during installation.

Before installing any fiber optic cable in conduit, all cable pulling equipment shall be approved by the Engineer and the cable manufacturer. The cable pulling equipment shall come with a meter to display pulling tension and a mechanism to ensure that the maximum allowable pulling tension cannot be exceeded at any time during installation.

Furnish and install attachment hardware, installation guides, and other necessary equipment, not specifically listed herein, as necessary to install the fiber optic cable.

Fiber optic cable in junction boxes shall be appropriately looped and tied to the side wall. Provide the following minimum slack requirements for installed fiber cables:

- 5 meters (16 feet) of slack in junction boxes
- 5 meters (16 feet) of slack in CCTV camera, DMS and MVD field cabinets
- 9 meters (30 feet) of slack in hub buildings and the MRTMC
- Jumper cables shall be a minimum 3 meters (10 feet) in length

Only splice individual fibers at locations that require splicing. Full-cable splicing is not warranted at cabinet installations, except when required to connect cables from two separate cable reels. Protect all splices and store in fiber optic splice units or an integrated fiber-optic splice and termination unit that is housed in field cabinets, hub buildings, or the MRTMC. All spare fibers in the 12 fiber drop cables shall be terminated in the equipment cabinet that they serve. Trunk line fibers shall be terminated in patch panels in the existing hub at I-77/Arrowood Road, the Existing Hub at I-485/and I-85, and the Node installed under this project at I-485 and I-77.

Perform all splices by means of the fusion splice technique and do not induce more than 0.05 dB attenuation for each splice. Splices found to exceed 0.05 dB attenuation shall be re-spliced, at no additional cost to the NCDOT, by the Design-Build Team until this requirement is met.

Protect each splice in a protective sleeving or housing and secured in splice trays located in a fiber optic splice unit or an integrated fiber optic splice and termination unit. Bare fibers shall be completely re-coated with a protective heat-shrink coating prior to placement in a sleeve or housing. Provide heat-shrink coating approved for use by the fiber optic cable manufacturer and installed in such a manner as to protect the fiber from scoring, dirt accumulation, moisture intrusion, and microbending.

Termination of distribution and trunk fibers shall not exceed a measured attenuation of 0.5 dB at each termination. Fiber terminations shall be neatly, and permanently labeled to designate transmit or receive (when appropriate) and the string number. Spare fibers shall be labeled as “spare” with

the string number. Provide protective covers on unused terminations. Install cable with fiber counts as shown on the Functional Plans.

2. Overhead Cable Routing

At locations indicated on the functional plans, install risers, wood poles, messenger strand, and guy equipment in accord with the Standard Specifications. Overhead routing is to be used to span locations where the use of underground installation methods were determined during the preliminary design to have the potential to cause slope instability and/or potentially disrupt environmentally sensitive areas.

XV. METAL POLES AND POLE FOUNDATIONS

A. DESCRIPTION

Furnish and install metal poles and foundations for the CCTV units and MVD units and equipment cabinets, with grounding systems and all necessary hardware in accordance with the Functional Plans and Specifications.

B. FUNCTIONAL, INTERFACE, PHYSICAL, ENVIRONMENTAL REQUIREMENTS

1. CCTV Camera Metal Pole and Foundation

At all locations where new CCTV units are to be installed, furnish pole with integrated camera lowering system.

Furnish hot-dipped galvanized steel poles to mount CCTV units and where called for, co-located MVD units and equipment cabinets that meet or exceed the requirements of article 1098-15 of the NCDOT Standard Specifications unless otherwise noted in this functional design package.

Furnish and install concrete foundation for the pole that is in accordance with the plans and specifications. Comply with the provisions of section 1700 and section 1742 NCDOT Standard Specifications.

Furnish poles and foundations that meet or exceed the following functional requirements with all CCTV units and MVD units, power meter, service disconnect, and all equipment cabinets attached and all risers, conduits, and weather head accessories in place:

- Maximum deflection at top of pole (in 48.2 km/hr (30 mph), non-gusting wind): 25.4mm (1 inch)
- Ultimate load: 129 km/hr (80 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.

Conduit elbows in foundation shall have a minimum radius of 381 mm (15 inches).

Prepare a design for the pole 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 211 kg/cm^2 (3000 psi) minimum. Foundation design shall meet all NCDOT requirements and be prepared and sealed by a registered professional engineer.

Furnish poles with 12 mm (0.50 inches) x 610 mm (24 inches) air terminal, with #6 AWG wire, routed down pole and attached to cabinet equipment grounding system.

Furnish UV resistant rubber grommets (or other material as approved by the Engineer) for all pole through-holes and attachment insert holes.

Pole height shall be determined by the Design-Build Team to enable the CCTV view the intended viewing area shown on sheet ITS 2R – ITS 2T in the Functional Plans. CCTV poles shall have a

minimum height of 12.25 meters (40 feet) and a maximum height of 21.5 meters (70 feet) above the pavement surface unless otherwise approved by the Engineer

Develop shop drawings for each pole location (each combination of pole height and equipment mix) and submit to pole manufacturer. Determine and provide to pole manufacturer the effective projected area of all items (such as cabinet, CCTV camera unit, MVD unit, etc.) to be attached to each pole at each pole location.

Provide pole manufacturer with soil core sample test results with soil classification results performed by a geotechnical laboratory approved by the Engineer.

Install steel pole in accordance with the plans and specifications. Comply with the provisions of section 1740 and section 1742 of the *2002 Standard Specifications*.

a. CCTV Camera Lowering System

Furnish CCTV lowering system that is an integrated component of the CCTV camera unit metal poles furnished under this project. The camera lowering system shall be designed to support the standard CCTV units as called for in the Functional Specifications and furnished under this project. The lowering system shall consist of support arm, camera connection box, and all necessary cabling and wiring for installation. The Design-Build team shall furnish three locations where the selected CCTV lowering system pole has been installed in the United States for approval by the Engineer.

The lowering devices shall be operated by use of a portable lowering tool. The lowering device shall attach to the pole with one single bolt and shall be capable of operating both manually and motor driven. The lowering tool shall be equipped with a positive breaking mechanism to secure the cable during raising and lowering operations and prevent freewheeling. The lowering tool shall come equipped with a variable speed, heavy duty reversible motor as recommended by the CCTV lowering system manufacturer.

All lowering equipment, lowering tool, pulleys, cables, etc. shall be made of durable, corrosion resistant materials, powder coated, galvanized, or otherwise protected from the environment by industry-accepted coatings to withstand exposure to corrosive environment.

(1.) MVD Metal Pole and Foundation

Furnish hot-dipped galvanized steel poles to mount MVD units and equipment cabinets that meet or exceed the requirements of article 1098-15 of the NCDOT Standard Specifications unless otherwise noted in the Plans or the these Functional Specifications.

Furnish and install concrete foundation for the pole that is in accordance with the plans and specifications. Comply with the provisions of section 1700 and section 1742 *2002 Standard Specifications*.

Furnish poles and foundations that meet or exceed the following functional requirements with all MVD units, power meter, service disconnect, and all equipment cabinets attached and all risers, conduits, and weather head accessories in place:

- Maximum deflection at top of pole (in 48.2 km/hr (30 mph), non-gusting wind): 25.4mm (1 inch)
- Ultimate load: 129 km/hr (80 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.

Conduit elbows in foundation shall have a minimum radius of 381 mm (15 inches).

Prepare a design for the pole 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 211 kg/square cm (3000 psi) minimum. Foundation design shall meet all NCDOT requirements and be prepared and sealed by a registered professional engineer.

Furnish poles with 12 mm (0.50 inches) x 610 mm (24 inches) air terminal, with #4 AWG wire, routed down pole and attached to cabinet equipment grounding system.

Furnish nylon plugs (or other material as approved by the Engineer) for all pole through-holes and attachment insert holes.

Pole height shall be dependent upon manufacturer suggested MVD unit mounting height above pavement surface, and shall exceed the suggested height by 1 meter (3.3 feet).

Develop shop drawings for each pole location (each combination of pole height and equipment mix) and submit to pole manufacturer. Determine and provide to pole manufacturer the effective projected area of all items (such as cabinet, MVD Unit, etc.) to be attached to each pole at each pole location.

Provide pole manufacturer with soil core sample test results with soil classification results performed by a geotechnical laboratory approved by the Engineer.

Install steel pole in accordance with the plans and specifications. Comply with the provisions of section 1740 and section 1742 of the *2002 Standard Specifications*.

XVI. COMMUNICATIONS SYSTEM INTEGRATION

A. FIELD DATA TRANSMISSION

The communications network shall use the network of serial data transceivers, IMUX 2000 T-1 multiplexer Nodes (manufactured by RFL Electronics), and SONET OC-12 hubs to facilitate data communication of field devices with the MRTMC.

The communications network shall utilize video optical transceivers and video optical multiplexers to facilitate video communications for field CCTV units with the MRTMC.

Under this project, no new hubs will be required. Two T-1 Multiplexer Nodes will be required.

One IMUX 2000 T-1 multiplexer Node will be installed in a field cabinet as shown on the plans near the I-485/I-77 interchange. Final location of the field cabinet will be determined by the Design-Build team. The Node (referred to as Node 20 in the functional plans) will contain DS-0 circuits for four channels of CCTV data (CCTV Units 86-89), the multi-drop communications ring of DMS units, and the nine (9) proposed multi-drop rings of MVD unit, comprising a total of 14 DS-0 channels. This Node unit will be connected to the existing SONET hub at I-77/Arrowood Rd through the fiber optic communications network and a Fiber Service Unit (FSU) that will be located at the hub site. Furnish FSU that is completely compatible and interoperable with the T-1 multiplexer Node. Furnish FSU that is single mode, contains laser optics, and has a minimum optical budget of 36dB. The function of the FSU will be to convert the optical output from Node 20 to an electrical interface than can be integrated onto the SONET Hub. Furnish all equipment at the Node and at the Hub to integrate Node into the SONET Hub and to integrate the serial data circuits into the T-1 Multiplexer Node.

A second Node will be installed into the existing hub building at the I-485/I-85 interchange. The Node (referred to as Node 21 in the functional plans) will contain DS-0 circuits for four channels of CCTV camera data (CCTV camera units 90-93), the multi-drop communications ring of DMS units, and the nine (9) proposed multi-drop rings of MVD unit, comprising a total of 14 DS-0 channels. Furnish all equipment at the node and at the Hub to integrate Node into the SONET Hub and to integrate the serial data circuits into the T-1 Multiplexer Node.

Fully integrate serial channels and node into the Network Management Element.

In all cases, components shall match or provide compatibility with existing communication equipment as required to complete a working expansion system.

B. CCTV FIELD UNIT VIDEO AND DATA TRANSMISSION

1. Functional Requirements

At CCTV locations in the existing MRTMC field deployments, CCTV control data and status data are transmitted to the T-1 multiplexer nodes via the data channel on point-to-point video optical transmitters with a single bi-direction data channel. Under the original system, IFS model 4730 transceivers were utilized.

Once at the T-1 Multiplexer Node, the two data channels from each CCTV cabinet will placed on to DS-0 channels of the T-1 multiplexer as shown in the schematic diagram in the plans.

As depicted on the block diagrams, the CCTV data shall be directly routed or "homerun" to a single node where the channel will be placed on the SONET communications network.

Furnish encoded digital video optical transceivers in pairs that that transmit from the field end and receive at the node end a single channel of NTSC video while multiplexing a minimum of two (2) bi-directional channels of user selectable full duplex RS-232 or RS-422 data with digital status and control signal communications. The VOT-D shall be interfaced to an NTSC video signal by means of a BNC connector with 75 ohms impedance. The VOR-D shall provide NTSC RS-250B compatible electrical signal at the BNC output connector driving a 75 ohm impedance. The NTSC output signal level shall be 1 volt peak-to-peak.

If required, install variable optical attenuators to accommodate a flexible separation distance between each VOT-D and VOR-D pair. The variable optical attenuators shall be incidental to the cost of the VOTR-D devices. The equipment shall not cause rapid aging of the optical receiver, nor allow the optical receiver to reach optical or electrical saturation thereby causing high bit errors.

The VOTR-D shall have a minimum MTBF of 43,800 hours when operated as a pair.

Stand-alone VOTR-D shall include their own power supply.

Rack chassis installed VOTR-D (in rack) units shall be "hot swappable" into and out of rack unit with no risk of damage to the unit or the rack.

a. Optical/Electrical Parameters

An ST type connector on each of the transmitter and receiver units shall provide the optical interface. The optical interface shall accommodate a single mode fiber operating at 1310 nm and/or 1550 nm. The VOTR-D shall accommodate a minimum link loss budget of 25 dB at 1310 nm and/or 18dB at 1550 nm including a 3 dB safety margin. The optical dynamic range shall be equal to or exceed the link loss budget. When a signal complying with NTSC standards and EIA-250C is applied to the transmitter inputs, the output of the receiver shall provide an undistorted, NTSC and EIA-250C standard signal output when link loss budget is not exceeded. The optical transmitter shall use high reliability laser diodes and optical sensors.

b. Video Communications

When operated within its power, link loss budget, and environmental specifications the VOTR-D pair shall comply with EIA-250C, medium haul video transmission standards. The VOTR-D shall provide a 10 MHz (3 dB) minimum video bandwidth. The transmission technique used between the receiver and transmitter shall be digital encoding. Differential gain and differential phase shall comply with EIA-250C medium haul video requirements. Video linearity shall be 3 percent maximum. Output voltage shall be one volt peak-to-peak per EIA-170. Signal-to-noise shall comply with requirements specified in EIA-250C when measured at the output of the VOR-D with input signals to the VOT-D in compliance with EIA-250C and fiber interconnected to accommodate signal

loss within specified link budget. Signal-to-noise (S/N) shall be 65 dB minimum at the receiver electrical output with an equal or greater S/N of the input signal to the video optical transmitter.

c. RS-232/RS-422 Communications

The VOTR-D shall provide a communications reliability of one error in 10^9 bits minimum, when operated within link loss budgets, power tolerances, and operating environment as specified. Full duplex communications shall be accommodated at data rates of 1200, 2400, 4800, 9600, 19.2 kbps, and 38.4 kbps.

d. Digital Encoding

Video transmission shall be by means of minimum 10 bit digitally encoded video transmission for the entire video bandwidth specified.

e. Power Requirements

The VOTR-D power input circuitry shall be designed to protect the electronics from damage from a power surge or an under voltage condition without causing damage to electronics. Over and under voltage condition is considered to be a power failure and therefore the VOTR-D does not have to perform to specification during this condition. The VOTR-D shall automatically recover from an over or under voltage condition when the prime power has returned to values defined by this specification.

Standalone VOT-D devices shall receive the power from a step-down transformer supplied with the unit. The transformer shall receive 120 VAC ±15 percent, 60 Hz ±10 percent prime power from a utility power strip within a field cabinet. A three-prong power connector shall be provided with the transformer. The power cable from the transformer to the transceiver shall be 1.8 meters (6 feet) (minimum) and terminated with a compatible female connector or with leads prepared for easy attachment to a terminal block on the VOT-D. Clearly label the power cable to uniquely distinguish it from any other cables in a field cabinet or equipment rack. The characteristics of the distinguishing labeling shall include: using a label that is at least 26 cm^2 (four in^2) in area, red or yellow in color, marked in permanent ink with the words: “warning, power cable,” and affixed to the cable in a manner to remain permanently within 50 mm (2 inches) of the connector. Open power terminals shall not be used. Power input requirements (voltage and current) shall be marked on the transceiver housing.

2. Interface Requirements

Video Electrical Signal: The transmitter shall contain a BNC connector that will accept an NTSC color video signal complying with EIA-250C signal standards. Input impedance shall be 75 ohms. The receiver shall contain a UG-88 BNC connector and shall provide 75 ohm impedance. Output signal level shall comply with NTSC and associated EIA-250C video standards.

Digital Data Signal: The VOTR-D shall accommodate RS-232 and RS-422 interfaces with dip-switch selectability. Input and output signals shall comply with EIA standards. When the dip-switch is in RS-422 mode, the VOT-D shall convert the RS-422 format to RS-232 and then to an optical format for transmission to the VOR-D and vice-versa. The VOR-D shall provide both, via dip-

switch selection, RS-232 and RS-422 signal formats and the selection of this format shall be independent of the format selected on the VOT-D A standard RJ-45, DB-25, DB-15, or DB-9 connector shall be provided to accommodate this interface. Any necessary cable adapter and cables necessary to interface with the CCTV field equipment and the video server shall be provided and shall be incidental to the cost of the VOTR-D devices.

3. Physical and Environmental Requirements

Connectors shall be located on the transceivers for convenient cable attachments. Strain relief shall be included on all cables provided with the transceivers. Signal indicators shall be easily viewable when the transceivers are mounted in equipment cabinets and at central. All connectors and indicators shall be marked. All replaceable components shall be marked, and all markings shall conform to the supplied documentation, including schematics and parts lists. The transceivers' external markings shall include the product name, model number, part number, serial number, manufacturer's name, and manufacturer's address.

Construction and materials selection for the transceivers shall prevent fungus growth and cathodic action.

Standalone, shelf mountable, VOT-D devices are to be provided at field CCTV camera locations. VOT-D devices deployed in field equipment cabinets shall be external to the CCTV equipment. Furnish standalone transceivers in an aluminum housing that has been treated to prevent corrosion. The standalone VOT-D devices shall be interchangeable between field cabinets. For this reason, the transceivers shall conform to standard mounting and interconnection provisions within the field cabinet. The mounting plate for the transceivers shall have mounting holes manufactured to tolerances to assure interchangeability of units within field cabinets.

The VOTR-D shall conform to performance specification when operated in the following environment:

- Temperature: -30 degrees C to 70 degrees C (-20 degrees F to 160 degrees F)
- Humidity: 0 to 98 percent relative humidity with minimal condensation

No cooling airflow shall be required for VOTR-D in field cabinets. The unit shall be sealed to prevent damage by blowing sand and dust within a field cabinet. Units shall be shipped with protective covers over all connectors.

4. Construction Requirements

Install VOT-D units new field equipment cabinets to facilitate video and CCTV camera data communication.

Install VOR-D units at node locations. Integrate CCTV data circuit with T-1 Mux Node. Integrate PK-2100 alarm controller circuit with T-1 Mux Node. Integrate CCTV camera video channel with 4:1 Video Optical Transmitter Multiplexer (VOTMUX).

C. MVD AND DMS FIELD DATA TRANSMISSION

Furnish and install optical transceivers at field device locations (MVD and DMS) and in node cabinets depicted on the plans. Provide separate communication rings for DMS apart from MVD.(i.e. group devices of the same protocol on the same communications channel).

1. Functional Requirements

Provide drop and repeat capability for fiber optic transceiver (FOT) at all field cabinet locations. Provide master modem functionality at the corresponding node. Provide redundant master modems, placing each master in a separate node with the ring of field cabinets in between. Provide IFS Model D9130 (supercedes previous model D3130) drop/repeat and D9130E end-point optical transceivers compatible with the existing communication system and software, unless otherwise approved by the Engineer or required to support compatibility. FOTs operate using four single-mode fibers (two upstream and two downstream).

2. Interface Requirements

Provide fiber-optic connectors identical to those on the existing and proposed optical communication equipment. Provide RS-232 connectors and adapters compatible with the PK-2100 Alarm Controller (field cabinet) and the RFL IMUX2000 (node/hub). Provide single-mode fiber-optic transceivers operating at 1300nm with connectors compatible with existing and proposed fiber-optic patch panels and distribution equipment (i.e. ST, SC).

3. Physical & Environmental Requirements

Provide stand-alone FOTs in field device cabinets. Provide rack-mount FOTs in nodes and hubs. Rack-mount FOTs shall be compatible with the existing IFS Model R3 modem chassis.
Operating Temp: -40° C to +74° C, ambient
Storage Temp: -40° C to +85° C, ambient

4. Construction Requirements

Two uplink single mode fibers (1 transmit and 1 receive) and two downlink fibers (1 transmit and 1 receive) for a total of 4 fibers shall be connected to each FOT using optical connectors in the field cabinet and in the communication node/hub.

Provide two master FOTs for each fiber ring. One shall be configured as a primary master/secondary slave FOT located in a primary hub/node, and the other as a primary slave/secondary master FOT located in an alternate hub/node. In field cabinets, the FOTs shall be interconnected to PK-2100 Alarm Controllers (Detectors) or the DMS controller through an RS-232 interface channel. All field communication FOTs shall be configured as slave devices. Connect the two master FOTs to the RFL IMUX2000 in the respective communication node/hub. Perform stand-alone and system testing as described in these Functional Specifications.

D. T-1 MULTIPLEXER NODE

The MRTMC includes an RFL IMUX2000 subsystem for use in managing data to/from MVD, DMS, and pan/tilt/zoom camera controls. RFL IMUX2000s are located in field nodes/hub where optical ring master modems and video optical receivers are terminated. Integrate field devices located along the proposed sections of I-485 with Intelligent Multiplexers and optical transceivers as specified in these documents for communication with the MRTMC. At locations where a node cabinet is not co-located with a field hub, the T-1 Multiplexer Node shall be connected to the SONET hub via the fiber optic cable network and the RFL T1/E1 Fiber Service Unit (FSU).

1. Functional Requirements

Provide two new T-1 Multiplexer Nodes that are compatible with the existing and proposed communications and central software system. The location of these Nodes is described earlier in the Functional Specifications. Equip the T-1 Multiplexer Nodes with Simple Network Management Protocol (SNMP) software. Equip the T-1 Multiplexer Nodes with redundant power supplies, alarm modules, status modules, and common logic modules for each equipment chassis. Provide appropriate number of serial interfaces to terminate field device communications and terminate data channels at the MRTMC. Provide voice channel communications compatible with existing RFL IMUX2000 capabilities for communicating between T-1 Multiplexer Node locations with a telephone headset.

2. Interface Requirements

Provide serial connectors and adapters (e.g. RS-232, RS-422, etc.) compatible with the CCTV camera unit controllers, MVD units, DMS, and existing communication and video switching equipment and software. The existing RFL IMUX2000 chassis' use a 4 port module from RFL to interconnect field device communication channels. Where connecting to SONET, provide DS-1 electrical connectors that are compatible with existing and proposed SONET multiplexer equipment.

3. Physical & Environmental Requirements

Provide rack-mount RFL IMUX2000 in the new field node/hub. Rack-mounted RFL IMUX2000 shall be compatible with the EIA-310 483 mm (19 inches) equipment racks (no larger than 3RU in height).
Operating Temp: -20° C to +55° C, ambient

4. Construction Requirements

Connect each CCTV data channel, DMS ring data channel, and MVD ring data channel to a data port on the T-1 Multiplexer. Connect T-1 Multiplexer Node DS-1 electrical port to an available DS-1 timeslot on the SONET multiplexer. Perform stand-alone and system testing as described in the General Requirements section.

E. VIDEO MULTIPLEXER NODE

At the node locations, furnish and install video optical transmitter multiplexers (VOTMUX) at the node locations as depicted on the plans.

1. Functional Requirements

Provide IFS, Model VT7430-R3 in the field node/hub with a corresponding VR7430-R3 in the MRTMC that are compatible with the existing communication system, video system, and software, unless otherwise approved by the Engineer or required to support compatibility. VOTMUX units operate using one single-mode fiber. Provide unidirectional video for 4 NTSC video channels from the field node/hub to the MRTMC.

2. Interface Requirements

Provide composite video NTSC connectors and adapters compatible with CCTV VOTR-D units.

3. Physical & Environmental Requirements

Provide rack-mount VOTMUX units in field node/hub. Rack-mount VOTMUX units shall be compatible with the existing IFS chassis.

Operating Temp: -40° C to +74° C, ambient
Storage Temp: -40° C to +85° C, ambient

4. Construction Requirements

Connect one single mode fiber to each VOTMUX unit using optical connectors in the field node/hub. In field nodes/hub, the VOTMUX shall be interconnected to the respective VOTR-D camera outputs. Perform stand-alone and system testing as described in these functional specifications.

XVII. FIELD EQUIPMENT CABINETS

A. GENERAL

Furnish and install equipment cabinets at locations shown in the Functional Plans to house CCTV equipment, MVD equipment, T-1 Multiplexer Nodes, and fiber optic splice facilities.

This section of the Functional Specifications describes a cabinet for CCTV camera, MVD, T-1 Multiplexer Nodes and splice equipment and does not serve to replace section 1098-19 of the NCDOT Standard Specifications describing Type 170E cabinets for traffic signal controllers.

Furnish field equipment cabinets that contain all of the electrical interface, transient and surge protection, and grounding equipment and methods as called for and implemented in the existing equipments installed as part of the existing MRTMC deployment as described in the "System User's Guide Volume 3 (Communication Subsystem) developed by Honeywell Technology Systems Incorporated for NCDOT (March 2001).

B. FUNCTIONAL, INTERFACE, PHYSICAL, ENVIRONMENTAL REQUIREMENTS

1. Pole Mounted Equipment Cabinets

Furnish 336 stretch cabinets to house CCTV camera unit control and transmission equipment, MVD transmission equipment, and fiber optic interconnect centers for terminating, splicing, and cross-connecting fiber optic cables. The 336 stretch equipment cabinet shall consist of a cabinet housing, 483 mm (19 inches) EIA mounting cage, and power distribution assembly (PDA #3 as described in the *California Department of Transportation Traffic Signal Control Equipment Specifications* (CALTRANS TSCES)).

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

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

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

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

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

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

The Engineer shall approve all equipment cabinets.

a. Shelf Drawer

A pull out, hinged-top drawer, having sliding tracks, with lockout and quick disconnect feature, such as a Vent-Rak Retractable Writing Shelf, #D-4090-13 or equivalent, shall be provided in the splice cabinet. The pull-out drawer shall extend a minimum of 350 mm (14 inches). It shall be possible to lift this hinged platform in order to gain access to the interior of the drawer. Minimum interior dimensions of the drawer shall be 25 mm (1 inch) high, 330 mm (13 inches) deep, and 400 mm (16 inches) wide. The drawer shall be capable of supporting an 18 kg (40 pound) device or component when fully extended.

b. Cabinet Light

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

c. Surge Protection for System Equipment

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

d. Main AC Power Input

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

- Maximum AC line voltage: 140 VAC.
- Twenty pulses of peak current, each of which shall rise in 8 microseconds and fall in 20 microseconds to ½ the peak: 20000 Amperes.
- The protector shall be provided with the following terminals:
- Main Line (AC Line first stage terminal).
- Main Neutral (AC Neutral input terminal).
- Equipment Line Out (AC line second state output terminal, 19 amps).
- Equipment Neutral Out (Neutral terminal to protected equipment).
- GND (Earth connection).
- The Main AC line in and the Equipment Line out terminals shall be separated by a 200 Microhenry (minimum) inductor rated to handle 10 AMP AC Service.
- The first stage clamp shall be between Main Line and Ground terminals.

- The second stage clamp shall be between Equipment Line Out and Equipment Neutral.
- The protector for the first and second stage clamp shall have an MOV or similar solid state device rated at 20 KA and shall be of a completely solid state design (i.e., no gas discharge tubes allowed).
- The Main Neutral and Equipment Neutral Out shall be connected together internally and shall have an MOV similar solid state device or gas discharge tube rated at 20 KA between Main Neutral and Ground terminals.
- Peak Clamp Voltage: 350 volts at 20 KA. (Voltage measured between Equipment Line Out and Equipment Neutral Out terminals. Current applied between Main Line and Ground Terminals with Ground and Main Neutral terminals externally tied together).
- Voltage shall never exceed 350 volts.
- The Protector shall be epoxy-encapsulated in a flame retardant material.
- Continuous service current: 10 Amps at 120 VAC RMS.
- The Equipment Line Out shall provide power to cabinet, CCTV camera units, MVD units, and communications equipment and to the 24V power supply.

e. Ground Bus

All ground buses shall be pressure contact and sized to accommodate #4 AWG conductors.

f. Cabinet Monitoring Systems

Furnish cabinets with equipment required to return to the user at the MRTMC the current ambient internal temperature of field equipment cabinet and a button actuated, contact closure output indicating if the cabinet door is open or closed. Both the temperature output and the cabinet door status shall be transmitted to the MRTMC via the fiber optic communications network and a programmable logic controller installed into each field equipment cabinet installed under this project. Unless otherwise approved, furnish cabinet thermometer and install cabinet thermometer in the same manner as is done in the existing control equipment cabinets installed along the I-77 corridor in use for the MRTMC freeway management system.

Unless otherwise approved, furnish and install a cabinet door button that closes an electrical contact closure when the cabinet door is closed, and opens the contact closure when the door is opened. Install the cabinet door button and contact closure wiring in the same manner as is done in the existing control equipment cabinets installed along the I-77 corridor in use for the MRTMC freeway management system.

Route both the cabinet door contact closure relay and the cabinet thermometer output to the programmable logic controller. At locations where MVD units are installed, route the MVD output thorough the programmable logic controller upstream of the optical transceiver. Program the programmable logic controller to take the inputs from the MVD unit, the thermometer, and the cabinet contact closure and the groom them into a single polled response for use by the MRTMC central software. Obtain the programming protocols from the Engineer. Use programmable logic controller that is from the PK-2100 family of controllers that is of the same make and model of the existing programmable logic controllers currently in use in existing control equipment cabinets installed along the I-77 corridor in use for the MRTMC freeway management system.

At locations where only CCTV units are installed, remove PK-2100 units if existing and do not install PK-2100s in new locations. Cabinets containing only CCTV camera unit equipment will not transmit open door or temperature status.

2. Base Mounted Equipment Cabinets

Furnish 332 cabinets to house T-1 Multiplexer Nodes, VOTMUX units, serial data ring transceivers, and associated equipment. The 332 base mounted equipment cabinets shall consist of a cabinet housing and 19-inch EIA mounting cage. The cabinet housing shall conform to sections 6.2.2 (Housing Construction), 6.2.3 (Door Latches and Locks), and 6.2.5 (Hinges and Door Catches) of the CALTRANS TSCES. Splice cabinet housings shall not be equipped with a housing ventilation system or police panel. The cabinet cage shall conform to section 6.3 of the CALTRANS TSCES.

With the exception of size and mounting, the 332 base-mounted cabinets shall have all of the functionality and features of the 336 stretch pole mounted cabinet

Furnish and install cabinet base adapters in accordance with the plans and specifications. Comply with the provisions of Section 1700 of the NCDOT Standard Specifications.

3. Base Mounted Equipment Cabinet Base Adapter

Furnish base adapters fabricated from the same materials and with the same finish as the cabinet housing. Fabricate the base adapter in the same manner as the equipment cabinets, meeting all applicable specifications called for in Section 6.2.2 of the CALTRANS TSCES. Provide base adapters that are a minimum height of 300 mm (12 inches).

4. Base Mounted Equipment Cabinet Foundation

Furnish base mounted equipment cabinet foundations that comply with the NCDOT Standard Specifications.

C. CONSTRUCTION REQUIREMENTS

Install and integrate equipment cabinets and integrate with field equipment
Integrate cabinet thermometer, cabinet door contact closure, MVD, and DMS output with the programmable logic controller and the FOT.

At locations shown in the Plans, attach base mounted cabinets to base adapters to new foundations to form a weather-tight seal as described in these Functional Specifications.

Install cabinet base adapters at every location requiring a new base mounted cabinet.

Furnish and install all auxiliary and accessory equipment necessary to ensure cabinets and their associated equipment are completely operable and functional and meet the requirements of these functional specifications.

XVIII. SYNCHRONOUS OPTICAL NETWORK (SONET) COMMUNICATIONS BACKBONE INTEGRATIONS

At the start of construction of this project, there will be six (6) SONET hubs interconnected in a series of folded rings. With the completion of this project, a physical ring will be able to be created between six of the seven hubs. Sheet ITS-2U illustrates this transformation. Complete all splicing, rearrangement of fiber optic jumpers and connectors, and hardware, and software configuration to orient the SONET fault tolerant ring as depicted on Sheet ITS-2U in the functional plans.

At the existing hub that will be re-used at the western interchange of I-85 and I-485 and the existing hub that will be reused at the northern interchange of I-77 and I-485, furnish all equipment, perform all connections, and implement all software and database modifications to fully integrate the T-1 Multiplexer Nodes and their associated data circuits with the central software and network management databases.

A. ELECTRONIC CHASSIS AND CABINETS

Provide standard cabinets complying with EIA 310D or Bellcore TR-TSY-000487 equivalent within the existing hub buildings as needed to provide for the installation and integration of T-1 Multiplexer Nodes, T1/E1 Fiber Service Units, and VOTMUX units.

Cabinets shall include all cooling provisions for installed equipment, all internal power distribution, a utility power strip supporting AC power for test equipment and alarms on front and rear doors. Alarms shall be reset upon door closure. Alarm report by the network management system shall include location, cabinet number, date/time opened and date/time closed. Cabinets shall also include over temperature alarm with appropriate dead band to prevent oscillatory alarming.

All electronic chassis and factory integrated cabinets shall contain a permanently attached "tag" which contains:

- Functional identification of the unit
- Model number
- Part number
- Serial number
- Manufacturer's name
- Manufacturer's address

All removable and replaceable printed circuit board (PCB) modules shall include a permanently attached part number and functional identification. All connectors, switches, and indicators shall be marked with function. All power connectors and circuit breakers shall be marked with maximum voltage/current capacity. All voltages higher than 28 VDC or any voltage contacts which have high current capability if shorted (such as battery) and which may be exposed during maintenance to inadvertent contact shall be protected and marked. All cables shall be permanently marked with cable number and information designating from/to units and associated connectors. Schematics, parts lists and other documentation shall correspond to equipment part numbers and component designations as delivered and installed.

XIX. MRTMC CENTRAL HARDWARE AND SOFTWARE MODIFICATIONS

To integrate and fully implement the system expansion, modify existing hardware and software at the MRTMC and install additional hardware and software. The major central subsystems requiring modification include:

- Addition of T-1 Multiplexer Nodes(s) as required to accommodate new DMS, CCTV camera unit, and MVD data circuits installed under this project
- Configuration of the existing SONET Hub at the MRTMC to accommodate the reconfiguration of the communications ring from a series of folded ring to a primarily physical ring as shown in the functional as well as to accommodate the additional T-1 Multiplexer Node(s) installed under this project
- Addition of terminal servers to interface terminating CCTV camera unit control, DMS, and MVD data serial channels from the T-1 Multiplexer Node(s) to the local area network (LAN) via the Cabletron LAN hubs
- Addition of 1:4 VORDEMUX units to service video channels added under this project
- Modification of the system database to recognize and monitor all added network elements
- Modification of the System Graphical User Interface to display and contain in its database all field devices and Nodes added under this project
- Modification of the Detection Sub-System Database and server to incorporate all MVD units added under this project to be fully functional and operational the same as existing MVD units currently online in the existing system
- Modification of the DMS Sub-System Database and server to incorporate all DMS units added under this project to be fully functional and operational the same as existing DMS units currently online in the existing system
- Installation and integration of CCTV keypad joystick control panels with the existing video matrix switcher and all of its required components, which includes:
    - Integration of new video inputs with the new video matrix switcher
    - Integration of CCTV camera field unit control units with video matrix switcher to facilitate video matrix switcher control keypad control that can operate in the absence of the video/CCTV management server being online
- Installation and integration of a standalone audio switcher unit

A. CENTRAL SITE COMMUNICATIONS HARDWARE MODIFICATIONS

1. Terminal Servers

Install additional terminal servers in the MRTMC to accommodate the number of homerun CCTV camera units, DMS and MVD data ring channels required to accomplish the central to field communications called for under this project to accommodate the newly installed DMS, CCTV camera units MVD units installed under this project. Install and integrate terminal server units in accordance with the existing system architecture such that each ring channel (MVD and DMS) requires two terminal server positions per device ring. Install terminal servers into the rack cabinets at the MRTMC as approved by the Engineer. The terminal servers shall be DECSERVE700 unless otherwise approved by the Engineer. The terminal servers shall be integrated into the MRTMC

central hardware communications system. Connections to the new terminal servers shall be made as shown in the functional plans and the MRTMC existing system literature.

2. T-1 Multiplexer Nodes

Install additional T-1 multiplexer nodes in the MRTMC to accommodate the number of CCTV camera units, DMS and MVD data ring channels required to accomplish the central to field communications called for under this project to accommodate the newly installed DMS, CCTV camera units, MVD units installed under this project. Install and integrate T-1 multiplexer units in accord with the existing system architecture. Install T-1 Multiplexer nodes into the rack cabinets at the MRTMC as approved by the Engineer. T-1 Multiplexer nodes shall be as called for in these functional specifications. Integrate T-1 Multiplexer nodes into the MRTMC central hardware communications system.

3. Central SONET Hub Integration

Integrate the existing SONET hub at the MRTMC and component software and hardware network infrastructure to accommodate new T-1 multiplexer nodes and the reorientation of the SONET ring to physical ring architecture as described in the functional plans and these functional specifications.

4. Central Video Demultiplexers

Furnish video optical receiver demultiplexer (VORDEMUX) that demultiplexes a single optical channel of into four NTSC video channels. The VORDEMUX units shall be the matched pair of the VOTMUX units that are installed in the field. Integrate video channels with video distribution amplifiers and video matrix switcher.

5. Central Communications Integration

Modify, expand, and upgrade the Cabletron LAN hubs as necessary to accommodate all new data channels installed under this project and all hub and LAN management hardware and software configuration required for data channels to be integrated into their respective servers.

Integrate MVD and DMS ring channels to terminal servers. Integrate device data channels with MVD and DMS server databases and servers. Integrate PK-2100 Cabinet Alarm Monitoring data from MVD and DMS cabinets with system server and system server database as required to facilitate cabinet temperature and door open status monitoring.

Integrate homerun CCTV data channels with terminal server.

Integrate CCTV control channels with the data ports on the CCTV switcher. Integrate with CCTV control channels with matrix switcher processing unit, and CCTV server software.

B. CENTRAL SITE VIDEO SUBSYSTEM MODIFICATIONS

1. Video Distribution Amplifiers (VDA)

For each video channel installed under this project, install one new video distribution amplifier (VDA). Install and integrate VDA units in the same manner as the existing VDA units. The VDAs installed shall be the same make and model as the existing VDAs (Pelco CM9760-MDA), or an approved equivalent.

2. Video Matrix Switcher Modifications

Integrate Field CCTV PTZ control circuits and NTSC video circuits on the existing Cornet VDOLink-2000 Video Switch (VS) and VDORouter-8000. Integrate/terminate all CCTV control circuits onto the VS and provide for the selection and control of field CCTV via keypad control panels.

3. CCTV Field Unit Control and Keypad Control

Furnish keypad control panels that allow for pan, variable speed pan, tilt, zoom, and focus functions as well as CCTV unit selection and assignment of the existing Cornet VDOLink-2000 Video Switch (VS) input port feeds to VS output ports. Furnish control keypad that contains a control "joystick" for CCTV unit variable speed pan, tilt, and zoom. The keypad control units shall be tied directly to the VS via a serial data port on the existing Cornet VDORouter-8000 connected to the VS.

Install keypad control panels in each of the three MRTMC control operator consoles as well as in the maintenance room and training console. Integrate new keypad units into space formerly occupied by COHU remote control units removed under this project. Restore consoles using methods, means, and materials approved by the Engineer to a level of aesthetic appearance approved by the engineer that is the same for all consoles.

4. Audio Switching

Remove existing Cornet audio switching engine.

Install new audio switching engine into rack cabinets formerly occupied by the existing matrix audio switcher equipment. Integrate the audio switcher with the VS, with the Cabletron LAN, and cable television inputs, and CCTV Keypad Controller units.

Furnish, install, and integrate audio switching unit that takes as inputs audio feeds from the eight (8) demodulated cable television inputs and allows the switching of these audio channels to the existing console, conference room, and event staging monitors. Furnish audio switching unit that is compatible and completely interoperable with the demodulated cable television signal and physical interfaces as well as with the console, conference room, and event staging monitor signal and physical interfaces. Furnish audio switching unit that supports the cross-point switching and routing of up to 16 stereo inputs to 16 stereo outputs.

Furnish audio switcher that has audio channel routing and selection control in a personal computer based, client-server, Ethernet-IP environment. Integrate audio switching server software onto the existing MRTMC CCTV server and install an audio switcher control software client on each console workstation.

Furnish COTS software that is in production at time of procurement. The audio switching unit shall be integrated with the existing VS to provide synchronous switching of the companion audio channels for the respective video channels currently in operation at the MRTMC by the cable television provider.

C. CENTRAL TMC SOFTWARE MODIFICATIONS

1. System Map and Interface

The Design-Build Team shall use the existing SL-GMS graphics package to modify the existing system map. Modifications to the existing map will include: extending the map to include the limits of this project, assigning roadway laneage on a link (between MVD devices) basis, and adding new ITS field elements (MVD, Nodes, and Hubs). The Design-Build Team shall incorporate the MVD devices into the system overview map such that the links are color coded and automatically update (in the same fashion as the existing map) to demonstrate the speeds between the links. All new ITS device icons on the map (DMS, MVD, lanes, etc.) shall maintain the same level of functionality as the existing map. Information obtained by clicking on the icons and lanes should be the same as is available on the existing map. The SL-GMS graphics package uses a hardware dongle for licensing purposes. To upgrade the system map the Design-Build Team will either have to procure, at their own expense, and additional dongle to allow them to have modifications at their facility, or make the required modifications at the MRTMC. If the Design-Build Team elects to make modifications to the map at the MRTMC, these modifications may not be made during the normal system operating hours.

CCTV devices will be added to indicate their position only. CCTV camera unit devices will no longer be functional using the MRTMC central software. CCTV camera unit access and control will no longer be available through the MRTMC central software GUI but will be available through the CCTV camera control software furnished and integrated under this project.

2. Modifying the System Database to accommodate new Field Devices

The Design-Build Team will be required to configure and modify the system database to incorporate all new devices (with the exclusion of CCTV camera units) installed with this project to make the device a fully functional component of the MRTMC system.

Field devices are configured using external software or the device keypad according to the manufacturer's instructions. The devices must be configured using addressing and communication parameters compatible with the configuration of the central system.

The EasyStreets database maintenance utility provides a user interface for adding new devices to the system database. The MRTMC System User's Guide provides instruction in the use of the EasyStreets database maintenance utilities. In addition to the list of equipment defined within the

system, the database includes lane designations, segments, and incident parameters associated with the field devices. The Design-Build Team will be required to update the database for all of these devices (with the exception of incident parameters which will be installed by NCDOT at a later date).

The delivery documents associated with each system build contain updated information on database contents. The Design-Build Team will be required to assure new device parameters do not conflict with any existing database parameters as defined in the most recent delivery documents.

The MRTMC system utilizes SL-GMS as a graphics engine. SL-GMS provides utility programs for updating and maintaining graphic displays. The SL-GMS utilities required to maintain the map are located on the development computer. The Design-Build Team will be required to update the system map to include the new devices, and lanes.

The Design-Build Team will be required to update the system database to reflect the impact of relocating existing devices. This will include updating the equipment database and map display using the utilities identified in the section describing adding new devices.

XX. MODIFICATION OF EXISTING CCTV FIELD EQUIPMENT AND ASSOCIATED COMMUNICATIONS EQUIPMENT

Integrate all field CCTV camera unit control data channels installed under this project that terminate at MRTMC with the data portion of the video matrix switch. Furnish, install, and integrate code distribution units as required to accommodate the CCTV camera units.

Expand and add T-1 Multiplexer units at field hub and node locations and at the MRTMC as necessary.

Integrate CCTV camera units into VS CPU database, CCTV server database, and CCTV central software GUI.

Integrate all hubs, nodes, and network management elements to accommodate all newly added communications channels.

A. INTEGRATION OF MRTMC VIDEO OUTPUTS AND CONTROL WITH REMOTE CENTERS

As part of the existing regional ITS architecture, the City of Charlotte TOC (Transportation Operations Center) has an MRTMC software client that resides on the NCDOT ITS workstation. The software client access to the MRTMC network through a fiber optic based LAN connection.

Coordinate all work with the Engineer and only perform work at the Charlotte TOC with the permission of the Engineer.

CONSTRUCTION INSPECTION SCOPE OF WORK

The Design-Build team shall employ a private engineering firm to perform Construction Inspection for all work required under this contract. This private engineering firm is to be a separate entity, unaffiliated with the Design-Builder in any way. Private engineering firms must be prequalified under the Department's normal prequalification procedures prior to bid submission. This Scope of Work describes and defines requirements for the construction inspection, materials sampling and testing, and technician level contract administration by the private engineering firm (commonly referred to as "Construction Engineering & Inspection" (CEI) firms) required for construction of this project.

I. General

A. The CEI firm shall be responsible for all construction inspection, field materials sampling and testing, and technician level contract administration for the construction of the project.

B. The CEI firm shall be responsible for all technician level construction administrative functions as defined in this scope of work and in accordance with the Department's Construction Manual and any other referenced manuals and processes.

C. 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.

D. The CEI firm shall be responsible for providing qualified technical personnel in appropriate numbers at the proper times such that all contract administration responsibilities are effectively carried out. Qualified technicians shall have all certifications necessary to perform the work required under this contract. It is the CEI Firms responsibility to provide, at all times, an appropriate number of employees to perform the necessary CEI work.

E. Work shall be performed in accordance with the established standard procedures and practices of the Department. The CEI firm shall be familiar with Departmental standard procedures and practices as set forth in the Construction Manual and associated manuals and with informal procedures and practices for construction contract administration used by the Department. This includes adhering to all safety policies and procedures established by the Department. Failure on the part of the CEI Firm to perform this work as expected will result in suspension of all work on the project until adequate inspection processes are in place.

II. Work Standards

A. It shall be the responsibility of the CEI firm to ensure that the project is constructed in reasonably close conformity with the plans, specifications, and contract provisions.

B. The CEI firm shall document any observed omissions, substitutions, defects, and deficiencies noted in the work, take corrective action necessary, and advise the Department accordingly.

C. The CEI firm shall**,** in a timely manner make normal and routine project decisions consistent with the Department policies and procedures and general guidance by the Department's Resident Engineer.

D. 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.

E. The CEI firm shall monitor on-site and off-site construction operations and inspect all materials entering into the work as required such that the quality of workmanship and materials is such that the project will be completed in reasonably close conformity with the plans, specifications, and other contract provisions. The CEI firm shall keep detailed, accurate records daily of construction operations and significant events that affect the work.

F. The standard procedures and practices of the Department for inspection of construction projects are set out in the Department's Construction Manual. The CEI firm shall perform inspection, sampling and testing, and technician level contract administration in accordance with these standard procedures and practices and other accepted practices as may be appropriate.

G. The CEI firm shall perform field sampling and testing of component materials as described in the Minimum Sampling Guide and completed work items such that the materials and workmanship incorporated into the project are in reasonably close conformity with the plans, specifications, and contract provisions. CEI firm personnel performing sampling and testing must have appropriate certifications for each test that is performed.

H. The CEI firm shall maintain, on a daily basis, 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 in conformity with the Department's policies and procedures.

I. The CEI firm shall prepare inspector's daily reports of the construction operations in accordance with the Department's Construction Manual. These shall be forwarded to the Department's Resident Engineer on a daily basis**.**

J. 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 furnish records on a weekly basis to the Department's Resident Engineer for inclusion into the HiCAMS computer system.

K. The CEI firm shall, at a minimum, each month prepare a comprehensive tabulation of the quantity of each work item satisfactorily completed to date. Quantities shall be based on daily records or calculations. Calculations shall be retained. The tabulation will be submitted to the Department's Resident Engineer who shall prepare and submit the progress payment estimate.

L. The CEI firm shall provide timely interpretations of the plans, specifications, and contract provisions. The CEI firm shall consult with the Department's Resident Engineer when an interpretation involves complex issues or may have a significant impact on the cost of performing the work or is known to be an area of dispute with the Design-Builder.

M. The CEI firm shall monitor each construction operation to the extent necessary to determine whether construction activities violate the requirements of any permits. The CEI firm shall notify the Design-Builder immediately of any violations or potential violations and require his immediate resolution of the problem. Permit violations shall be reported to the Department's Resident Engineer immediately.

N. The CEI firm shall inspect all traffic control devices and the safety related items each working day to ensure that all measures are properly installed and maintained. Checks should also be made after significant storms and/or high winds. Traffic control should match the appropriate work and/or conditions at all times and should be regulated by the CEI firm.

O. If ground disturbing activities are a part of this project, the CEI firm shall perform an erosion control inspection daily and/or after every significant rainfall event. 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. The list of deficiencies will be provided to the Department's Resident Engineer as well as the Design-Builder's Project Manager. The CEI firm shall maintain an updated set of erosion control plans in accordance with Department policy.

The CEI firm shall have a dedicated erosion control inspector who is knowledgeable of current North Carolina Sediment and Erosion Control Laws and vegetation establishment and maintenance techniques.

III. Data and Services to be Furnished by the Department

A. The Department will furnish to the CEI firm Construction Manuals, Minimum Sampling Guides, Standard Specifications, project diaries, and any Departmental forms necessary for the performance of the Scope of Work.

B. The Department will perform Quality Assurance on a minimum of 10% of the samples taken. The Department reserves the right to inspect any and all processes and procedures at any time.

C. All QMS Verification sampling and testing of asphalt pavements and all QMS asphalt lab Quality Assurance sampling and testing necessary for this project will be performed by the Department.

IV. Miscellaneous Provisions

A. The control and supervision of all phases of the Scope of Work performed by the CEI firm shall be under the direction of a Professional Engineer or a person with an acceptable combination of education and experience. The CEI firm shall assign at all times a staff of competent, qualified technicians adequate in number and experience to perform the described Scope of Work.

B. The CEI firm shall maintain all books, documents, papers, accounting records, and other information pertaining to costs incurred on this project and to make such materials available at its offices at all reasonable times during the contract period and for three years from the date of final payment by the Department, the Federal Highway Administration, or any authorized representative of the Department or Federal Highway Administration. Copies thereof shall be furnished to the Department and/or Federal Highway Administration if requested.

C. Employees of the CEI firm or employees of any subconsultant for the CEI firm to provide inspection services for this project shall comply with the Department's ethics policy. Failure to comply with the ethics policy will result in the employee's removal from the project and may result in removal of the CEI firm from the Department's list of prequalified Engineering Firms for Construction Engineering and Inspection.

D. The Department shall have the right to approve or reject any personnel, assigned to a project by the CEI firm.

V. Compensation

A. No direct compensation will be made for the work of "Construction Inspection". Compensation is included in the lump sum line item for design and construction of the entire project. No separate payment will be made for vehicles, office space, inspection equipment, materials, training requirements, surveying equipment, or any other incidentals as may be necessary to accomplish this work. The Design-Builder

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-Builder. The CEI quote for services to the Design-Builder must be in the form of a lump sum quote.

VI. Other

A. The Resident Engineer & the Assistant Resident Engineer will be Department employees maintaining their traditional duties and responsibilities.

B. The Design-Builder shall perform all quality control for the Quality Management System (QMS) for Asphalt Pavements in accordance with section 609 of the Standard Specifications. The CEI firm shall perform all density quality assurance for the QMS for asphalt pavements in accordance with Section 609 of the Standard Specifications. The CEI firm or any subcontracting CEI firm on this project is not allowed to perform both the quality control and quality assurance under the QMS for asphalt pavements specifications.

C. Materials sampling, testing, or approval required in state or out of state precast concrete, steel manufacturing, high mast light poles, overhead sign assemblies, and other fabricating facilities where the Department's Materials and Tests Unit routinely performs these functions will continue to be performed by the Department.

D. DBE goals for this contract do not include participation by any DBE CEI firms. Contract goals must be met utilizing highway construction contractors.

The CEI firm is responsible for maintaining as-built plans during the construction and delivering a final set of as-built plans to the Resident Engineer upon completion of the project. The CEI firm shall also prepare the final estimate in accordance with Departmental policy for submittal to the Resident Engineer at the conclusion of the project.

STANDARD SPECIAL PROVISIONS

PROMPT PAYMENT

Prompt Payment of Monies Due Subcontractors, Second Tier Subcontractors and Material Suppliers and Release of Retainage

Design Build Teams at all levels; prime, subcontractor, or second tier subcontractor, shall within seven calendar days of receipt of monies, resulting from work performed on the project or services rendered, pay subcontractors, second tier subcontractors, or material suppliers as appropriate. This seven-day period begins upon knowledgeable receipt by the contracting firm obligated to make subsequent periodic or final payment. These prompt payment requirements will be met if each firm mails the payment to the next level firm by evidence of postmark within the seven-day period.

This provision for prompt payment shall be incorporated into each subcontract or second tier subcontract issued for work performed on the project or for services provided. If any retainage is held on subcontractors, all retainage shall be released within seven calendar days of release by the Department.

Failure of any entity to make prompt payment as defined herein may result in (1) withholding of money due to that entity in the next partial payment until such assurances are made satisfactory to this provision; or (2) removal of an approved Design Build Team from the prequalified bidders list or the removal of other entities from the approved subcontractors list.

DB1G76

PLANT AND PEST QUARANTINES
(IMPORTED FIRE ANT, GYPSY MOTH, WITCHWEED, AND OTHER NOXIOUS WEEDS)

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.

DB1G130

BORROW EXCAVATION - (EVALUATION OF WETLANDS)

Revise the 2002 Standard Specifications as follows:

Page 2-20, Article 230-6

After the first paragraph, insert the following paragraph:

"No separate payment will be made for the work of Evaluation of Potential Wetlands and Endangered Species as outlined above. Payment at the contract lump sum price for Construction of the Design Build project will be considered full compensation for this work.

DB2R37

LIME AND CEMENT TREATED SOIL

Revise the 2002 Standard Specifications as follows:

Page 5-4, Article 501-8. In the second sentence of the first paragraph, **change 40 days to 24 days**.

Page 5-28, Article 542-7. In the second sentence of the first paragraph, **change 45 days to 24 days**.

DB5R20

ASPHALT PAVEMENTS – SUPERPAVE 2-17-04

Revise the 2002 Standard Specifications as follows:

ASPHALT TACK COAT

Page 6-4, Article 605-8

Insert the following after paragraph one in this Article:

Take necessary precautions to limit the tracking and/or accumulation of tack coat material on either existing or newly constructed pavements. Excessive accumulation of tack may require corrective measures.

FIELD VERIFICATION AND JOB MIX FORMULA ADJUSTMENTS

Page 6-7, Article 609-4

Delete the first paragraph under this Article and substitute the following:

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.

Page 6-8, Article 609-4

Delete the first paragraph on this page and substitute the following:

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 working day after beginning production of the mix.

Page 6-8, Article 609-4

Add the following sentence to the end of the last paragraph in this Article:

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 density deficiencies.

Quality control minimum sampling and testing schedule:

Page 6-9, Subarticle 609-5(C)1

Delete the second sentence in the second paragraph of this Article and substitute the following:

Retain the QC compacted volumetric test specimens for 5 calendar days, commencing the day the specimens are prepared.

Page 6-9, Subarticle 609-5(C)2

At the bottom of this page, delete the sentence directly above the Accumulative Production Increment and substitute the following:

Sample and test the completed mixture from each mix design at the following minimum frequency during mix production:

Page 6-10, Subarticle 609-5(C)2

Revise Items B, C, D and E on this page as follows:

B. Gradation on Recovered Blended Aggregate from Mix Sample (AASHTO T 30 Modified) Grade on all sieves specified on JMF
C. Maximum Specific Gravity (AASHTO T 209 or ASTM D 2041), optional (ASTM D 6857)
D. Bulk Specific Gravity of Compacted Specimens (AASHTO T166), optional (ASTM D 6752), Average of 3 specimens at N_{des} gyrations (AASHTO T 312)
E. Air Voids (VTM) (AASHTO T 269), Average of 3 specimens at N_{des} gyrations

Page 6-11, Subarticle 609-5(C)2

At the top of this page, delete Item B.," Reclaimed Asphalt Pavement…" and substitute the following:

B. Reclaimed Asphalt Pavement (RAP) Binder Content and Gradation (AASHTO T 308 Modified or T 164 and AASHTO T 30 Modified) (sampled from stockpiles or cold feed system at beginning of production and weekly thereafter). Have RAP approved for use in accordance with Article 1012-1(G). (Split Sample Required)

Page 6-11, Subarticle 609-5(C)2

Insert the following sampling and testing at the end of this Subarticle

F. Uncompacted Void Content of Fine Aggregate, AASHTO T 304, Method A (natural sand only). Performed at Mix Design and when directed as deemed necessary. (Split Sample Required)
G. Reclaimed Asphalt Shingle Material (RAS) Binder Content and Gradation (AASHTO T 308 Modified or T 164 and AASHTO T 30 Modified) (sampled 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). (Split Sample Required)

CONTROL CHARTS

Page 6-11, Subarticle 609-5(C)3

Delete the second sentence of the first paragraph in this Subarticle and substitute the following:

Record all regularly scheduled random sample or directed sample full test series results for mix incorporated into the project on control charts the same day the test results are obtained.

Page 6-12, Subarticle 609-5(C)3

Delete item 3 in the list below the second full paragraph on this page.

CONTROL LIMITS

Page 6-12, Subarticle 609-5(C) 4

At the bottom of this page, delete the table and substitute the following:

CONTROL LIMITS

Mix Control Criteria	**Target Source**	**Warning Limit**	**Moving Average Limit**	**Individual Limit**
2.36mm Sieve	JMF	±4.0 %	±5.0 %	±8.0 %
0.075mm Sieve	JMF	±1.5 %	±2.0 %	±2.5 %
Binder Content	JMF	±0.3 %	±0.5 %	±0.7 %
VTM @ N_{des}	JMF	±1.0 %	±1.5 %	±2.0 %
VMA @ N_{des}	Min. Spec. Limit	-0.5%	-0.8%	-1.0%
$P_{0.075}$/ P_{be} Ratio	Max. Spec. Limit	0.0	N/A	+0.4%
$\%G_{mm}$ @ N_{ini}	Max. Spec. Limit	N/A	N/A	+2.0%
TSR	Min. Spec. Limit	N/A	N/A	-15.0%

FIELD COMPACTION QUALITY CONTROL

Page 6-15, Subarticle 609-5(D)1

Delete the first and second sentences in the fourth paragraph on this page and substitute the following:

Base and intermediate mix types (surface mixes not included) utilized for pavement widening of less than 4.0 feet and all mix types used in tapers, irregular areas and intersections (excluding full width travel lanes of uniform thickness), will not be subject to the sampling and testing frequency specified above provided the pavement is compacted using approved equipment and procedures. However, the Engineer may require occasional density sampling and testing to evaluate the compaction process.

Page 6-16, Subarticle 609-5(D)1

Delete item number 2 at the top of this page. Item number 3 should be re-numbered as 2 after the specified deletion.

LIMITED PRODUCTION PROCEDURE

Page 6-17, Subarticle 609-5(D) 5

Delete the first paragraph in this Subarticle and substitute the following:

Proceed on limited production when, for the same mix type, one of the following items occur:

(1) Two consecutive failing lots, excluding lots representing an individual resurfacing map or portion thereof.
(2) Three consecutive failing lots, with each lot representing an individual resurfacing map or portion thereof.
(3) Two consecutive failing nuclear control strips.

Pavement within each construction category (New and Other), as defined in Article 610-13, and pavement placed simultaneously by multiple paving crews will be evaluated independently for limited production purposes.

Delete the first sentence in the last paragraph in this Subarticle and substitute the following:

If the Design Build Team does not operate by the limited production procedures as specified above, the two consecutive failing density lots, three consecutive failing lots with each lot representing an individual resurfacing map or portion thereof, or two consecutive failing nuclear control strips, whichever is applicable, and all mix produced thereafter will be considered unacceptable.

DOCUMENTATION (RECORDS)

Page 6-18, Subarticle 609-5(E)

Delete the third and fourth sentence in the first full paragraph on this page and substitute the following:

Maintain all QC records, forms and equipment calibrations for a minimum of 3 years from their completion date.

Delete the second full paragraph on this page and substitute the following:

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 and/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 is determined not to be acceptable, remove and replace with mix, which complies with the Specifications. Payment will be made for the actual quantities of materials required to replace the falsified quantities, not to exceed the original amounts.

QUALITY ASSURANCE

Page 6-18, Article 609-6

In Item 5 under Plant Mix Quality Assurance, add "at a frequency equal to or greater than 5% of the QC sample frequency".

In the first sentence within the paragraph below Plant Mix Quality Assurance, delete the words "of mix".

In Item 1 under Density Quality Assurance, delete the wording at the end of the sentence "at a frequency equal to or greater than 10% of the frequency required of the Design Build Team".

Page 6-19, Article 609-6

In Item 4 under Density Quality Assurance, add "at a frequency equal to or greater than 5% of the QC sample frequency."

Insert the following after Item 4 under Density Quality Assurance:

6. By periodically directing the recalculation of random numbers for the Quality Control core or nuclear density test locations. The original QC test locations may be tested by QA and evaluated as verification tests.

LIMITS OF PRECISION

Page 6-19, Article 609-6

In the limits of precision table, delete the last three rows and substitute the following:

QA retest of prepared QC Gyratory Compacted	
Volumetric Specimens	± 0.015
Retest of QC Core Sample	± 1.2% (% Compaction)
Comparison of QA Core Sample	± 2.0% (% Compaction)
QA Verification Core Sample	± 2.0% (% Compaction)
Nuclear Comparison of QC Test	± 2.0% (% Compaction)
QA Nuclear Verification Test	± 2.0% (% Compaction)

ASPHALT CONCRETE PLANT MIX PAVEMENTS – DESCRIPTION

Page 6-20, Article 610-1

Insert the following after the last paragraph in this Article:

A high frequency of asphalt plant mix, density, or mix and density deficiencies occurring over an extended duration of time may result in future asphalt, which is represented by mix and/or density test results not in compliance with minimum specification requirements, being excluded from acceptance at an adjusted contract unit price in accordance with Article 105-3. This acceptance process may apply to all asphalt produced and /or placed and may continue until the Engineer determines a history of quality asphalt production and placement is reestablished.

MATERIALS

Page 6-21, Article 610-2

Delete reference of Anti-strip additive (chemical) to Article 1020-2 and substitute Article 1020-8.

COMPOSITION OF MIXTURES (MIX DESIGN AND JOB MIX FORMULA)

Page 6-21, Subarticle 610-3(A)

At the end of the second paragraph under this Subarticle, add the following sentence:

In addition, submit Superpave gyratory compactor printouts for all specimens compacted at N_{des} and N_{max} during the mix design process.

Insert the following paragraph after the second paragraph under this Subarticle:

For the final surface layer of the specified mix type, use a mix design with an aggregate blend gradation above the maximum density line on the 2.36 mm and larger sieves.

Insert the following at the end of the third paragraph under this Article:

When the percent of binder contributed from RAS or a combination of RAS and RAP exceeds 20 percent of the total binder in the completed mix, the virgin binder PG grade must be one grade below (both high and low temperature grade) the binder grade specified in Table 610-2 for the mix type.

Delete the fourth paragraph in this Subarticle and substitute the following:

For Type S 12.5D mixes, the maximum percentage of reclaimed asphalt material is limited to 15% and must be produced using virgin asphalt binder grade PG 76-22. For all other recycled mix types, when the percentage of RAP is 15 percent or less of the total mixture, the virgin binder PG grade must be as specified in Table 610-2 for the specified mix type. When the percentage of RAP is greater than 15 but not more than 25 percent of the total mixture, the virgin binder PG grade must be one grade below (both high and low temperature grade) the specified grade for the mix type. When the percentage of RAP is greater than 25 percent of the total mixture, the Engineer will establish and approve the asphalt binder grade.

Page 6-22, Subarticle 610-3(A)

Insert the following sentence at the end of the Item 4:

If natural sand is utilized in the proposed mix design, determine and report the Uncompacted Void Content of the natural sand in accordance with AASHTO T-304, Method A.

Page 6-23, Subarticle 610-3(A)

Under the quantities of mix components insert the following sentence:

When requested by the Engineer, submit to the Department’s Materials and Tests Unit, in Raleigh, six (6) Superpave Gyratory Compactor specimens compacted to a height of 75 mm and to a void content (VTM) of 4.0% +/- 0.5% for performance rut testing with the Asphalt Pavement Analyzer.

JOB MIX FORMULA

Page 6-24, Subarticle 610-3(C)

Delete Table 610-1 and associated notes. Substitute the following:

TABLE 610-1

SUPERPAVE AGGREGATE GRADATION DESIGN CRITERIA

Standard	**Percent Passing Criteria (Control Points)**											
Sieves	**Mix Type (Nominal Maximum Aggregate Size)**											
	4.75 mm (a)		**9.5 mm (c)**		**12.5 mm (c)**		**19.0 mm**		**25.0 mm**		**37.5 mm**	
(mm)	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**
50.0												100.0
37.5										100.0	90.0	100.0
25.0								100.0	90.0	100.0		90.0
19.0						100.0	90.0	100.0		90.0		
12.5				100.0	90.0	100.0		90.0				
9.5		100.0	90.0	100.0		90.0						
4.75	90.0	100.0		90.0								
2.36	65.0	90.0	32.0**(b)**	67.0**(b)**	28.0	58.0	23.0	49.0	19.0	45.0	15.0	41.0
1.18												
0.600												
0.300												
0.150												
0.075	4.0	8.0	4.0	8.0	4.0	8.0	3.0	8.0	3.0	7.0	3.0	6.0

(a) For Type S 4.75A, a minimum of 50% of the aggregate components shall be manufactured material from the crushing of stone.

(b) For Type SF 9.5A, the percent passing the 2.36mm sieve shall be a minimum of 60% and a maximum of 70%.

(c) For the final surface layer of the specified mix type, use a mix design with an aggregate blend gradation above the maximum density line on the 2.36 mm and larger sieves.

Page 6-25, Subarticle 610-3(C),

Delete Table 610-2 and associated notes. Substitute the following:

TABLE 610-2
SUPERPAVE MIX DESIGN CRITERIA

	Design	**Binder**	**Compaction Levels**			**Volumetric Properties (c)**			
Mix	**ESALs**	**PG**							
Type	**millions**	**Grade**	**No. Gyrations @**			**VMA**	**VTM**	**VFA**	**%Gmm**
(f)	**(a)**	**(b)**	**N_{ini}**	**N_{des}**	**N_{max}**	**% Min.**	**%**	**Min. - Max.**	**@ N_{ini}**
S-4.75A	<0.3	64 -22	6	50	75	20.0	7.0-15.0		
SF-9.5A	<0.3	64 -22	6	50	75	16.0	3.0 - 5.0	70 - 80	≤ 91.5
S-9.5B	0.3 - 3	64 -22	7	75	115	15.0	3.0 - 5.0	65 - 80	≤ 90.5
S-9.5C	3 - 30	70 -22	8	100	160	15.0	3.0 - 5.0	65 - 76	≤ 90.0
S-12.5C	3 - 30	70 -22	8	100	160	14.0	3.0 - 5.0	65 - 75	≤ 90.0
S-12.5D	> 30	76 -22	9	125	205	14.0	3.0 - 5.0	65 - 75	≤ 90.0
I-19.0B	< 3	64 -22	7	75	115	13.0	3.0 - 5.0	65 - 78	≤90.5
I-19.0C	3 - 30	64 -22	8	100	160	13.0	3.0 - 5.0	65 - 75	≤ 90.0
I-19.0D	> 30	70 -22	9	125	205	13.0	3.0 - 5.0	65 - 75	≤ 90.0
B-25.0B	< 3	64 -22	7	75	115	12.0	3.0 - 5.0	65 - 78	≤ 90.5
B-25.0C	> 3	64 -22	8	100	160	12.0	3.0 - 5.0	65 - 75	≤ 90.0
B-37.5C	> 3	64 -22	8	100	160	11.0	3.0 - 5.0	63 - 75	≤ 90.0
	Design Parameter					**Design Criteria**			
All	1. $\%G_{mm}$ @ N_{max}					≤ 98.0% **(d)**			
Mix	2. Dust to Binder Ratio ($P_{0.075}$ / P_{be})					0.6 - 1.4			
Types	3. Retained Tensile Strength (TSR) (AASHTO T 283 Modified)					85 % Min. **(e)**			

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) Based on specimens compacted to N_{max} at selected optimum asphalt content.

(e) AASHTO T 283 Modified (No Freeze-Thaw cycle required). TSR for Type S 4.75A, Type B 25.0 and Type B 37.5 mixes is 80% minimum.

(f) Mix Design Criteria for Type S 4.75A may be modified subject to the approval of the Engineer

WEATHER, TEMPERATURE, AND SEASONAL LIMITATIONS FOR PRODUCING AND PLACING ASPHALT MIXTURES

Page 6-26, Article 610-4, Table 610-3

Delete the title of Table 610-3 and substitute the following title:

ASPHALT PLACEMENT- MINIMUM TEMPERATURE REQUIREMENTS

In the first column, third row; delete reference to the ACSC Types S 9.5A and S 12.5B mix.

Add the following minimum placing temperatures for mix types S 4.75A and SF 9.5A.

Asphalt Concrete Mix Type	Minimum Air Temperature	Minimum Road Surface Temperature
ACSC, Type S 4.75A, SF 9.5A	40°F (5°C)	50°F (10°C)

SPREADING AND FINISHING

Page 6-32, Article 610-8

Insert the following after the second sentence within the sixth paragraph in this Article,

Take necessary precautions during production, loading of trucks, transportation, truck exchanges with paver, folding of the paver hopper wings, and conveying material in front of the screed to prevent segregation of the asphalt mixtures.

Page 6-33, Article 610-8

At the end of the third full paragraph on this page, add the following sentence:

Waiver of the use of automatic screed controls does not relieve the Design Build Team of achieving plan grades and cross-slopes.

DENSITY REQUIREMENTS

Page 6-34, Article 610-10,

Delete Table 610-4 and substitute the following table and associated notes:

Table 610-4

MINIMUM DENSITY REQUIREMENTS

MIX TYPE	**MINIMUM % of G_{mm}**
SUPERPAVE MIXES	**(Maximum Specific Gravity)**
S 4.75A	85.0[(a,b)]
SF 9.5A	90.0
S 9.5X, S 12.5X, I 19.0X, B 25.0X, B 37.5X	92.0

(a) All S 4.75A pavement will be accepted for density in accordance with Article 105-3

(b) Compaction to the above specified density will be required when the S 4.75 A mix is applied at a rate of 100 lbs/sy (55 kg/m^2)

Page 6-34, Article 610-10

Delete the second paragraph in this Article and substitute the following:

Compact base and intermediate mix types (surface mixes not included) utilized for pavement widening of less than 4.0 feet (1.2 meters) and all mix types used in tapers, irregular areas and intersections (excluding full width travel lanes of uniform thickness), using equipment and procedures appropriate for the pavement area width and/or shape. Compaction with equipment other than conventional steel drum rollers may be necessary to achieve adequate compaction. Occasional density sampling and testing to evaluate the compaction process may be required. Densities lower than that specified in Table 610-4 will be accepted, in accordance with Article 105-3, for the specific mix types and areas listed directly above.

SURFACE REQUIREMENTS AND ACCEPTANCE

Page 6-35, Article 610-12

Delete the first paragraph in this Article and substitute the following:

Construct pavements using quality paving practices as detailed herein. Construct the pavement surface smooth and true to the plan grade and cross slope. Immediately correct any defective areas with satisfactory material compacted to conform with the surrounding area. Pavement imperfections resulting from unsatisfactory workmanship such as segregation, improper longitudinal joint placement or alignment, non-uniform edge alignment and excessive pavement repairs will be considered unsatisfactory and if allowed to remain in place will be accepted in accordance with Article 105-3.

When directed due to unsatisfactory laydown or workmanship, operate under the limited production procedures. Limited production for unsatisfactory laydown is defined as being restricted to the production, placement, compaction, and final surface testing (if applicable) of a sufficient quantity of mix necessary to construct only 2500 feet (750 meter) of pavement at the laydown width.

Remain on limited production until such time as satisfactory laydown results are obtained or until three consecutive 2500 foot (750 meter) sections have been attempted without achieving satisfactory laydown results. If the Design Build Team fails to achieve satisfactory 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.

Mix placed under the limited production procedures for unsatisfactory laydown or workmanship will be evaluated for acceptance in accordance with Article l05-3.

DENSITY ACCEPTANCE

Page 6-36, Article 610-13

Delete the second paragraph on this page and substitute the following:

The pavement will be accepted for density on a lot by lot basis. A lot will consist of one day's production of a given job mix formula on a contract. As an exception, separate lots will be established when the one of the following occurs:

(6) Portions of pavement are placed in both "New" and "Other" construction categories as defined below. A lot will be established for the portion of the pavement in the "New" construction category and a separate lot for the portion of pavement in the "Other" construction category.

(7) Pavement is placed on multiple resurfacing maps, unless otherwise approved prior to paving. A lot will be established for each individual resurfacing map or portion thereof.

(8) Pavement is placed simultaneously by multiple paving crews. A lot will be established for the pavement placed by each paving crew.

(9) Pavement is placed in different layers. A lot will be established for each layer.

(10) Control strips are placed during limited production.

The Engineer will determine the final category and quantity of each lot for acceptance purposes.

Page 6-36, Article 610-13

Delete the first sentence in the third paragraph on this page and insert the following:

The "New" construction category will be defined as pavements of uniform thickness, exclusive of irregular areas, meeting all three of the following criteria:

Delete the sixth paragraph in this Article and substitute the following:

A failing lot for density acceptance purposes is defined as a lot for which the average of all test sections, and portions thereof, fails to meet the minimum specification requirement. If additional density sampling and testing, beyond the minimum requirement, is performed and additional test sections are thereby created, then all test results shall be included in the lot average. In addition, any lot or portion of a lot that is obviously unacceptable will be rejected for use in the work.

Page 6-36, Article 610-13

Delete the last paragraph on this page and substitute the following:

Any density lot not meeting minimum density requirements detailed in Table 610-4 will be evaluated for acceptance by the Engineer. If the lot is determined to be reasonably acceptable, the mix will be paid at an adjusted contract price in accordance with Article 105-3. If the lot is determined not to be acceptable, the mix will be removed and replaced with mix meeting and compacted to the requirement of these specifications.

CONSTRUCTION REQUIREMENTS

Page 6-43, Article 650-5

Add the following paragraph after the first paragraph under this Article:

Do not place open-graded asphalt friction course between October 31 and April 1 of the next year, unless otherwise approved. Place friction course, Type FC-1 mixes, only when the road surface temperature is 50°F (10°C) or higher and the air temperature is 50°F (10°C) or higher. The minimum air temperature for Type FC-1 Modified and FC-2 Modified mixes will be 60°F (15°C).

AGGREGATES FOR ASPHALT PLANT MIXES

Page 10-34, Subarticle 1012-1(B)4

Delete this Subarticle and substitute the following:

(4) Flat and Elongated Pieces:

Use coarse aggregate meeting the requirements of Table 1012-1 for flat and elongated pieces when tested in accordance with ASTM D 4791 (Section 8.4) on the No. 4 (4.75 mm) sieve and larger with a 5:1 aspect ratio (maximum to minimum) for all pavement types, except there is no requirement for Types S 4.75A, SF 9.5A, and S 9.5B.

Page 10-35, Table 1012-1

Delete Table 1012-1 and substitute the following:

Table 1012-1

AGGREGATE CONSENSUS PROPERTIES[a]

Mix Type	Course Aggregate Angularity[b]	Fine Aggregate Angularity	Sand Equivalent	Flat & Elongated 5 : 1 Ratio
		% Minimum	% Minimum	% Maximum
	ASTM D 5821	AASHTO T 304 Method A	AASHTO T 176	ASTM D 4791 Section 8.4
S 4.75 A		40	40	
SF 9.5 A S 9.5 B I 19.0 B B 25.0 B	75 / -	40	40	10[c]
S 9.5 C S 12.5 C I 19.0 C B 25.0 C B 37.5 C	95 / 90	45	45	10
S 12.5 D I 19.0 D	100 / 100	45	50	10
OGAFC	100 / 100	N/A	N/A	10

(a) Requirements apply to the course aggregate blend and/or fine aggregate blend
(b) 95/90 denotes that 95% of the course aggregate (+No.4 or + 4.75mm sieve)has one fractured face and 90% has two or more fractured faces.
(c) Does not apply to Mix Types SF 9.5 A or S 9.5 B

Page 10-36, Subarticle 1012-1(C)1

Insert the following after the fourth paragraph on this page:

When natural sand is utilized in "C" or "D" level asphalt mixes, do not exceed the maximum natural sand percentage in the mix design and/or production aggregate blend detailed in Table 1012-1A.

Table 1012-1A

Uncompacted Void Content of Fine Aggregate AASHTO T 304 Method A	Maximum Percent Natural Sand Included in Mix Design and/or Production*
Less than 42.0	10
Equal to 42.0 to 44.9	15
Equal to 45.0 and greater	20

*Maximum percent natural sand may be exceeded with approval from Pavement Construction Engineer upon satisfactory evaluation of pavement performance testing

FINE AGGREGATE ANGULARITY

Page 10-36, Subarticle 1012-1(C)6

Delete reference to AASHTO TP 33 Method A and substitute AASHTO T 304, Method A.

Page 10-37, Subarticle 1012-1(H)

Delete this Subarticle. It is a duplicate of Subarticle 1012-1(F) located on Page 10-36.

ASPHALT BINDER

Page 10-46, Article 1020-2

Delete the first paragraph under this Article and substitute the following:

Use Performance Graded Asphalt Binder meeting the requirements of AASHTO M 320. See Article 610-3 for the specified grades. Submit a Quality Control Plan for asphalt binder production in conformance with the requirements of AASHTO R 26 to the Materials and Tests Unit.

DB6R01

ASPHALT BINDER CONTENT OF ASPHALT PLANT MIXES

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 25.0X	4.3%

Asphalt Concrete Intermediate Course,	Type I 19.0X	4.7%
Asphalt Concrete Surface Course,	Type S 4.75A	7.0%
Asphalt Concrete Surface Course,	Type SF 9.5A	6.0%
Asphalt Concrete Surface Course,	Type S 9.5X	6.5%
Asphalt Concrete Surface Course,	Type S 12.5X	5.5%

The actual asphalt binder content will be established during construction by the CEI firm within the limits established in the Standard Specifications or Project Special Provisions.

DB6R15

DISPOSAL OF WASTE AND DEBRIS

Revise the 2002 Standard Specifications as follows:

Page 8-9, Subarticle 802-2(7. Buffer Zones:)

At the end of the last sentence in this subarticle, add the words "unless superseded by an environmental permit."

DB8R03

GUARDRAIL POSTS AND OFFSET BLOCKS 10/21/03

Revise the *2002 Standard Specifications* as follows:

Page 10-69, Subarticle 1046-3

Delete this sub-article in its entirety and replace with the following:

1046-3 POSTS AND OFFSET BLOCKS.

(A) General:

The Design Build Team may, at his option, furnish either of the following types of steel guardrail posts. Only one type of post will be permitted at any one continuous installation. Use structural steel posts throughout the project, unless otherwise directed or detailed in the plans.

1. Steel W6 x 8.5 or W6 x 9.0 posts.
2. Steel 4.5” x 6.0” “C” shape posts. (C150 x 12.2 kg/m)

The Design Build Team may, at his option, furnish either of the following types of treated timber posts if specifically directed or detailed in the plans. Only one type of post will be permitted at any one continuous installation.

1. Timber 6” x 8” (152 mm x 203 mm) posts.
2. Timber 8” x 8” (203 mm x 203 mm) posts.

(B) Structural Steel Posts:

Fabricate steel posts for guardrail of the size and weight shown on the plans from structural steel complying with the requirements of Section 1072. Metal from which C shape posts are fabricated shall meet the requirements of ASTM A570 for any grade of steel, except that mechanical requirements shall meet the requirements of ASTM A36. Punch or drill the holes for connecting bolts. Burning will not be permitted. After fabrication, the posts shall be galvanized in accordance with Section 1076.

(C) Treated Timber Posts:

All timber guardrail posts shall be of treated southern pine meeting the requirements of Article 1082-2 and 1082-3.

Bore bolt holes to a driving fit for the bolts. A minus tolerance of 1 percent will be allowed in the length of the post. Perform all framing and boring before the posts receive preservative treatment.

(D) Offset Blocks:

Provide 8-inch deep recycled plastic or composite offset blocks that have been approved for use with the guardrail shown in the standard drawings and/or plans. Only one type of offset block will be permitted at any one continuous installation. Prior to beginning the installation of recycled offset block, submit the FHWA acceptance letter, for each type of block, to the Engineer for approval

Treated timber offset blocks with steel beam guardrail will not be allowed unless required by the specifications, directed by the Engineer, or detailed on the plans. Steel offset blocks with steel beam guardrail will not be allowed.

Recycled plastic or composite offset blocks shall be made from no less than 50% recycled plastic or composite and meet the following minimum requirements:

- Specific Gravity: 0.950
- Compressive Strength in Lateral Direction:.....1600 psi (11 MPa)
- Maximum Water Absorption:.....10% by weight
- Maximum Termite and Ant Infestation: 10%

Testing: Shall pass NCHRP Report 350, Test Level 3 by CRASH TESTING

Revise the *2002 Standard Roadway Drawings* as follows:

Sheet 4 of 6, Standard 862.03, delete the note and substitute the following:

Note: The midpost and offset block of the WTR section will require special bolt hole drilling in the thrie beam offset block and line post.

STREET SIGNS AND MARKERS AND ROUTE MARKERS

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.

DB9R01

AGGREGATE PRODUCTION

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 Standard Specifications. Copies of this procedure are available upon request from the Materials and Test Unit.

DB10R05

CONCRETE BRICK AND BLOCK PRODUCTION

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 Standard Specifications. Copies of this procedure are available upon request from the Materials and Test Unit.

DB10R10

FINE AGGREGATE

Revise the 2002 Standard Specifications as follows:

Page 10-17, Table 1005-2

Make the following change to the table:

For Standard Size 2MS the following gradation change applies.

The minimum percent shown for material passing the No. 8 (2.36mm) sieve has been changed from 84 to **80.**

DB10R15

BORROW MATERIAL

Revise the 2002 Standard Specifications as follows:

Page 10-44

Section 1018-2 II (b) Delete the last sentence in its entirety.

DB10R17

DRUMS

Revise the 2002 Standard Specifications as follows:

Page 10-195, Subarticle 1089-5(C)

Delete the first (1^{st}) sentence of the first (1^{st}) paragraph and insert the following:

"Provide a minimum of three orange and two white alternating horizontal circumferential stripes covering the entire outside with each drum."

DB11R05

PORTABLE CONCRETE BARRIER

Portable Concrete Barrier used on this project must meet one of the following:

- NC Approved NCHRP 350 Portable Concrete Barrier (design can be found at http://www.doh.dot.state.nc.us/preconstruct/traffic/congestion/TC/ or can be obtained by calling the Traffic Control Section at (919) 250-4159)
- Other NCHRP 350 Portable Concrete Barrier as approved by the Engineer and the Traffic Control Section
- NC Approved NCHRP 230 Portable Concrete Barrier in Roadway Standard Drawing 1170.01 manufactured before October 1, 2002

DB11R10

PAVEMENT MARKING GENERAL REQUIREMENTS

Revise the 2002 Standard Specifications as follows:

Page 12-10, Subarticle 1205-3(J)

Delete the first (1st) sentence of the first (1st) paragraph and insert the following:

"Have at least one member of every pavement marking crew working on a project certified through the NCDOT Pavement Marking Technician Certification Process. For more information contact the Traffic Control, Marking and Delineation Section of the North Carolina Department of Transportation at 919-250-4151 or http://www.doh.dot.state.nc.us/preconstruct/traffic/congestion/TC/"

DB12R01

AVAILABILITY OF FUNDS - TERMINATION OF CONTRACTS

In accordance with G.S. 143-28.1 (6), Subsection (5) of G.S. 143-28.1 is hereby incorporated verbatim in this contract. G.S. 143-28.1(5) is as follows:

"(5). Amounts Obligated - Payments subject to the Availability of Funds - Termination of Contracts. Highway maintenance and construction appropriations may be obligated in the amount of allotments made to the Department of Transportation by the Office of State Budget and Management for the estimated payments for maintenance and construction contract work to be performed in the appropriation fiscal year. The allotments shall be multi-year allotments and shall be based on estimated revenues and shall be subject to the maximum contract authority contained in subdivision (2) above. Payment for highway maintenance and construction work performed pursuant to contract in any fiscal year other than the current fiscal year will be subject to appropriations by the General Assembly. Highway maintenance and construction 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 highway maintenance or construction contract and any highway maintenance or construction 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 Design-Builder shall be given a written notice of termination at least 60 days before completion of schedule work for which funds are available. In the event of termination, the Design-Builder 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, Item 5, of the North Carolina Department of Transportation *Standard Specifications for Roads and Structures*, dated January 1, 2002.

NCDOT GENERAL SEED SPECIFICATION FOR SEED QUALITY

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	Bermudagrass	27 seeds
Cocklebur	4 seeds	Cornflower (Ragged Robin)	27 seeds
Spurred Anoda	4 seeds	Texas Panicum	27 seeds
Velvetleaf	4 seeds	Bracted Plantain	54 seeds
Morning-glory	8 seeds	Buckhorn Plantain	54 seeds
Corn Cockle	10 seeds	Broadleaf Dock	54 seeds
Wild Radish	12 seeds	Curly Dock	54 seeds
Purple Nutsedge	27 seeds	Dodder	54 seeds
Yellow Nutsedge	27 seeds	Giant Foxtail	54 seeds
Canada Thistle	27 seeds	Horsenettle	54 seeds
Field Bindweed	27 seeds	Quackgrass	54 seeds
Hedge Bindweed	27 seeds	Wild Mustard	54 seeds

Seed of Pensacola Bahiagrass shall not contain more than 7% inert matter, Kentucky Bluegrass 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 give below:

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

Sericea Lespedeza
Oats (seeds)

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

Tall Fescue (all approved varieties)	Bermudagrass
Kobe Lespedeza	Browntop Millet
Korean Lespedeza	German Millet - Strain R
Weeping Lovegrass	Centipedegrass
Carpetgrass	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.

Crownvetch
Pensacola Bahiagrass
Japanese Millet
Switchgrass
Reed Canary Grass

03-16-04

STANDARD SPECIAL PROVISIONS
ERRATA

Correct the *2002 Standard Specifications for Roads and Structures* as follows:

Page 1-61, Subarticle 108-10(A)

In the first sentence, change the Article reference from 101-24 to 101-25.

Page 2-21, Subarticle 235-4(B)

In the third sub-bullet under the eighth bullet in this subarticle, delete the word "subgrade" and insert the words "finished grade".

Page 3-4, Article 300-10

Change all references to 300-8 to 300-9.

Page 5-9, Subarticle 520-3(A)

Delete the words "at your option".

Page 5-10, Subarticle 520-6(A)

In the first sentence, add a period after "(B)" and delete the words "and (C)."

Delete the last sentence of the subarticle.

Page 8-47, Subarticle 862-6

Change the subarticle number from 862-6 to **862-7**.

Page 8-49, Subarticle 864-4

In the first paragraph, change the Article reference from 862-3 to **864-3**.

Page 8-55, Subarticle 866-5(G)

In the third pay item, insert the words "with Posts" after the word "Fence".

Page 10-1, Subarticle 1000-3(A)

In the second paragraph, change 550 psi to 600 psi (4.1 MPa).

Page 10-2, Subarticle 1000-3(A)

In the last sentence of the second paragraph on this page, change 550 psi to 600 psi (4.1 MPa).

Page 10-5, Table 1000-1

Under the column "Consistency Max. Slump" change the sub-heading 'Non-Vibrated' to 'Vibrated' and change the sub-heading 'Vibrated' to 'Non-Vibrated'. Under the column "Min. Cement Content" change the sub-heading 'Non-Vibrated' to 'Vibrated" and change the sub-heading 'Vibrated' to 'Non-Vibrated'.

Page 10-7, Table 1005-2

For Std. Size # 2S make the following changes:
#50 (0.300) Sieve change the limits from 8 - 30 to **5 - 30**.
#100 (0.150) Sieve change the limits from 0.5 - 10 to **0 - 10**.

For Std. Size # 2MS make the following changes:
#50 (0.300) Sieve change the limits from 8 - 35 to **5 - 35**.
#100 (0.150) Sieve change the limits from 0.5 - 20 to **0 - 20**.

Page 15-3, Article 1505-3

In the last paragraph of this article, change Article 300-6 to Article 300-7.

Page 15-10, Article 1510-5

In the fourth paragraph, insert a comma after the word "water".

Page 15-18, Article 1530-2

In the third paragraph on the page, change "Section 812" to "Section 340".

Page 16-15, Article 1635-3(A)

Substitute the second paragraph with the following:

Construct the rock pipe inlet sediment trap type-A with a minimum height of 18 inches (457.2 mm) and a minimum of 12 inches (304.8 mm) below the roadway shoulder or diversion point.

AWARD OF CONTRACT

"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".

MINIMUM WAGES

Federal: The Fair Labor Standards Act provides that with certain exceptions every employer must pay wages at the rate of not less than FIVE DOLLARS AND FIFTEEN CENTS ($5.15) per hour.

State: The North Carolina Minimum Wage Act provides that every employer shall pay to each of his employees wages at a rate of not less than FIVE DOLLARS AND FIFTEEN CENTS ($5.15) per hour.

The minimum wage paid to all skilled labor employed on this contract shall be FIVE DOLLARS AND FIFTEEN CENTS ($5.15) per hour.

The minimum wage paid to all intermediate labor employed on this contract shall be FIVE DOLLARS AND FIFTEEN CENTS ($5.15) per hour.

The minimum wage paid to all unskilled labor on this contract shall be FIVE DOLLARS AND FIFTEEN CENTS ($5.15) per hour.

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

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

STANDARD SPECIAL PROVISIONS

DIVISION 1

GENERAL REQUIREMENTS

SECTION 101

DEFINITIONS OF TERMS

101-1 GENERAL

Whenever the terms defined in this section are used in those specifications, in any of the contract documents, or on the plans, the intended meaning of such terms shall be as defined in this section.

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
AWWA _____American Water Works Association
AWS _____American Welding Society
AWPA _____American Wood Preserver's Association
CRSI _____Concrete Reinforcing Steel Institute
DHV _____Design Hourly Volume
EEI_____Edison Electric Institute
FHWA _____Federal Highway Administration, U.S. Department of Transportation
FSS _____Federal Specifications and Standards, General Services Administration
GS _____General Statutes of North Carolina
IES_____Illuminating Engineering Society
NEC_____National Electrical Code
NEMA _____National Electrical Manufacturers Association
NESC_____National Electrical Safety Code
SPIB _____Southern Pine Inspection Bureau
SSPC _____Steel Structures Painting Council
UL _____Underwriters' Laboratories, Inc.
AMRL _____AASHTO Materials Reference Laboratory
CCRL_____Cement and Concrete Reference Laboratory

101-3 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.

101-4 ADDITIONAL WORK.

Additional work is that which results from a change or alteration in the contract and for which there are existing contract unit prices, provided in the original contract or an executed supplemental agreement.

101-5 ADMINISTRATOR.

The State Highway Administrator.

101-6 ADVERTISEMENT.

The public advertisement inviting Request for Qualifications for the design and construction of specific projects.

101-7 ARTICLE.

A primary numbered subdivision of a section of the standard specifications.

101-8 AWARD.

The decision of the Board of Transportation to accept the proposal of the selected Design-Builder for work which is subject to the furnishing of payment and performance bonds, and such other conditions as may be otherwise provided by law, the Request for Proposals, and the Standard specifications.

101-9 BASE COURSE.

That portion of the pavement structure of planned thickness placed immediately below the pavement or surface course.

101-10 BID (OR PROPOSAL).

The offer of a Design-Builder in the form of a Design-Build price proposal and a Design-Build technical proposal to perform the work and to furnish the labor and materials at the prices quoted.

101-11 BID BOND OR BID DEPOSIT.

The security furnished by the Proposer with his proposal as guaranty that he will furnish the required bonds and execute such documents as may be required if his proposal is accepted.

101-12 BIDDER.

An individual, partnership, firm, corporation, or joint venture formally submitting a proposal for the work contemplated. On Design-Build projects the word refers to respondents to the Design-Build Proposal invitation.

101-13 BOARD OR 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 state highway construction contracts.

101-14 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.

101-15 CALENDAR DAY.

A day shown on the calendar beginning and ending at midnight.

101-16 CHIEF ENGINEER.

The Chief Engineer, Operations, Division of Highways, North Carolina Department of Transportation.

101-17 COMPLETION DATE.

That date set forth in the special provisions or as revised by authorized extensions, by which date it is required that the work set forth in the contract be satisfactorily completed.

101-18 CONSTRUCTION EASEMENT.

A right owned by the Department of Transportation in a parcel of land owned by a third party outside the highway right of way for the purpose of containing construction which exceeds the right of way.

101-19 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. The contract shall specifically include, but not be limited to, the Design-Build Package, the Design-Build Technical Proposal, the Design-Build Price Proposal, the printed contract form and all attachments thereto, the contract bonds, the plans, the standard specifications and all supplemental specifications thereto, the standard special provisions and the project special provisions contained in the Design-Build Package, and all executed supplemental agreements, all of which shall constitute one instrument.

101-20 CONTRACT ITEM.

A specifically described unit of work for which a unit or lump sum price is provided in the original contract or an executed supplemental agreement. Synonymous with "Pay Item".

101-21 CONTRACT LUMP SUM PRICE.

The amount proposed for a lump sum item that has been submitted by the Design-Builder in his price proposal.

101-22 CONTRACT PAYMENT BOND.

A bond furnished by the Design-Builder and his corporate surety securing the payment of those furnishing labor, materials, and supplies for the design and construction of the project.

101-23 CONTACT PERFORMANCE BOND.

A bond furnished by the Design-Builder and his corporate surety guaranteeing the performance of the contract.

101-24 CONTRACT TIME.

The number of calendar days inclusive between the date of availability and the completion date, said dates being set forth in the contract, including authorized extensions to the completion date.

101-25 CONTRACT UNIT PRICE.

The unit price for a unit item established in an executed supplemental agreement.

101-26 CONTRACTOR.

The successful Proposer to whom the contract has been awarded, and who has executed the contract documents and furnished acceptable contract bonds.

101-27 CULVERT.

Any structure not classified as a bridge, which provides an opening under the roadway.

101-28 CURRENT CONTROLLING OPERATION OR OPERATIONS.

Any operation or operations, as determined by the Engineer, which if delayed would delay the completion of the project.

101-29 DATE OF AVAILABILITY.

That date set forth in the Request for Proposals, by which it is anticipated that the Contract will be executed and sufficient work sites within the project limits, will be available for the Design-Builder to begin his controlling operations.

101-30 DEPARTMENT OR DEPARTMENT OF TRANSPORTATION.

A principal department of the Executive Branch which performs the functions of planning, design, construction, and maintenance of an integrated statewide transportation system.

101-31 DIVISION OF HIGHWAYS.

The division of the Department of Transportation which, under the direction of the Secretary of Transportation, carries out state highway planning, design, construction, and maintenance functions assigned to the Department of Transportation.

101-32 DRAINAGE EASEMENT.

A right, owned by the Department of Transportation, 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.

101-33 EASEMENT.

A property right to use or control real property of another.

101-34a. DIRECTOR OF CONSTRUCTION IN LIEU OF CHIEF ENGINEER.

Wherever the term *Chief Engineer or Chief Engineer of Operations* occurs in the Specifications, the actions and responsibilities referred to will be performed by the Director of Construction, Division of Highways, North Carolina Department of Transportation, acting directly or through his duly authorized representative.

101-34b. ENGINEER.

The Chief Engineer of Operations, and/or Director of Construction, Division of Highways, North Carolina Department of Transportation, acting directly or through his duly authorized representatives.

101-35 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.

101-36 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 which in the terms of the specifications and special provisions is incidental to work for which there is a contract price or work for which payment is included in some other contract unit or lump sum price.

101-37 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.

101-38 FINAL ESTIMATE.

The document which 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-Builder. Receipt of this document by the Design-Builder will begin the time frame for filing of a verified claim with the Department as provided for in G.S. 136-29 of the General Statutes of North Carolina.

101-39 FINAL ESTIMATE ASSEMBLY.

As constructed plans and other project records which establish the final statement of quantities to be paid and document work performed on the project.

101-40 FORCE ACCOUNT NOTICE.

A written notice to the Design-Builder that extra work ordered by the Engineer will be paid for as force account work.

101-41 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.

101-42 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".

101-43 HOUR.

One of the 24 equal parts of a day.

101-44 INSPECTOR.

The authorized representative of the Engineer assigned to make a detailed inspection of any or all portions of the work and materials.

101-45 INTERMEDIATE COMPLETION DATE.

That date set forth in the contract 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.

101-46 INTERMEDIATE COMPLETION TIME.

The time set forth in the contract or as revised by authorized extensions, by which it is required that the portion of work set forth in the contract be satisfactorily completed.

101-47 INTERMEDIATE CONTRACT TIME (DAYS).

The number of calendar days inclusive between the date of availability and the completion date, said dates being set forth in the special provisions, including authorized extensions to the intermediate completion date.

101-48 INTERMEDIATE CONTRACT TIME (HOURS).

The number of hours inclusive between the time of availability and the intermediate completion time, said times being set forth in the special provisions, including authorized extensions to the intermediate completion time.

101-49 INVERT.

The lowest point in the internal cross section of a pipe or other culvert.

101-50 INVITATION TO BID.

The notification that proposals will be received for the design and construction of specific projects.

101-51 LABORATORY.

The testing laboratory of the Department of Transportation, Design-Builder, or any other testing laboratory which may be designated or approved by the Engineer.

101-52 LOCAL TRAFFIC.

Traffic which must use the facility under construction in order to reach its destination.

101-53 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.

101-54 MATERIALS.

Any substances which may be incorporated into the construction of the project.

101-55 MEDIAN.

The center section of a divided highway which separates the traffic lanes in one direction from the traffic lanes in the opposite direction.

101-56 PAVEMENT STRUCTURE.

The combination of base and surface courses placed on a subgrade to support the traffic load and distribute it to the roadbed.

101-57 PAY ITEM.

Synonymous with "Contract Item".

101-58 PLANS.

The project plans, Standard Drawings, working drawings and supplemental drawings, or reproductions thereof, approved 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 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) Initial Plans:

Department-furnished drawings included as part of the Design-Build Package.

(C) Project Plans:

Construction drawings prepared, sealed and completed by the Design-Builder. Specific details and dimensions peculiar to the work, which are completed by the Design-Builder.

(D) Working Drawings and Supplemental Drawings:

Supplemental design sheets, shop drawings, or similar data which the Design-Builder is required to submit to the Engineer as described in the Scope of Work.

(E) As-Constructed Drawings:

Final drawings prepared by the Design-Builder, documenting the details and dimensions, of the completed work.

101-59 PROJECT.

The specific section of the highway together with all appurtenances, and the design and construction to be performed thereon under the contract.

101-60 PROJECT SPECIAL PROVISIONS.

Special provisions peculiar to the project and not otherwise thoroughly or appropriately set forth in the standard specifications or plans.

101-61 PROPOSAL FORM.

This definition is deleted for this project.

101-62 RIGHT OF WAY.

The land area shown on the plans as right of way to be furnished by the Department of Transportation within which the project is to be constructed.

101-63 ROAD.

Synonymous with "Highway" and "Street".

101-64 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 median are constructed.

101-65 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.

101-66 ROADWAY.

The portion of a highway within limits of construction.

101-67 SECTION.

A numbered chapter of the standard specifications.

101-68 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.

101-69 SIDEWALK.

That portion of the roadway primarily constructed for pedestrian traffic.

101-70 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.

101-71 SPECIAL PROVISIONS.

Project special provisions and standard special provisions taken together as one body of special provisions.

101-72 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 which may be added or adopted as special provisions.

101-73 STANDARD SPECIAL PROVISIONS.

Special directions or requirements not otherwise thoroughly or appropriately set forth in the standard specifications and which are peculiar to a selected group of projects.

101-74 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".

101-75 STATE.

The State of North Carolina.

101-76 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 designated point on the project.

101-77 STREET.

Synonymous with "Highway" and "Road".

101-78 SUBCONTRACTOR.

An individual, partnership, firm, joint venture, or corporation to whom the Design-Builder, with the written consent of the Engineer, sublets any part of the contract.

101-79 SUBGRADE.

That portion of the roadbed prepared as a foundation for the pavement structure including curb and gutter. On portions of projects, which 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.

101-80 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.

101-81 SUPERINTENDENT.

The representative of the Design-Builder authorized to supervise and direct the construction for the Design-Builder and to receive and fulfill directions from the Engineer.

101-82 SUPERSTRUCTURE.

All of the part of the structure exclusive of the substructure.

101-83 SUPPLEMENTAL AGREEMENT.

A written agreement between the Design-Builder and the Department of Transportation covering amendments to the contract.

101-84 SUPPLEMENTAL SPECIFICATIONS.

General revisions or additions to this book of standard specifications which are issued under the title of "Supplemental Specifications", and which shall be considered as part of the standard specifications; or specifications, regulations, standards, or codes referenced in the contract documents.

101-85 SURETY.

A corporate bonding company furnishing the bid bond or furnishing the contract payment and performance bonds.

101-86 TEMPORARY CONSTRUCTION EASEMENT.

A temporary right, owned by the Department of Transportation, in a parcel of land owned by a third party outside the highway right of way, for the use of the Department of Transportation during the construction and which reverts to the third party on completion of construction.

101-87 THROUGH TRAFFIC.

Traffic which can reach its destination by a route or routes other than the facility under construction.

101-88 TIME OF AVAILABILITY.

That time, set forth in the special provisions, by which it is anticipated that sufficient work sites within the project limits will be available for the Design-Builder to begin his controlling operations.

101-89 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 Design-Build Price proposal.

101-90 UNBALANCED BID.

A bid which includes any unbalanced bid price.

101-91 UNBALANCED BID PRICE.

A unit or lump sum bid price that does not reflect reasonable actual costs which 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.

101-92 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.

101-93 WORKING DRAWINGS.

Stress sheets, shop drawings, erection drawings, falsework drawings, cofferdam drawings, catalog cuts, or any other supplementary drawings or similar data which the Design-Builder is required to submit to the Engineer for review and/or approval.

101-94.1 DESIGN-BUILD.

A form of contracting in which the successful proposer undertakes responsibility for both the design and construction of a project.

101-94.2 DESIGN-BUILDER.

An individual, partnership, joint venture, corporation or other legal entity that furnishes the necessary design and construction services, whether by itself or through subcontracts.

101-94.3 DESIGN-BUILD PACKAGE.

The documents prepared by the Department for a Design-Build project, containing all forms, information, drawings or other documentation furnished to proposers to guide the preparation and submittal of a proposal for a Design-Build project.

101-94.4 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 proposal on a Design-Build project. The technical proposal and price proposal, in some cases, may be scheduled to be submitted on different dates.

101-94.5 DESIGN-BUILD PRICE PROPOSAL.

The part of a design-Build proposal containing the offer of a Proposer, submitted on the prescribed forms, to perform the work and furnish the labor and materials at the price quoted.

101-94.6 DESIGN-BUILD TECHNICAL PROPOSAL.

A submittal from a proposer, in accordance with requirements of the Design-Build Package, for the purpose of final selection.

101-94.7 PROJECT MANAGER.

The Department’s authorized designee responsible for the administration of the Design-Build project.

101-94.8 TECHNICAL SPECIFICATIONS.

Additions and revisions to the Standard Specifications covering conditions and requirements peculiar to a Design-Build project.

101-94.9 TABLE OF VALUES.

A table prepared prior to beginning of construction listing estimated quantity of items for which a testing frequency is defined in the Minimum Sampling Guide. This estimate will be used to determine required frequency of testing for materials and products incorporated into construction, and shall be updated monthly and provided to the Engineer.

SECTION 102
PROPOSAL REQUIREMENTS AND CONDITIONS

102-1 INVITATION TO BID.

This section is deleted from this project and replaced with the special provision titled "Submittal of Proposals", which discusses the process used to evaluate the Technical and Price proposals.

102-2 PREQUALIFICATION FOR PROPOSERS.

Proposers shall prequalify with the Department. The requirements for prequalification will be furnished each prospective Proposer by the Engineer upon receipt of a written request. A Price Proposal or Technical Proposal will not be opened unless all prequalification requirements have been met by the Proposer and have been found to be acceptable by the Engineer.

In addition to the Experience Questionnaire, prequalification requirements will include provisions for the evaluation of a firm's safety record. A completed 'Safety Index Rating' form must be on file with the Department. To be prequalified to bid each firm must 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 or the requalification of existing firms at the time of their biennium renewal.

All subcontractors performing work for the Department shall have received a passing grade on the Safety Index Rating form, in accordance with Article 102-2, prior to beginning work. Subcontractors can request the Safety Index Rating form from the State Contractual Services Engineer.

Upon a determination by the Department that all prequalification requirements have been met, the applicant will be assigned a Prequalification Number. This Prequalification 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 and any other information obtained by the Department.

No Proposer will be prequalified who, at the time of the application for prequalification is determined by the Engineer to lack the financial capability to complete projects.

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.

102-3 CONTENTS OF DESIGN-BUILD PACKAGES.

A Design-Build Package will be furnished by the Department to the selected Proposers from among the respondents to the Request for Qualifications. Each Design-Build Package will be marked on the front cover by the Department with an identifier of the Proposer to whom it is being furnished. This package will state the location of the project and will show a schedule of contract items for which Technical and Price proposals are invited. It will set forth the date and

time Technical and Price Proposals are to be submitted and will be opened. The package will also include any special provisions or requirements which vary from or are not contained in any preliminary plans or standard specifications.

The package 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 Design-Build Proposal will be considered the same as execution of the contract by the Proposer.

All papers bound with the package are necessary parts thereof and shall not be detached, taken apart, or altered.

The plans, standard specifications, and other documents designated in the Design-Build package shall be considered a part of the Design-Build package whether attached or not.

Up to 3 copies of the Design-Build Package will be furnished to each prospective Proposer upon request. 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.*

102-4 COMBINATION BIDS.

This section is deleted for this project.

102-5 INTERPRETATION OF QUANTITIES IN PROPOSAL FORM.

This section is deleted for this project.

102-6 EXAMINATION OF PRELIMINARY PLANS, SPECIFICATIONS, CONTRACT, AND SITE OF WORK.

The Proposer shall examine carefully the site of the work contemplated, the preliminary plans and specifications, and the Design-Build Package.. 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 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 specifications.

102-7 SUBSURFACE INFORMATION.

If Subsurface Information is available on this project, a copy of the Subsurface Information may be obtained from the Department. A copy of the Subsurface Information will be mailed to the prospective proposers upon request.

The Subsurface Information and the Subsurface Investigation on which it 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 Information 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-climatic factors.

THE PROPOSER IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE INFORMATION ARE PRELIMINARY ONLY. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE OR OPINIONS OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE PROPOSER IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS THEY DEEM NECESSARY TO SATISFY THEIRSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS PROJECT. THE PROPOSER 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 INFORMATION.

102-8 PREPARATION AND SUBMISSION OF PRICE PROPOSALS .

All Price Proposals shall be prepared and submitted in accordance with the following listed requirements:

1. The Design-Build Package 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 price for every item in the Design-Build Price Proposal. The lump sum prices bid for the various contract items shall be written in figures.
4. An amount bid shall be entered in the Design-Build Package for every lump sum item and the price shall be written in figures in the "Amount Bid" column in the Design-Build Package.
5. The total amount bid shall be written in figures in the proper place in the Design-Build Package. 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 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.

   e. 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 Department 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 have been delivered to and received by the Department prior to the time specified in the Design-Build Package.

102-9 COMPUTER BID PREPARATION.

This section is deleted from this project.

102-10 NON-COLLUSION AFFIDAVIT.

In compliance with Section 112(c) of title 23 USC, and current regulations of the Department, each and every Proposer will be required to 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 subDesign-Builders and is not bidding for the benefit of another Design-Builder.

Affidavit forms will be included in the Design-Build Package as part of the signature sheets. Execution of the signature sheets will also constitute execution of the non-collusion affidavit. 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. 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 Principal shall not withdraw its Price proposal within 60 days after the opening of the same, and if the Board of Transportation shall award a contract to the Principal, the Principal shall within 14 calendar days after the notice of award is received by him give payment and performance bonds with good and sufficient surety as required for the faithful performance of the contract and for the protection of all persons supplying labor and materials in the prosecution of the work; in the event of the failure of the Principal to give such payment and performance bonds as required, then the amount of the bid bond shall be immediately paid to the Department as liquidated damages or, in the case of a bid deposit, the deposit shall be forfeited to the Department.

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 Department. 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, Item 7b, 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.

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 but 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.

102-12 DELIVERY OF 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 State Highway 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 Contract Officer as stated in the Design-Build Package. The outer envelope shall also bear the statement " Price Proposal for the Design/Build of State Highway 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 State Highway 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 Contract Officer as stated in the Design-Build Package. The outer envelope shall also bear the statement " Technical Proposal for the Design/Build of State Highway Project No. _____". If delivered in person on or before the due date, the sealed envelope shall be delivered to the office of the Contract Officer as indicated in the Design-Build Package. Price Proposals and Technical Proposals shall be submitted in accordance with the project special provision “Submittal of Proposals” contained elsewhere in this Design Build package.

All Price Proposals and Technical Proposals shall be delivered prior to the time specified in the Design-Build Package. 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 PROPOSALS.

A Design-Build proposer will not be permitted to withdraw its Technical and Price proposals after they have been submitted to the Department.

102-14 RECEIPT AND OPENING OF PROPOSALS.

Price Proposals will be opened and read publicly at the time and place indicated in the Design-Build Package. The scores of the previously conducted evaluation of the Technical Proposals will also be read publicly at this time. Proposers, their authorized agents, and other interested parties are invited to be present.

102-15 REJECTION OF PRICE PROPOSALS.

Any Price proposal submitted which fails to comply with any of the requirements of Article 102-8, 102-11, or with the requirements of the project scope and functional specifications 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, which is significantly unbalanced to the potential detriment of the Department, will be considered irregular and may be rejected. In the event the Board 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 provisions of Subarticle 109-4(B).

A Price proposal, which does not contain costs for all proposal items, shall be considered irregular and may be rejected.

In addition to the above, any Price proposals for contracts not funded with any Federal funds which 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 irregular and will not be considered for award.

The right to reject any and all Proposals shall be reserved to the Board.

102-16 DISQUALIFICATION OF PROPOSERS.

Any one of the following causes may be justification for disqualifying a Proposer from further bidding until he has applied for and has been requalified in accordance with Article 102-2:

1. Unsatisfactory progress in accordance with Article 108-8.
2. Being declared in default in accordance with Article 108-9.
3. Uncompleted contracts which, in the judgment of the Chief Engineer, might hinder or prevent the timely completion of additional work if awarded.
4. Failure to comply with prequalification requirements.
5. The submission of more than one Price proposal for the same contract by an individual, partnership, joint venture, or corporation prequalified under the same prequalification number.
6. Evidence of collusion among Proposers. Each participant in such collusion will be disqualified.
7. Failure to furnish a non-collusion affidavit upon request.
8. Failure to comply with Article 108-6.
9. Failure to comply with a written order of the Engineer as provided in Article 105-1 if in the judgment of the Chief Engineer such failure is of sufficient magnitude to warrant disqualification.
10. Failure to satisfy the Disadvantaged Business Enterprise requirements of the project special provisions.
11. The Department has not received the amount due under a forfeited bid bond or under the terms of a performance bond.
12. Failure to submit within 60 days after being requested by the Engineer, or the submission of false information in, the documents required by Article 109-9.
13. Failure to return overpayments as directed by the Engineer.
14. Recruitment of Department employees as prohibited by Article 108-5.
15. Failure to maintain a satisfactory safety index as required by Article 102-2.

Upon a determination that a Proposer should be disqualified for one or more of the reasons listed above, the Department may, at its discretion, remove all entities prequalified under the same Prequalification Number.

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 to the public. 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 "Special Provision for 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, the best interests of the State will be promoted thereby.

103-2 CORRECTION OF PRICE PROPOSAL ERRORS.

(A) General:

The provisions of this article shall apply in waiving irregularities and correcting apparent clerical errors and omissions in the "amount bid" and "total amount bid" for bid items.

(B) 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 Total Amount Bid shall be deemed to be the correct total for the entire project.

(C) 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 PROPOSAL -MISTAKE.

(A) Criteria for Withdrawal of Price Proposal:

The Department of Transportation may allow a Proposer submitting a Price proposal 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 interpreting the functional requirements.
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 of Price proposal.
5. The Proposers notice of his mistake and request for withdrawal of the Price proposal by reason of the mistake was promptly communicated to the Chief Engineer and in no instance longer than 48 hours after the scheduled time of Price proposal opening. If the Proposer notifies the Chief Engineer verbally, written notice of mistake must be submitted within 48 hours to the Chief Engineer accompanied by copies of Price proposal preparation information.
6. The Department of Transportation will not be prejudiced or damaged except for the loss of the Price proposal.

(B) Hearing by Chief Engineer:

If a files a notice of mistake along with a request to withdraw his Price proposal, the Chief Engineer (or his designee) will promptly hold a hearing thereon. The Chief 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 will 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 State Highway Administrator:

A determination may be made by the Administrator 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 Chief Engineer will present his findings to the State Highway Administrator for action on the Proposer’s request. The Chief Engineer will advise the Proposer of the Administrator's decision prior to the Board of Transportation's consideration of award.

(D) Bid Bond:

If a bid 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 Administrator that the conditions in Subarticle 103-3(A) have been met. The effect of the refusal of the Proposer 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 Proposer's request to withdraw his Price proposal, shall be governed by the terms and conditions of the bid bond.

103-4 AWARD OF CONTRACT.

(A) General:

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 CFR, Part 21), issued pursuant to such act, hereby notifies all proposers that it will affirmatively insure that contracts entered in pursuant to this Request for Proposals, if awarded, will be made by the Board of Transportation to the Proposer with the lowest adjusted price as outlined in the Design-Build package without discrimination on the grounds of race,

color, or national origin. The Proposer with the lowest adjusted price will be notified by letter that his 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 60 days after the opening of Price proposals, except that with the consent of the 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 Proposer with the lowest adjusted price may withdraw his proposal at the expiration of the 60 days 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 provisions of Article 102-15.

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.

All 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.

Checks which 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 Department of Transportation warrants in the equivalent amount of checks which were furnished as a bid deposit will be issued.

103-7 CONTRACT BONDS.

The successful Proposer, within 14 calendar days after the notice of award is received by him, shall provide the Department 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 Proposer.

103-9 FAILURE TO FURNISH CONTRACT BONDS.

The successful Proposer’s failure to file acceptable bonds within 14 calendar days after the notice of award 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 Proposer with the next lowest adjusted price Proposer or the work may be readvertised and constructed under contract or otherwise, as the Board 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 which the Design-Builder 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-Builder 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-Builder 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 to satisfactorily complete the proposed design and 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-Builder. The Design-Builder 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 CONTRACT

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-Builder 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 that 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-Builder will be paid for performing the affected work in accordance with Subarticle 104-8(A).

When the Design-Builder is required to perform work, which is, in his opinion, an alteration in the contract that 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:

1. If the Engineer determines that the affected work is an alteration of the plans or details of construction that materially changes the character of contract, the Design-Builder will

be notified in writing by the Engineer and compensation will be made in accordance with Subarticle 104-8(A).

2. 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-Builder in writing of his determination. If the Design-Builder, 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-Builder believes that additional compensation for idle equipment and/or labor is justifiably due as a result of such suspension, the Design-Builder 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-Builder of the notice to resume work, the Design-Builder 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-Builder contends he has 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-Builder, its suppliers, or subcontractors at any tier, and not caused by weather, but the Engineer has not suspended the work in writing, the Design-Builder 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-Builder’s notice of intent to file a claim for additional compensation. If the Engineer agrees with the Design-Builder’s contention, the Engineer will suspend in writing the performance of all or any portion of the work and the provisions of Subarticle 104-8(C) shall be strictly adhered to.

If the Engineer does not agree with the Design-Builder’s contention as described above and determines that no portion of the work should be suspended, he will notify the Design-Builder in writing of his determination. If the Design-Builder does not agree with the Engineer's determination, the provisions of Subarticle 104-8(C) shall be strictly adhered to. Within 14 calendar days after the last day of the alleged-suspension, the Design-Builder 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-Builder.

104-7 EXTRA WORK.

The Design-Builder 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 specifications and as directed by the Engineer. No extra work shall be commenced prior to specific authorization for the performance of such extra work being given by the Engineer.

Extra work which is specifically authorized by the Engineer will be paid for in accordance with Subarticle 104-8(A).

When the Design-Builder 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.

1. If the Engineer determines that the affected work is extra work, the Design-Builder will be notified in writing by the Engineer and compensation will be made in accordance with Subarticle 104-8(A).

2. If the Engineer determines that the work is not extra work, he will notify the Design-Builder in writing of his determination. If the Design-Builder 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 the provisions of Subarticle 104-8(B) shall be strictly adhered to.

104-8 COMPENSATION AND RECORD KEEPING.

(A) Compensation--Article 104-3 and Article 104-7:

When the Engineer and Design-Builder agree that compensation is due under the provisions 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-Builder 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-Builder 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-Builder shall not begin the affected work until the supplemental agreement is executed.
2. When the Engineer and the Design-Builder cannot agree to the prices to be paid for the affected work, the Engineer will issue a force account notice prior to the Design-Builder beginning work. In this instance the affected work shall be performed as directed by the Engineer and paid for in accordance with the provisions of Article 109-3.

(B) Claim for Additional Compensation--Article 104-3 and Article 104-7:

The Design-Builder's notice of intent to file a claim for additional compensation under the provisions of Articles 104-3 and 104-7 shall be given to the Engineer in writing. The Design-Builder shall keep accurate and detailed cost records in accordance with the provisions of Article 109-3. The Design-Builder's cost records and supporting data shall be complete in every respect and in such form that the Engineer may check them. The Design-Builder'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-Builder'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-Builder 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-Builder's justification for an adjustment in compensation under the terms of the contract.

Upon receipt, the Engineer will review the Design-Builder's request and supporting documentation.

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-Builder 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-Builder to perform any of the following shall be a bar to recovery under the provisions of Articles 104-3 or 104-7:

1. The failure of the Design-Builder 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-Builder to keep records in accordance with the provisions of Article 109-3.
3. The failure of the Design-Builder to give the Engineer the opportunity to monitor the methods by which records are being maintained.

The failure of the Design-Builder to submit additional documentation requested by the Engineer provided documentation requested is available within the Design-Builder's records.

The failure of the Design-Builder to submit cost records on a weekly basis.

The failure of the Design-Builder 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--Article 104-4:

The Design-Builder's notice of intent to file a claim for additional compensation under the provisions 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-Builder's notice of intent to file a claim for additional compensation under the provisions of Subarticle 104-4(B) shall be given to the Engineer in writing. The Design-Builder shall keep accurate and detailed records of the equipment and labor alleged to be idle. The Design-Builder's cost records, supporting data, and supporting information shall be complete in every respect and in such form that the Engineer may check them. The Design-Builder'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-Builder's cost records, supporting data, and supporting information for idle labor shall include the specific employees, classification, dates and time 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-Builder'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-Builder choose 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 or 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-Builder's justification for an adjustment in compensation under the terms of the contract.

Upon receipt, the Engineer will evaluate the Design-Builder'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-Builder, 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-Builder 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-Builder in writing of his determination.

The Engineer will notify the Design-Builder 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-Builder to perform any of the following shall be a bar to recovery under the provisions 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-Builder to keep records in accordance with the details of Article 109-3.
4. The failure of the Design-Builder to give the Engineer the opportunity to monitor the methods by which records are being maintained.
5. The failure of the Design-Builder to submit additional documentation requested by the Engineer provided documentation requested is available within the Design-Builder's records.
6. The failure of the Design-Builder to submit cost records on a weekly basis.
7. The failure of the Design-Builder 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.

8. The failure of the Design-Builder 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-Builder 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-Builder, 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-Builder 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 Fixed Income Investment Fund during the month preceding the date interest becomes payable, will be paid the Design-Builder 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-Builder 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-Builder 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-Builder will only be allowed to submit the request for an adjustment in compensation one time during the construction of the project.

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-Builder, unless otherwise stated in the plans or special provisions, with the following exceptions:

1. Materials which are the property of utility companies providing service to buildings which are to be demolished or removed in accordance with Sections 210 and 215.
2. Materials resulting from the removal of existing pavement in accordance with Section 250 which are to be stockpiled for the use of the Department.
3. Materials resulting from the removal of existing structures in accordance with Section 402 where the plans or special provisions indicate that the material will remain the property of the Department.
4. Aggregate base course where the Special Provisions require that this material become the property of the Department.
5. Left over materials for which the Department has reimbursed the Design-Builder as provided in Article 109-6.
6. Materials that have been furnished by the Department for use on the project.

Property shall include but not be limited to materials furnished by the Design-Builder or the Department 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 of the Design-Builder shall be removed from the project by the Design-Builder prior to final acceptance.

104-10 MAINTENANCE OF THE PROJECT.

The Design-Builder shall maintain the project from the date of beginning construction until the project is finally accepted. This maintenance shall be continuous and effective and shall be prosecuted with adequate equipment and forces to the end that all work covered by the contract is kept in satisfactory and acceptable condition at all times.

The Design-Builder 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.

In the event that the Design-Builder's work is suspended for any reason, he 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-Builder 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 Department.

Where an observation period(s) is required that extends beyond the final acceptance date, the Design-Builder shall perform any work required by the observation period until satisfactory completion of the observation period. The Design-Builder 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.

104-11 FINAL CLEANING UP.

Before acceptance of the work for maintenance, the highway, borrow sources, waste areas, and all ground occupied by the Design-Builder 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-Builder 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-Builder to initiate, develop, and present to the Department of Transportation for consideration, any cost reduction proposals conceived by him involving changes in the drawings, designs, specifications, or other requirements of the contract. This specification does not apply unless the proposal submitted is specifically identified by the Design-Builder 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 implementation, Value Engineering Proposals that provide for total savings prior to distribution of less than the thousand dollars ($10,000.00) will not generally be considered.

Value Engineering Proposals contemplated are those that would result in a net savings to the Department 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 Proposal may have on the following items, but not limited to these items, will be considered by the Department 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
9) Environmental Impact

The Department 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 Department 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 design-build package, for the one on which the Design-Builder proposed, will not be allowed. Plan errors which are identified by the Design-Builder 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-Builder 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-Builder is encouraged to include this specification in contracts with subcontractors. The Design-Builder shall encourage submissions of Value Engineering Proposals from subcontractors, however, it is not mandatory that the Design-Builder accept or transmit to the Department Value Engineering Proposals proposed by his subcontractors. The Design-Builder may choose any arrangement for the subcontractor value engineering payments, provided that these payments shall not reduce the Department's share of the savings resulting from the Value Engineering Proposal.

Should the Design-Builder 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 Resident Engineer and the Value Engineering Office. The submittal shall state Preliminary Value Engineering Proposal Review Request and must 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-Builder to prepare designs or revisions to designs. The Department 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 Department to approve the final proposal should a preliminary review indicate the proposal has possible merit. The Department

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-Builder to the Resident Engineer and the Value Engineering Office. The proposal shall contain, as a minimum, the following:

(1) A statement that the request for the modification is being made as a Value Engineering Proposal.

(2) A description of the difference between the existing contract requirements and the proposed modifications, with the comparative advantages and disadvantages of each.

(3) 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 registered in the State of North Carolina. Further, the Department may require a review, and possibly the redesign, be accomplished by the project's original designer, or an approved equal. The Department may contract with private engineering firms, when needed, for reviews requested by the Department. The contractor shall contract with the original project designer, or an approved equal, when required by the Department, for any design work needed to completely and accurately prepare contract drawings. The Department 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.

(4) An itemized list of the contract requirements that would be modified and a recommendation of how to make each modification.

(5) A detailed estimate of the cost of performing the work under the proposed modification.

(6) A statement of the time by which approval of the Value Engineering Proposal must be issued by the Department 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 contractor 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-Builder shall be coordinated with appropriate Department Branch through the Value Engineering Office. The contractor shall provide, at no charge to the Department, one set of reproducible drawings of the approved design needed to implement the value engineering proposal.

The Engineer, as defined in Article 101-34 of the Standard Specifications, will be the sole judge of the acceptability of a Value Engineering Proposal requested in accordance with these provisions and of the estimated net savings resulting from the approval of all or any part of the Proposal. The Design-Builder has the right to withdraw, in whole or in part, any Value Engineering Proposal not accepted by the Department within the period to be specified in the Proposal per Item (6) 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 provisions for price adjustment giving the Design-Builder 50 percent of the net savings to the project resulting from the modifications.

The Department 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-Builder 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 Department reserves the right to disregard the contract prices if, in the judgement of the Department, 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 Department's review and administrative costs for value engineering proposals will be borne by the Department. The Design-Builder's costs for designs and/or revisions to designs and the preparation of design drawings will be borne by the Design-Builder. The costs to either party will not be considered in determining the net savings obtained by implementing the value engineering proposal. The Design-Builder'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-Builder and 50 percent for the Department, for all accepted Value Engineering Proposals.

Upon execution of the Supplemental Agreement, 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-Builder. Restrictions or conditions imposed by the Design-Builder for use of the proposal on other projects shall not be valid.

Except as may be otherwise precluded by this specification, the Design-Builder may submit a previously approved value engineering proposal on another project.

Unless and until a Supplemental Agreement is executed and issued by the Department, the Design-Builder 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-Builder shall not be entitled to additional compensation under Section 104 of the Standard Specifications for alterations in the plans or in the details of construction pursuant to the Value Engineering Proposal.

The Department will not be liable to the Design-Builder for failure to accept or act upon any Value Engineering Proposal submitted pursuant to this provision nor for any delays to the work attributable to any such proposal.

The Department reserves the right to negotiate desired changes with the Design-Builder under the provisions 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-Builder. His decision shall be final and he shall have executive authority to enforce and make effective such decisions and orders as the Design-Builder fails to carry out promptly.

The Engineer shall have the authority to issue any written order to the Design-Builder which he considers necessary to the prosecution of the work, and shall have executive authority to enforce such written orders as the Design-Builder fails to carry out promptly. Failure on the part of the Design-Builder to comply with any written order issued by the Engineer may be justification for disqualifying the Design-Builder from further bidding in accordance with Article 102-16.

105-2 PLANS AND WORKING DRAWINGS.

See Scopes of Work:

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 on the plans, or indicated in the specifications.

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 plans and specifications 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 plans and specifications and have resulted in an inferior or unsatisfactory product, the work or materials shall be removed and replaced or otherwise corrected by the contractor at no cost to the Department.

The Design-Builder 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-Builder 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-Builder 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 within the sole discretion of the Engineer.

105-4 COORDINATION OF PLANS, SPECIFICATIONS, SUPPLEMENTAL SPECIFICATIONS, AND SPECIAL PROVISIONS.

The Design-Build Package, the 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) Design-Build Package

(B) Technical Proposal

(C) Accepted Construction Plans

(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-Builder shall take no advantage of any error or omission in the plans, estimated quantities, or specifications. In the event the Design-Builder discovers an error or omission, he shall immediately notify the Engineer.

105-5 COOPERATION BY DESIGN-BUILDER.

The Design-Builder 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-Builder shall notify the Engineer in writing at least 7 days prior to beginning work on the project. He shall notify the Engineer at least 1 day in advance when work is to be suspended and at least 2 days in advance when work is to be resumed.

The Design-Builder shall keep available on the project site at all times the contract assembly including special provisions, standard specifications, and plans.

105-6 SUPERVISION BY DESIGN-BUILDER.

(A) On Site Personnel:

At all times that work is actually being performed the Design-Builder 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-Builder, unless otherwise approved by the Engineer.

(B) On Call Personnel:

At all times during the life of the project the Design-Builder 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-Builder 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 OR DESIGN-BUILDERS.

The Department reserves 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 Contractor or Design-Builder shall conduct his work so as not to interfere with or hinder the progress or completion of the work being performed by other Contractors or Design-Builders. Contractors or Design-Builders working within the limits of the same project shall cooperate with each other.

Each Contractor or Design-Builder 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.

The Department will under no circumstances be liable for any claim for additional compensation due to acts of one Contractor or Design-Builder holding up the work of another.

The Department will under no circumstances be liable for any damages experienced by one Contractor or Design-Builder as a result of the presence and operations of other Contractors or Design-Builders working within the limits of the same project.

105-8 COOPERATION WITH UTILITY OWNERS

Prior to the beginning of construction, the Department or Design-Builder 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-Builder when such adjustments are part of the work covered by his contract.

The Design-Builder shall use special care in working around and near all existing utilities that are encountered during construction, protecting them where necessary so that they will give uninterrupted service.

The Design-Builder 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 Department.

In the event that utility services are interrupted by the Design-Builder, the Design-Builder 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.

The Design-Builder 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-Builder shall consider all of the permanent and temporary utility facilities in their present or relocated positions. It will be the Design-Builder's responsibility to anticipate any additional costs to him resulting from such utility work and to reflect these costs in his bid for the various items in the contract.

Where changes to utility facilities are to be made solely for the convenience of the Design-Builder, it shall be the Design-Builder's responsibility to arrange for such changes and the Design-Builder shall bear all costs of such changes.

105-9 CONSTRUCTION STAKES, LINES, AND GRADES.

The Design-Builder 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 Proposal, 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 Department are authorized to inspect all work done 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 provisions of the contract. The inspector is not authorized to issue instructions contrary to the plans and specifications, or to act as foreman for the Contractor; 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-Builder shall allow and provide a reasonable access to all parts of the work to the Engineer or his authorized representative. The Design-Builder 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 at the work site shall in no way lessen the Design-Builder's responsibility for conformity with the plans and specifications. Should the Engineer, prior to or during construction, fail to point out or reject materials or work that does not conform with plans and specifications, 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-Builder 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-Builder, 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-Builder shall restore said portions of the work to the standard required by the specifications. The Design-Builder shall keep cost records of the work performed and if the uncovered work is found to be acceptable, the Department will pay the Design-Builder 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 Department.

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 will not be paid for under the provisions 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 will not be paid for under the provisions of the contract. Any of the above work so performed may be ordered removed, replaced, or repaired at no cost to the Department.

Upon failure on the part of the Design-Builder to comply forthwith 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 provisions of the contract and to deduct the cost of removal and/or adjustment from any monies due or to become due the Design-Builder.

105-13 LIMITATIONS OF OPERATIONS.

At any time when, in the opinion of the Engineer, the Design-Builder 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 must be maintained, the Engineer may require the Design-Builder 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-Builder's operations are being conducted at night, the Design-Builder 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 1412.

105-15 RESTRICTION OF LOAD LIMITS.

The Design-Builder shall comply with all legal load restrictions in hauling equipment and materials on roads under the jurisdiction of the Department.

The Department has the right to place load limit restrictions on the load a Design-Builder may haul on any road or bridge in the vicinity of his contract. The Design-Builder, prior to bidding on a project, will be responsible for making his own investigations to determine beforehand the possibility of load limit restrictions being placed on any of the highways he plans to use for hauling purposes. The Design-Builder shall not be entitled to an extension of time or to compensation for any costs, inconvenience, delay, or any other adversity to the Design-Builder 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-Builder; and the Design-Builder thereafter will be allowed to haul up to the statutory legal limits over such roads and/or bridges, provided the Design-Builder enters into an agreement with the Department providing for:

1. Maintenance by the Design-Builder of such roads in a condition satisfactory to the Engineer during the haul period.
2. Repair by the Design-Builder 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.
3. Furnishing bond by the Design-Builder in an amount determined by the Engineer for the roads. Furnishing a bond for the roads does not entitle the Design-Builder to exceed the posted load limits of any bridge.
4. Assumption by the Design-Builder of all costs of strengthening any bridges which may be necessary in order to safely haul loads up to statutory legal limits. The Department will, upon request by the Design-Builder, make a determination as to the method and extent of strengthening required for the bridges and will advise the Design-Builder 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-Builder shall reimburse the Department in the amount of the actual charges for said work. When Design-Builder's forces perform the work, it shall be done in accordance with plans approved by the engineer and under his inspection.
5. Indemnification of the Department 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-Builder's hauling operations, but also for the use of the 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-Builder 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-Builder 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-Builder to comply with the provisions of Article 104-10 or to perform erosion control work as directed will result in the Engineer notifying the Design-Builder to comply with these provisions. In the event that the Design-Builder 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-Builder for work performed by others. Any costs incurred by 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-Builder will be deducted from monies due the Design-Builder on his contract.

105-17 INSPECTION AND ACCEPTANCE.

Upon apparent completion of the entire project, the Engineer will make an inspection of 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 there entirely will not be altered except as listed below:

1. When any continuous project is equal to or in excess of 5 miles in length, the Department will accept the project in 2 increments with the first increment equaling at least 50 percent of the total length of the project.
2. When it is considered to be in the best interest of the Department, other increments or parts of projects may be considered for acceptance.
3. 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-Builder.
4. Bridge decks and rails that have been constructed or rehabilitated at such time as they are open to public traffic.

5. 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-Builder of such unsatisfactory or incomplete work, and the Design-Builder shall immediately correct, repair, or complete such work. The project will not be accepted and the Design-Builder 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-Builder in writing that the project has been accepted as soon as practicable after the completion of the project.

105-18 Substantial Completion

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

1. Through traffic has been placed along the project or along the work required by an intermediate contract time and the work is complete to the extent specified below, and all lanes and shoulders are open such that traffic can move unimpeded at the posted speed. Intersecting roads and service roads are complete to the extent that they provide the safe and convenient use of the facility by the public.
2. The final layers of pavement for all lanes and shoulders along the project or along the work required by an intermediate contract time are complete.
3. All signs are complete and accepted except for the signs on intersecting roadways.
4. All guardrails, drainage devices, ditches, excavation and embankment are complete.
5. Remaining work along the project consists of permanent pavement markings, permanent pavement markers or incidental construction that is away from the paved portion of the roadway.

Upon apparent substantial completion of the entire project or the work required by an intermediate contract time, the Engineer will make an inspection of the work. If the inspection discloses the entire project or the work required by an intermediate contract time is substantially complete; the Engineer will notify the Design-Builder in writing that the work is substantially complete. If the inspection discloses the entire project or the work required by an intermediate contract time is not substantially complete, the Engineer will notify the Design-Builder in writing of the work that is not substantially complete. The entire project or the work required by an intermediate contract time will not be considered substantially complete until all of the recommendations made at the time of the inspection have been satisfactorily completed.

SECTION 106

CONTROL OF MATERIAL

106-1 GENERAL REQUIREMENTS.

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 Departments intent to expand the use of recovered materials in its construction programs. The Design-Builder 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-Builder 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-Builder's responsibility to obtain materials which will meet the requirements of the contract. The Design-Builder 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.

The Design-Builder 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-Builder 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 Department forces to take samples as requested by the Design-Builder. In the latter case, the Design-Builder shall reimburse the 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 which may be delivered later for incorporation in the work. The Design-Builder shall assume full responsibility for the production of uniform and satisfactory materials from such local deposits, and shall indemnify and save harmless the Department 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.

106-2 SAMPLES, TESTS, AND CITED SPECIFICATIONS.

The Design-Builder shall perform Quality Control (QC) and acceptance testing at the frequencies described in the Minimum Sampling Guide. Quality Assurance (QA), verification and Independent Assurance (IA) will be performed by the Department. Laboratory testing performed by the Design- Builder shall be performed by an AASHTO Accredited facility and participate in the AMRL/CCRL proficiency testing program for the tests being performed. Technicians performing sampling and testing shall be qualified in accordance with the Department’s training and certification requirements for the specific materials, or in accordance with AMRL/CCRL accreditation requirements.

Prior to beginning construction, the Design-Builder shall provide a “Table of Values” as described in Section 101-102 Definitions of Terms.

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, which does not indicate the date of publication, will be understood to mean the specification current on the date of Request for Proposals 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-Builder and the Engineer and such agreement is documented by a supplemental agreement, the Department may accept materials meeting the requirements of the latest publication.

106-3 DESIGN-BUILDER FURNISHED CERTIFICATION.

The Design-Builder shall maintain 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

1. Materials required to meet criteria documented by tests which are normally performed during the production process.
2. Materials which are required to meet specifications other than those published by AASHTO, ASTM, or the Division of Highways.
3. Materials produced at locations which are not within routine travel distance for Department representatives.
4. Materials required to meet criteria documented by tests involving special equipment not readily available to Department representatives.
5. Any other special material when so directed by the Engineer.

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 Department’s Minimum Sampling Guide.

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-Builder's Certification:

Design-Builder's certification is a signed statement by a contractor that the used material described in the certification meets the requirements of the current specifications to the best of contractor's knowledge and that the contractor 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 contractor's certification.

Final Material Certificate:

The Design-Builder shall, upon completion of the project, certify that all certifications were received and the materials were found in compliance with the specification requirements and list all exceptions to the plans and specifications. This certification 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:"

Upon final acceptance of the Project, the Design-Builder shall submit all certifications to the Engineer.

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-Builder's plant and equipment, but any additional space required therefor shall be provided by the Design-Builder at no expense to the Department. All storage sites located within the right of way shall be restored to their original condition by the Design-Builder at no expense to the Department, except where the materials stored are or are to become the property of the Department.

106-6 INSPECTION AT SOURCE.

The Engineer may undertake the inspection of materials at the source of supply. This inspection will be performed by Department personnel or private organizations retained by the Department. Where approved by the Engineer, the results of tests performed by private laboratories or producer's or manufacturer's laboratories may be used in determining compliance of a material or product with the contract.

The Department assumes no obligation to inspect materials at the source of supply and such inspection will be undertaken only upon condition that:

1. The cooperation and assistance of the Design-Builder and the producer with whom he has contracted for materials is assured.
2. 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.
3. Laboratory facilities shall be provided when required by the Engineer.

Where the Department agrees to inspect or test materials during their production or at the source of supply, the Design-Builder 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-Builder 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 reserves 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.

In the event material is to be paid for on a ton basis, the Contractor 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.

106-8 DEPARTMENT FURNISHED MATERIAL.

The Design-Builder shall furnish all materials necessary to complete the work, except those materials specified in the Design-Build Package to be furnished by the Department. Payment at the contract price for the item which includes the use of Department 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-Builder.

The Design-Builder will be held responsible for all material furnished 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 Department 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.

The Engineer may, at his option, utilize nuclear methods as described in Article 520-10 and 610-11C 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-Builder shall keep himself 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 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-Builder or by his agents and employees.

107-2 ASSIGNMENT OF CLAIMS VOID.

In accordance with G.S. 143-3.3, the Department will not recognize any assignment of claims by any Design-Builder.

107-3 PERMITS AND LICENSES.

The Design-Builder 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.

107-4 PATENTED DEVICES, MATERIALS, AND PROCESSES.

If the Design-Builder 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-Builder and his surety shall indemnify and save harmless the Department 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 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. The Design-Builder 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-Builder 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-Builder. 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-Builder 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.

The Design-Builder shall provide and maintain in a neat, sanitary condition such accommodations for the use of his 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 jurisdiction.

107-8 PUBLIC CONVENIENCE AND SAFETY.

The Design-Builder 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-Builder as specified in Section 150.

107-9 COORDINATION WITH RAILWAY.

All work to be performed by the Design-Builder on railway right of way shall be done 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-Builder 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-Builder shall carry such railroad protective insurance and public liability and property damage insurance as may be stipulated in the special provisions.

When the Design-Builder is required by the plans or special provisions to transport materials or equipment across the tracks of any railway or to perform work on railway right of way, the Design-Builder will 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. The Design-Builder will be required to bear the cost of any watchman service or flagging protection necessary due to such operations, as the railway company will be reimbursed directly by the Design-Builder for the cost of such work.

In case the Design-Builder 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 plans or special provisions, 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 Department from the authority granting the permit. These conditions will be included in the project special provisions. 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-Builder shall prepare drawings necessary to obtain any addendums which may be required for his operations which are not included in the Department'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-Builder shall exercise the utmost care not to endanger life or property. The Design-Builder 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-Builder. Provided that in cases of damage or interruption to underground water supply or veins to adjacent landowners, the Design-Builder shall not be held responsible where the Design-Builder 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-Builder 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-Builder 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-Builder 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: (1) station limits of shot, (2) plan of drill hole pattern, blast hole spacing, blast hole diameters and free face, (3) initiation sequence of blastholes including delay timer and delay system, (4) manufacturers data sheet for all explosives, primers, and initiators employed, (5) 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-Builder of his responsibilities as provided in Article 107-12.

107-12 PROTECTION AND RESTORATION OF PROPERTY.

The Design-Builder 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-Builder 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-Builder shall be responsible for the removal, preservation, and resetting of all mail boxes disturbed by the construction operations. The mail boxes and their supports, when reset, shall be left in as good a condition as they were before removal. The Design-Builder will

not be required to furnish new material except as required to repair damage resulting from construction operations.

The Design-Builder 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 Department. In case of failure on the part of the Design-Builder to restore such property or make good such damage or injury the Department may at the Design-Builder'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-Builder shall take whatever measures are necessary to minimize soil erosion and siltation, water pollution, and air pollution caused by his operations. The Design-Builder shall also comply with the applicable regulations of all legally constituted authorities relating to pollution prevention and control. The Design-Builder shall keep himself fully informed of all such regulations which 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-Builder'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 area greater than one acre, the Design-Builder shall provide ground cover sufficient to restrain erosion within 30 calendar days. When the construction is within a high quality water zone, as indicated in the plans, ground cover sufficient to restrain erosion shall be provided within 15 calendar days. The ground cover shall be either temporary or permanent and the type specified in the special provisions.

(B) Erosion and Siltation Control:

The Design-Builder 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-Builder 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.

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.

(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-Builder shall be liable for all damages to public or private property caused by silting or slides originating in waste areas furnished by the Design-Builder.

Materials for temporary erosion control measures shall have been approved by the Engineer before being used or shall be as directed by the Engineer.

Erosion control measures installed by the Design-Builder shall be acceptably maintained by the Design-Builder.

(D) Water and Air Pollution:

The Design-Builder shall exercise every reasonable precaution throughout the life of the project to prevent pollution of rivers, streams, and water impoundments. Pollutants such as chemicals, fuels, lubricants, bitumens, raw sewage, and other harmful waste shall not be discharged into or alongside of rivers, streams, or impoundments, or into natural or manmade channels leading thereto.

The Design-Builder shall comply with all State or local air pollution regulations throughout the life of the project.

(E) Dust Control:

The Design-Builder 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-Builder 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 provisions 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-Builder'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-Builder as directed by the Engineer at no cost to the Department. If the Design-Builder fails to perform such measures as directed, the Engineer may have the work performed in accordance with Article 105-16.

Failure of the Design-Builder 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-Builder to perform the necessary measures to control erosion, siltation, and pollution will result in the Engineer notifying the Design-Builder to take such measures. In the event that the Design-Builder 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-Builder for the performance of this work and the cost of such work so performed will be deducted from monies due the Design-Builder 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-Builder 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, 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-Builder 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-Builder shall obtain any construction permits, which 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-Builder shall indemnify and save harmless the Board of Transportation and its members and the Department of Transportation and its officers, agents, and employees from all suits, actions, or claims of any character brought for any injury or damages received or sustained by any person, persons, or property by reason of any act of the Design-Builder, Subcontractor, its agents or employees, in the performance of the contract. The Design-Builder's liability to save harmless and indemnify shall include, but not by way of limitation, the following: (1) damages or claims for the failure of the Design-Builder to safeguard the work; (2) damages or claims by reason of the failure of the Design-Builder to erect adequate barricades and post adequate warnings to the public of such barricades; (3) any damage or claims caused through the Design-Builder's use of defective materials or by the performance of defective work; (4) any claims by reason of the Design-Builder's infringement of patent, trademark, or copyright; (5) any amounts paid by the Department by reason of the Design-Builder's failure to comply with or for violations of laws, ordinances, orders, or decrees; (6) any damages or claims caused by blasting operations of the Design-Builder with or without proof of negligence on the part of the Design-Builder; (7) damages or claims caused by the failure of the Design-Builder 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-Builder, without proof of negligence; (8) damages caused by the failure of the Design-Builder to control erosion in accordance with the plans and specifications.

In addition to any remedy authorized by law, the Department shall have a right to retain from moneys due the Design-Builder as the Department 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 which are the Design-Builder's responsibility under Section 107 of the specifications. The Design-Builder and the Surety shall remain responsible until such suits or claims against the Department have been settled and until the Department has been indemnified and saved harmless. (2) In case of claims by the third parties against the Design-Builder involving tort liability for which the Department might be held liable for as a taking of property, or as a tort before the Industrial Commission. However, moneys due the Design-Builder will not be retained provided the Design-Builder produces satisfactory evidence to the Department 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-Builder, amounts due the Design-Builder 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-Builder may be determined to be legally liable for. (3) In cases of damage to property of the Department, such amounts necessary to pay for such damage.

In cases where claims are made or suits filed against employees, agents, or officers of the Department of Transportation or members of the Board of Transportation, the Department of Transportation may retain from moneys due the Design-Builder sufficient to indemnify such employee, agent, or officer of the Department of Transportation or member of the Board of Transportation for any amounts which they may be held liable for but for which the Design-Builder is responsible under the provisions of Section 107 of these specifications. In the event that there is not sufficient money retained or the final estimate is paid, the Department of Transportation may collect from the Design-Builder or its Surety amounts sufficient to

indemnify such employee, agent, or officer of the Department of Transportation or member of the Board of Transportation for such damages incurred.

107-16 LIABILITY INSURANCE.

When required by the special provisions the Design-Builder 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-Builder.

107-17 OPENING SECTIONS OF PROJECT TO TRAFFIC.

If it is determined by the Engineer that the Design-Builder will not complete the work by the completion date, intermediate completion date, or intermediate completion time, the Engineer may notify the Design-Builder 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, which are opened, the Design-Builder shall conduct the remainder of his operations to cause the least obstruction to traffic. The Design-Builder 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-BUILDER'S RESPONSIBILITY FOR WORK.

Until final acceptance of the work by the Engineer, as evidenced in writing, the Design-Builder 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-Builder 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 Department will reimburse the Design-Builder for the repair of the work due to actions of the elements of such exceptional nature as to be legally classified as Acts of God.

In case of suspension of work from any cause whatever, the Design-Builder 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 Department will be responsible for the securing of all necessary rights of way in advance of construction.

107-20 PERSONAL LIABILITY OF PUBLIC OFFICIALS.

Employees, agents, officers, and members of the Board of Transportation 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 Board of Transportation or the Department of Transportation.

107-21 WAIVER OF LEGAL RIGHTS BY THE DEPARTMENT.

Upon completion of the work, the Department will expeditiously make an inspection and notify the Design-Builder of acceptance. Such final acceptance and processing of the final estimate, however, shall not preclude or stop the Department from correcting any measurement, estimate, or certificate made before or after completion of the work, nor shall the Department be precluded or stopped from recovering from the Design-Builder or his Surety, or both, such overpayment as it may sustain, or by failure on the part of the Design-Builder to fulfill his obligations under the contract. A waiver on the part of the Department 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-Builder, without prejudice to the terms of the contract, shall be liable to the Department for latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the Department's rights under any warranty or guaranty.

107-22 SAFETY AND ACCIDENT PROTECTION.

The Design-Builder 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.

107-23 WAGES AND CONDITIONS OF EMPLOYMENT.

The Design-Builder's attention is directed to the provisions and requirements of any and all public statutes, which 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-Builder with his own organization and with the assistance of workmen under his immediate superintendence, and to all work performed by subcontract. It will be the responsibility of the Design-Builder 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 special provisions 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 Request for Proposals for such projects. The Design-Builder shall provide at the job site at no cost to the Department 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-Builder 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-BUILDER TO FILE VERIFIED CLAIM.

If the Design-Builder fails to receive such settlement as he claims to be entitled to under the terms and provisions of the contract, the Design-Builder 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 State Highway Administrator within 60 days from the time the Design-Builder receives the final estimate as defined by Article 101-38 and shall be submitted in accordance with G.S. 136-29.

107-26 HAZARDOUS, CONTAMINATED, AND/OR TOXIC MATERIAL.

When the Design-Builder's operations encounter or expose any abnormal condition which 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-Builder, 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 which 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-Builder'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-Builder 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.

SECTION 108

PROSECUTION AND PROGRESS

108-1 GENERAL.

It is the intent of these specifications that the Design-Builder shall commence work on the date of availability shown in the Request for Proposals or as soon thereafter as practicable, but not before the contract has been executed by both the Design-Builder and the Department. The Design-Builder shall not begin work prior to the date of availability without written approval of the Engineer. If such approval is given and the Design-Builder does begin work prior to the date of availability the Department 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.

It is further the intent of these specifications that the Design-Builder 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 PROGRESS SCHEDULE.

This section is replaced by the Project Special Provision entitled " Progress Schedule" contained elsewhere in this Design-Build Package.

108-3 PREDESIGN CONFERENCE / PRECONSTRUCTION CONFERENCE.

The selected Design-Builder shall meet with the Engineer for a predesign 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-Builder shall furnish authorized signature forms and a list of any proposed subcontractors and major material suppliers 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 Builder 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-Builder is responsible for utilities in accordance with Article 105-8, he shall be responsible for coordinating with the Engineer in scheduling their attendance and for notifying them. The Design-Builder 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-Builder shall submit copies of completed and signed DBE subcontracts, purchase orders, or invoices to the Department.

The Design-Builder shall submit a traffic control plan in accordance with Article 1101-5. The Design-Builder 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-Builder 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 would be submitted at the predesign conference.

During the preconstruction conference, the Engineer will designate a Department employee or employees who will be responsible to see that the traffic control plans and any alterations thereto are implemented and monitored to the end that traffic is carried through the work in an effective manner. If approved by the Engineer, the Design-Builder may designate one employee to be responsible for both the traffic control and safety plans. The Design-Builder 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-Builder or State personnel work from falsework, within shoring, or in any other hazardous area the Design-Builder shall submit, as part of the Design-Builder's safety plan, specific measures it will use to ensure worker safety.

The Design-Builder 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-Builder 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-Builder shall not be entitled to additional compensation or an extension of contract time resulting from any delays due to such a suspension.

The Design-Builder shall designate a qualified employee as Quality Control Manager. The Quality Control Manager shall be responsible for the implementing and monitoring of the quality control requirements of the project.

108-4 CONSTRUCTION CONFERENCES.

After work on the project has begun, construction conferences are to be held no less than once per month. The construction conferences are to be scheduled at times, which are mutually agreeable to both the Design-Builder and the Department. It shall be the Design-Builder's responsibility to attend and record the proceedings of these conferences.

108-5 CHARACTER OF WORKMEN, METHODS, AND EQUIPMENT.

The Design-Builder 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-Builder cannot recruit Department employees for employment. Additionally, Department employees who elect to become employed by a Design-Builder may not perform any

function on a project, which they have been involved in during employment with the Department without written consent of the State. Any person employed by the Design-Builder and assigned to a project who has previously been involved in the project as a Department 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.

Failure of the Design-Builder to comply may be justification for disqualifying the Design-Builder from further bidding in accordance with the provisions of Article 102-16 and shall be grounds for termination of this contract.

No person shall be employed by the Design-Builder or by any Subcontractor who has been determined by the Engineer to have engaged in fraudulent activities in connection with any work for the Department of Transportation.

Any person employed by the Design-Builder 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 Department of Transportation shall be, at the written request of the Engineer, removed forthwith by the Design-Builder 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-Builder fail to remove such person or persons as required above, the Engineer may suspend the work in accordance with the provisions of Article 108-7 until such orders are complied with.

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-Builder in accomplishing the construction are not prescribed in the contract, the Design-Builder 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 authorized by the Engineer. If the Design-Builder desires to use a method or type of equipment other than those specified in the contract, he may request authority 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-Builder 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-Builder shall discontinue the use of the substitute method or equipment and shall complete the remaining construction with the specified methods and equipment. The Design-Builder 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 nor 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-Builder 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-Builder to comply with these provisions will be just cause for the work to be considered unauthorized in accordance with Article 105-12. A firm which has been disqualified due to its failure to maintain satisfactory progress under the provisions 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-Builder shall submit a certified copy of the actual subcontract agreement executed between the Design-Builder and Subcontractor prior to written consent being issued by the Engineer. In case such consent is given, the Design-Builder 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:

1. Any 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 original contract amount before computing the amount of work required to be performed by the Design-Builder with his own organization.

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-Builder.

An assignment by operations of law or assignment for the benefit of creditors, or the bankruptcy of the Design-Builder, shall not vest any right in this contract in the Trustee in bankruptcy, the Design-Builder'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-Builder 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-Builder 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-Builder 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-Builder, nor any Subcontractor, shall enter into any written or oral equipment lease or rental agreement, materials purchase agreement, and/or labor agreement which circumvents the provisions of this article.

If the Design-Builder or a Subcontractor enters 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, which 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-Builder of his liability under the contract and bonds, nor will the Subcontractor or the second tier Subcontractor have any claim against the Department of Transportation by reason of the approval of the subcontract. The State Highway Administrator will review and consider Subcontractor claims for additional time or compensation provided such claims are submitted by the contractor in accordance with Article 107-25 and General Statute 136-29.

Failure of the Design-Builder to comply with any of the provisions of this article may be justification for disqualifying the Design-Builder from further bidding in accordance with the provisions 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:

1. Conditions considered unfavorable for the suitable prosecution of the work, or
2. The Design-Builder's failure to correct conditions unsafe for workmen or the general public, or
3. The Design-Builder has not carried out orders given to him by the Engineer, or
4. The Design-Builder'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 will check the Design-Builder’s progress at the time each partial pay request is received. The Design-Builder’s progress may be considered as unsatisfactory if, according to the CPM of Record, the projected finish date for all work exceeds the scheduled finish date by greater than 10%.

When the Design-Builder's progress is found to be unsatisfactory as described above, the Engineer may make written demand of the Design-Builder to state in writing the reason for the unsatisfactory progress and produce such supporting data as the Engineer may require or the Design-Builder may desire to submit. The Engineer will consider the justifications submitted by the Design-Builder and extensions of the completion date that have or may be allowed in accordance with Article 108-10(B).

When the Design-Builder cannot satisfactorily justify the unsatisfactory progress the Engineer may invoke one or more of the following sanctions:

1. Withhold anticipated liquidated damages from amounts currently due or which become due.
2. Remove the Design-Builder and all firms prequalified under the Design-Builder's Prequalification Number from the Department's list of qualified bidders.

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 a default of the contract for breach by the Design-Builder of any material term or condition of the contract or specifications. Material breach by the Design-Builder 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 plans and specifications 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 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-Builder, 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-Builder in directing Design-Builder'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 Department 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-Builder under the contract without penalty or interest until the work is completed and accepted by the Department.

(C) Notice:

Before invoking any of the sanctions provided for herein, the Department, acting through the Engineer, will give the Design-Builder at least 7 days written notice with a copy to the Surety, which will set forth the breach of contract involved and the sanctions to be imposed. The Department, in its discretion, may grant the Design-Builder time in excess of 7 days within which to comply with the contract terms and specifications, and the time allowed will be set forth in writing. If the Department determines during such period that the Design-Builder is not proceeding satisfactorily to compliance, it may impose the sanctions after 24 hours notice to the Design-Builder. If the Department determines that the Design-Builder 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-Builder, in writing, with a copy to the Surety of the sanctions imposed.

(D) Payment:

After declaration of default has been made final, the Design-Builder will be entitled to receive payment for work satisfactorily completed or portions of work satisfactorily completed, less any sums that may be due the Department from the Design-Builder but in no event shall payment exceed the contract unit or lump sum price for such work. The Department, at its election, may retain the sum due the Design-Builder, or any portion thereof, without interest or penalty, until the contract work is completed; or it may make payment to the Design-Builder

upon declaration of default for work satisfactorily completed to the date that notice of default is received by the Design-Builder. The Design-Builder 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-Builder's employees, equipment, or materials are used in prosecution of the work, or any part thereof, after default is declared, payment to the Design-Builder 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 Department; 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-Builder, 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-Builder and the Surety shall be liable to the Department for such excess and shall pay such amount to the Department.

(E) Authority of Engineer:

The Engineer will exercise the powers and discretion vested in him by the specifications and other contract conditions 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-Builder and Surety:

No term or terms of this article and no action taken pursuant hereto by the Department of Transportation, its agents, or employees, will be construed to release or discharge the Design-Builder or the Surety upon the obligation set forth in the contract bonds, and the Design-Builder 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 Department and all obligations of the Design-Builder 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 Article 101-24. 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 Articles 101-47 and 101-48, will be that as allowed in the special provisions 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 special provisions may be extended on the same basis as completion dates and as described in this article.

When the liquidated damages stipulated in the project special provisions are to be on an hourly basis, extensions as described in this article will be considered on an hourly basis.

(B) Completion Date, Intermediate Completion Date, and Intermediate Completion Time Extensions:

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 supplemental agreements covering the performance of extra work include provisions for an extension of the completion date, intermediate completion date, or intermediate completion time, and the final dollar value of the extra work exceeds the estimated dollar value, the number of days or the number of hours by which the completion date, intermediate completion date, or intermediate completion time was extended will be increased by the percentage which the final dollar value exceeds the estimated value.
2. If the Design-Builder'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 the final payment 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-Builder, and that the Design-Builder 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.

3. If changes in the work from that originally contemplated in the Design-Build Package are ordered by the Engineer and these changes result in 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. It is, however, the Design-Builder'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.

Submit all requests for extensions of Contract time in writing. Only delays to activities which affect the Contract completion date will be considered for an extension of contract time. No time 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. Include in the request a written narrative describing the events, which would require an extension of contract time.

Any extension to the Contract completion date will be based on the number of calendar days the Contract completion date is impacted as determined by the Engineer's analysis.

The Design-Builder'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.

108-11 LIQUIDATED DAMAGES.

It is mutually recognized that 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 and administrative costs to the Department. 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 special provisions will be charged against the Design-Builder for each calendar day, each hour, or portion thereof that the work, or any portion of the work as described in the special provisions, remains uncompleted after the expiration of the completion date, intermediate completion date, or intermediate completion time shown in the special provisions, not as a penalty but as liquidated damages.

Should the Design-Builder 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, or intermediate completion times shown in the special provisions, a deduction of the amount stipulated in the special provisions 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, intermediate completion date, or intermediate completion time applicable to the uncompleted work. This amount will be deducted from any money due the Design-Builder or his Surety under the contract, and the Design-Builder and his Surety will be liable for any liquidated damages in excess of the amount due.

In the event that the special provisions establish one or more intermediate completion dates and/or one or more intermediate completion times 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-Builder 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-Builder to continue and finish the work or any part thereof after the expiration of the completion date, intermediate 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.

It is the intent of Articles 108-10 and 108-11 of these specifications that when a contract is not completed by the completion date, intermediate completion date, or intermediate completion time the Design-Builder shall be entitled to an extension of the 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-Builder, however, shall be entitled to an extension of the completion date, intermediate 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-Builder by reason of failure of the Design-Builder to complete the said contract by the completion date, intermediate completion date, or intermediate completion time specified therein or as revised by authorized extensions.

108-13 TERMINATION OF CONTRACT.

The Board may terminate the contract in accordance with the following provisions:

1. Consideration will be given to termination of the contract if any of the following circumstances exist:
    a. If it is impossible for the Design-Builder to obtain critical materials for completion of the contract within a practical time limit, or
    b. If it is impossible for the Design-Builder 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-Builder will be unduly delayed in completing the project by reason of such unanticipated conditions and changes in design, or

c. If the Design-Builder 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

d. If the Design-Builder 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-Builder will be unduly delayed in completing the project by reason of such order or requirement, or

e. If the Design-Builder is prevented from proceeding with the work due to the unavailability of the site.

2. The Design-Builder shall determine that the circumstances in item 1 exist and are beyond his control, and shall notify the Department in writing of his determination and include adequate documentation of these circumstances along with such notification.

3. The Contract will be terminated under this article if:

   a. Request by Design-Builder:

      i. The Board concurs in the determination by the Design-Builder of the circumstances or makes an independent determination that such circumstances hereinabove indicated exist, and

      ii. The Board determines that such circumstances are beyond the control of the Design-Builder, and the Design-Builder was not at fault in creating the circumstances, and

      iii. The Board determines that a termination of the contract is in the best public interest, or

   b. Authority of the Board:

      The Board determines that a termination of the contract is in the best public interest.

4. The Design-Builder will be notified in writing by the State Highway Administrator of the action of the Board.

5. After a contract is terminated in accordance with this termination provision, the following provisions shall be applicable:

   a. 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.

   b. Upon request from the Design-Builder, materials meeting the requirements of the contract which were to have been incorporated into the work or were to remain the property of the Department but are not used in the work will be paid for in accordance with Article 109-6.

   c. No claim for loss of anticipated profits will be considered and no payment will be made for loss of anticipated profits.

d. Termination of a contract shall not relieve the Design-Builder 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 CONTRACTOR'S RESPONSIBILITY.

After the project has been completed and accepted, as provided for in Article 105-17, the Design-Builder's responsibility will cease except as provided in Article 107-21 and as set forth in his contract bonds.

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 "gage" 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 consisting of 2,000 pounds avoirdupois.

Cement will be measured by the barrel unless otherwise indicated elsewhere in the Specifications. 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-Builder shall receive and accept compensation 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 provisions of Article 107-21. Payment to the Design-Builder will be made only for the work completed and accepted in accordance with the terms of the contract.

If the "Basis of Payment" or "Compensation" 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 which may appear elsewhere in the specifications.

109-3 FORCE ACCOUNT WORK.

(A) Design:

The actual costs for labor will be paid.

(B) Construction:

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.

All work to be paid for on a force account basis will be paid for in the following manner:

1. Labor. For all authorized labor and foremen in direct charge of the specific operations, the Design-Builder will receive the rate of base wages (or scale) actually being paid by the Design-Builder for each hour that the labor and foremen are actually engaged in the work. Prior to beginning the work the Design-Builder shall 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 work. An amount equal to 35 percent of the total base wages paid for labor and foremen will be added to the total base wages paid to the Design-Builder.

   The percentage additive will be full compensation for overhead, profit, benefits, and contingencies.

2. Bond, Insurance, and Tax. For property damage, liability, and worker's compensation insurance premiums, unemployment insurance contributions, bond premiums, and social security taxes on the force account work, the Design-Builder will receive the actual cost to which cost 6 percent will be added. The Design-Builder shall furnish satisfactory evidence to the Engineer of the rate or rates paid for such bond, insurance, and tax.

   An annualized composite percentage of the direct cost for labor and foremen may be used to determine the cost for bond, insurance, and tax to which cost 6 percent will be added. The Design-Builder shall furnish satisfactory evidence to the Engineer of the annualized composite percentage for the bond, insurance, and tax.

   The percentage additive will be full compensation for overhead, profit, and contingencies.

3. Materials. For materials authorized and accepted by the Engineer and used, the Design-Builder will receive the actual cost of such materials, including transportation charges paid by him (exclusive of equipment rentals as hereinafter set forth), to which cost 15 percent will be added. The Design-Builder shall furnish records to the Engineer to verify the quantities of materials used in the work, prices of the materials, and costs of transportation for the materials.

   If materials used in the force account work are not specifically purchased for such work but are taken from the Design-Builder's stock, the Design-Builder shall furnish an affidavit

certifying that such materials were taken from his stock, the quantity was actually used in the work, and the price and transportation cost claimed represent the actual cost to the Design-Builder.

The percentage additive will be full compensation for overhead, profit, and contingencies.

4. Equipment. For all equipment authorized by the Engineer to be used on the force account work the Design-Builder will receive rental payment.

Hourly rental rates paid for equipment in use which is Design-Builder 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", as published by Dataquest, Incorporated, which is current at the time the 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 70 percent of the Blue Book estimated operating cost per hour will also be paid for the time 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-Builder 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 the time 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 time 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 time in use.

Hourly rental rates for idle equipment held in ready in accordance with Article 104-4 will be 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 which 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 time 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 time in use.

In the event the Design-Builder 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-Builder 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 the time 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-Builder or an affiliate of the Design-Builder.

No compensation will be made for the use of equipment not authorized by the Engineer.

The Design-Builder will be reimbursed for the actual transportation costs for equipment which the Design-Builder 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-Builder shall furnish records to the Engineer to verify the actual transportation costs for equipment.

The Design-Builder shall provide to the Engineer for approval a listing of all equipment and attachments to be utilized in the prosecution of the work. The list shall include the manufacturer's name, type, model, serial number, and year of manufacture. The list shall also include the invoice rate for equipment rented from a commercial rental agency. It shall be the Design-Builder'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.

5. 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.

6. Subcontracting. For administrative costs of the Design-Builder in connection with approved subcontract work, the Design-Builder will receive an amount in accordance with the rate schedule shown below of the total cost of such subcontracted work. The total cost will include labor; bond, insurance, and tax; materials; and equipment costs incurred by the subcontractor and computed in accordance with Items 1, 2, 3, and 4 above.

Total Cost of Subcontract Work	Rate Schedule
$0 - $10,000	10%
Above $10,000	$1,000 + 5% Above $10,000

7. General. The Engineer will maintain the payment records of work performed on a force account basis. The Design-Builder shall compare records of work with the Engineer at the end of each day on which such work is in progress.

Any contention the Design-Builder may have for an extension in the completion date, intermediate completion date, or intermediate completion time, due to performance of force account work will be considered as provided in Article 108-10.

109-4 PARTIAL PAYMENTS.

(A) General:

Partial payments will be based upon progress estimates prepared by the Engineer at least once each month on the date established by the Engineer. Partial payments may be made twice each month if in the judgment of the Engineer the amount of work performed is sufficient to warrant such payment. No partial payment will be made when the total value of work performed since the last partial payment amounts to less than $10,000.00. Partial payments will be approximate only and will be subject to correction in the final estimate and payment.

Partial payments for the lump sum design-build price shall be based on a Schedule of Payments submitted by the successful Design-Build proposer and approved by the Engineer. The Schedule of Payments shall be submitted not less than 30 calendar days after the date of award. Each item on the Schedule of Payments shall be assigned a cost and quantity and shall be identified as an activity on the project schedule. A revised Schedule of Payments shall be submitted with each update of the CPM of Record as described in Article 108-2 or when requested by the Engineer.

The Engineer will withhold an amount sufficient to cover anticipated liquidated damages as determined by the Engineer.

109-5 PAYMENT FOR MATERIAL TO BE USED IN THE WORK.

No partial payments will be made for materials to be incorporated in the work unless elsewhere provided.

109-6 PAYMENT FOR LEFTOVER MATERIALS.

Payment will be made to the Design-Builder 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 but due to revisions or elimination of items of work by the Engineer, due to changes in the scope, or due to termination of the contract are not used in the work. The Design-Builder 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-Builder shall furnish invoices and cost records to the Engineer to verify the actual cost of materials, handling charges, discounts which 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, as the case may be. Payment shall be made at the adjusted contract unit or lump sum price, as applicable, when a price adjustment or pay factor is provided for by the Specifications or as determined by the Engineer in accordance with Article 105-3. The Design-Builder shall not be paid for any work performed for which there is not a contract price, nor shall the Design-Builder 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 provisions of Section 104.

109-8 FUEL PRICE ADJUSTMENTS.

No fuel price adjustments will be made.

109-9 FINAL PAYMENT.

The Engineer will notify the Design-Builder giving the apparent liquidated damages, if any assessed. After the Design-Builder 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 provisions of the contract will be paid the Design-Builder.

109-10 DOCUMENTS REQUIRED FOR THE PROCESSING OF THE FINAL ESTIMATE.

Prior to the processing of the final estimate, the following documents shall have been submitted to and accepted by the Engineer.

1. Statement of Consent of Surety on the contract bonds for payment of money due the Design-Builder.
2. Affidavit of the Design-Builder that all obligations and debts arising out of the construction have been satisfied, or affidavit which shall include a list of obligations not satisfied.
3. Written notice that the Design-Builder 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.
4. Any other documents that are required by the contract such as completed Form PR-47 and all reports, statements, and other information necessary for compliance with applicable labor regulations of the Federal Highway Administration.
5. As-constructed plans.
6. Final Material Certificate

Submission of false information in the documents required by this section shall be a basis for disqualifying the Design-Builder from further bidding 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 Fixed Income Investment Fund during the month preceding the date interest becomes payable, will be paid the Design-Builder 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-Builder 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-Builder requires to submit the document(s).

SECTION 150

MAINTENANCE OF TRAFFIC

150-1 GENERAL.

The Design-Builder will be required to maintain traffic within the limits of the project, including all existing roadways, which 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-Builder begins work on the project site until acceptance of the project, including any periods during which the Design-Builder's operations are suspended, unless otherwise provided for in the contract or approved by the Engineer. The Design-Builder shall conduct his work in a safe manner, which will create a minimum amount of inconvenience to traffic.

The Design-Builder 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-Builder begins work on the project until acceptance of the project. As an exception to the above, 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 utilize traffic control devices as shown in the contract, as determined by the Engineer, or in order to conform to the provisions of this section, the work of furnishing, erecting, operating, maintaining, covering, relocating, and removing traffic control devices shall be in accordance with the provisions of Division 11 & 12.

ITEMIZED PROPOSAL FOR CONTRACT No. C 201235

May 26, 2004 2:41 pm

County: Mecklenburg

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
			ROADWAY ITEMS			
0001	0000900000-N	SP	GENERIC MISCELLANEOUS ITEM DESIGN, CONSTRUCTION &INSPEC-TION	Lump Sum	L.S.	

1441/May26/Q1.0/D 900000 /E 1 **Total Amount Of Bid For Entire Project:**

12/19/89

*AWARD LIMITS ON MULTIPLE PROJECTS

It is the desire of the Proposer to be awarded contracts, the value of which will not exceed a total of $_____, for those projects indicated below on which bids are being opened on the same date as shown in the Proposal Form. Individual projects shall be indicated by placing the project number and county in the appropriate place below. Projects not selected will not be subject to an award limit.

_____	_____
(Project Number)	(County)
_____	_____
(Project Number)	(County)
_____	_____
(Project Number)	(County)
_____	_____
(Project Number)	(County)

*If a Proposer desires to limit the total amount of work awarded to him in this letting, he shall state such limit in the space provided above in the second line of this form.

It is agreed that in the event that I am (we are) the successful Design Build Team on indicated projects, the total value of which is more that the above stipulated award limits, the Board of Transportation will award me (us) projects from among those indicated which have a total value not exceeding the award limit and which will result in the best advantage to the Department of Transportation.

_____
**Signature of Authorized Person

**Only those persons authorized to sign bids under the provisions of Article 102-8, Item 7, shall be authorized to sign this form.

LISTING OF MB & WB SUBCONTRACTORS

Sheet _____ of _____

FIRM NAME AND ADDRESS	MB OR WB	ITEM NO.	ITEM DESCRIPTION	(*) AGREED UPON UNIT PRICE	DOLLAR VOLUME OF ITEM

CONTRACT NO._____ **COUNTY**_____**FIRM**_____

LISTING OF MB & WB SUBCONTRACTORS

Sheet _____ of _____

FIRM NAME AND ADDRESS	MB OR WB	ITEM NO.	ITEM DESCRIPTION	(*) AGREED UPON UNIT PRICE	DOLLAR VOLUME OF ITEM

CONTRACT NO._____ **COUNTY**_____**FIRM**_____

LISTING OF MB & WB SUBCONTRACTORS

Sheet _____ of _____

FIRM NAME AND ADDRESS	MB OR WB	ITEM NO.	ITEM DESCRIPTION	(*) AGREED UPON UNIT PRICE	DOLLAR VOLUME OF ITEM

CONTRACT NO._____ **COUNTY**_____**FIRM**_____

LISTING OF MB & WB SUBCONTRACTORS

Sheet _____ of _____

FIRM NAME AND ADDRESS	MB OR WB	ITEM NO.	ITEM DESCRIPTION	(*) AGREED UPON UNIT PRICE	DOLLAR VOLUME OF ITEM

COST OF CONSTRUCTION WORK ONLY $ _____

(*) The Dollar Volume Shown in this Column Shall be Actual Price Agreed Upon by the Prime Contractor and the MB and/or WB Subcontractor, and These Prices will be Used to Determine the Percentage of the MB and/or WB Participation in the Contract.

Dollar Volume of MB Subcontractor.....$ _____
MB Percentage of Total Contract Bid Price.....____%
Dollar Volume of WB Subcontractor .....$_____
WB Percentage of Total Contract Bid Price..... ____%

EXECUTION OF BID, NONCOLLUSION AFFIDAVIT AND DEBARMENT CERTIFICATION

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 this bid, 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 included elsewhere in the proposal form, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

SIGNATURE OF CONTRACTOR
(If a corporation uses this sheet)

_____
(Print full name of corporation)

_____
(Address as Prequalified)

Attest_____ By_____
(Secretary) (Assistant Secretary) (President) (Vice President)
Delete inappropriate title (Asst. Vice President)
Delete inappropriate title

_____ _____
Print Signer's Name Print Signer's Name

CORPORATE SEAL

NOTE - AFFIDAVIT MUST BE NOTARIZED

Subscribed and sworn to before me this the

_____ day of _____, 20___.

_____
(Signature of Notary Public) NOTARY SEAL:

of _____County.

State of _____.

My Commission Expires: _____

EXECUTION OF BID, NONCOLLUSION AFFIDAVIT, AND DEBARMENT CERTIFICATION

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 this bid, 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 included elsewhere in the proposal form, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

SIGNATURE OF CONTRACTOR
(If a joint venture, use this sheet)

Instructions to Bidders: On Line (1), print the name of each contractor. On Line (2), print the name of one of the joint venturers and execute below in the appropriate manner and furnish in the following lines all information required by Article 102-8 of the Specifications. On Line (3), print the name of the other joint venturer and execute below in the appropriate manner and furnish all information required by said article of the Specifications. For correct form of execution and information required for execution of this sheet by an individual, see Signature Sheets 3 and 4; for a corporation, see Signature Sheet 1; and for a partnership, see Signature Sheet 5.

(1)_____ and _____
A Joint Venture

(2)_____(Seal)
(Name of Contractor)

_____

_____ By_____
Witness or Attest

_____ _____
Print Signer's Name Print Signer's Name
If a corporation, affix corporate seal:

and

(3)_____(Seal)
(Name of Contractor)

_____
(Address as Prequalified)

_____ By_____
Witness or Attest

_____ _____
Print Signer's Name Print Signer's Name
If a corporation, affix corporate seal:

NOTE - AFFIDAVIT MUST BE NOTARIZED For Line (2)

Subscribed and sworn to before me

this the _____day of _____, 20____.

_____
(Signature of Notary Public & Seal)

of _____County.

State of _____.

My Commission Expires:_____.

NOTE - AFFIDAVIT MUST BE NOTARIZED For Line (3)

Subscribed and sworn to before me

this the ____ day of _____, 20___.

_____
(Signature of Notary Public & Seal)

of _____County.

State of _____.

My Commission Expires_____.

EXECUTION OF BID, NONCOLLUSION AFFIDAVIT, AND DEBARMENT CERTIFICATION

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 this bid, 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 included elsewhere in the proposal form, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

SIGNATURE OF CONTRACTOR
(If an individual doing business under a
firm name, use this sheet)

Name of Contractor_____trading
(Print individual name)

_____
Witness

and doing business as _____
(Print firm name)

_____
Print Signer's Name

_____
(Address as Prequalified)

Signature of Contractor_____
(Individually)

_____
Print Signer's Name

NOTE - AFFIDAVIT MUST BE NOTARIZED

Subscribed and sworn to before me this the

NOTARY SEAL

_____ day of _____, 20___.

_____
(Signature of Notary Public)

of _____County.

State of _____.

My Commission Expires:_____

12/21/99

EXECUTION OF BID, NONCOLLUSION AFFIDAVIT, AND DEBARMENT CERTIFICATION

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 this bid, 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 included elsewhere in the proposal form, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

SIGNATURE OF CONTRACTOR
(If an individual doing business in his own name, use this sheet)

Name of Contractor_____
(Print)

_____
(Address as Prequalified)

_____ Signature of Contractor_____
Witness (Individually)

_____ _____
Print Signer's Name Print Signer's Name

NOTE - AFFIDAVIT MUST BE NOTARIZED

Subscribed and sworn to before me this the NOTARY SEAL

_____ day of _____, 20___.

_____
(Signature of Notary Public)

of _____County.

State of _____.

My Commission Expires:_____

12/21/99

EXECUTION OF BID, NONCOLLUSION AFFIDAVIT, AND DEBARMENT CERTIFICATION

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 this bid, 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 included elsewhere in the proposal form, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

SIGNATURE OF CONTRACTOR
(If a partnership, use this sheet)

_____
(Print Name of Partnership)

_____
(Address as Prequalified)

_____ By_____
Witness Partner

_____ _____
Print Signer's Name Print Signer's Name

NOTE - AFFIDAVIT MUST BE NOTARIZED

Subscribed and sworn to before me this the NOTARY SEAL

_____ day of _____, 20___.

_____
(Signature of Notary Public)

of _____County.

State of _____.

My Commission Expires:_____

EXECUTION OF BID, NONCOLLUSION AFFIDAVIT, AND DEBARMENT CERTIFICATION

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 this bid, 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 included elsewhere in the proposal form, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

SIGNATURE OF CONTRACTOR
(Limited Liability Company, use this sheet)

Name of Contractor_____
(Print firm name)

_____
(Address as Prequalified)

Signature of Manager_____
(Individually)

_____
Print Signer's Name

NOTE - AFFIDAVIT MUST BE NOTARIZED

Subscribed and sworn to before me this the

_____ day of _____, 20___.

NOTARY SEAL

_____
(Signature of Notary Public)

of _____County.

State of _____.

My Commission Expires:_____

2/16/99

Contract No: C201235

County: Mecklenburg

ACCEPTED BY THE
DEPARTMENT OF TRANSPORTATION

_____
Contract Officer

_____
Date

Execution of Contract and Bonds
Approved as to Form:

_____
Attorney General

DEBARMENT CERTIFICATION OF BIDDERS

Instructions & conditions for certification

1. By signing and submitting this proposal, the bidder is providing the certification set out below.

2. The inability of a bidder to provide the certification required below will not necessarily result in denial of participation in this contract. If the certification is not provided, the bidder must submit an explanation (exception) of why it cannot provide the certification set out below. The certification or explanation (exception) will be considered in connection with the Department's determination whether to award the contract. However, failure of the prospective bidder to furnish a certification or an explanation (exception) may be grounds for rejection of the bid.

3. The certification in this provision is a material representation of fact upon which reliance is placed when the Department determines whether or not to award the contract. If it is later determined that the bidder knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the Department may terminate this contract for cause of default.

4. The prospective bidder shall provide immediate written notice to the Department if at any time the bidder learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

5. 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 12540. 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.

6. The bidder agrees by submitting this bid that, should the contract be awarded, 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 contract, unless authorized by the Department.

7. The prospective bidder further agrees by submitting this proposal that it 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.

8. The prospective bidder may rely upon a certification of a prospective participant in a lower tier covered transaction that it 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.

9. 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.

10. Except for transactions authorized under paragraph 6 of these instructions, if the successful 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 to the Federal Government, the Department may terminate this transaction for cause of default.

DEBARMENT CERTIFICATION

The bidder 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 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.

Where the prospective bidder is unable to certify to any of the statements in this certification, it shall attach an explanation to this proposal.

****

IF AN EXPLANATION, AS PROVIDED IN THE ABOVE DEBARMENT CERTIFICATION, HAS BEEN ATTACHED TO THE PROPOSAL, PLEASE CHECK THE BOX SHOWN BELOW:

☐ An explanation has been attached to the proposal.