

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION 5

PROPOSAL

DATE AND TIME OF BID OPENING: July 23, 2014 AT 2:00 P.M.

CONTRACT ID: DE00090

WBS ELEMENT NO.: 38688.3.FS4

FEDERAL AID NO.: IMS-085-47(124)

COUNTY: Vance and Warren Counties

TIP NO.: I-0914BC

ROUTE NO.: I-85

LOCATION: I-85 FROM US 158 WEST TO VIRGINIA STATE LINE

TYPE OF WORK: COMMUNICATIONS CABLE AND CONDUIT ROUTING,
DYNAMIC MESSAGE SIGNS AND CCTV CAMERA INSTALLATION

NOTICE:

ALL BIDDERS SHALL COMPLY WITH ALL APPLICABLE LAWS REGULATING THE PRACTICE OF GENERAL CONTRACTING AS CONTAINED IN CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA WHICH REQUIRES THE BIDDER TO BE LICENSED BY THE N.C. LICENSING BOARD FOR CONTRACTORS WHEN BIDDING ON ANY NON-FEDERAL AID PROJECT WHERE THE BID IS \$30,000 OR MORE, EXCEPT FOR CERTAIN SPECIALTY WORK AS DETERMINED BY THE LICENSING BOARD. BIDDERS SHALL ALSO COMPLY WITH ALL OTHER APPLICABLE LAWS REGULATING THE PRACTICES OF ELECTRICAL, PLUMBING, HEATING AND AIR CONDITIONING AND REFRIGERATION CONTRACTING AS CONTAINED IN CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA. NOTWITHSTANDING THESE LIMITATIONS ON BIDDING, THE BIDDER WHO IS AWARDED ANY FEDERAL - AID FUNDED PROJECT SHALL COMPLY WITH CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA FOR LICENSING REQUIREMENTS WITHIN 60 CALENDAR DAYS OF BID OPENING.

THIS IS AN ITS PROJECT.

BID BOND ARE NOT REQUIRED.

NAME OF BIDDER

ADDRESS OF BIDDER

**PROPOSAL FOR THE CONSTRUCTION OF
CONTRACT No. DE00090 IN VANCE AND WARREN COUNTIES, NORTH CAROLINA**

Date _____ 20 _____

**DEPARTMENT OF TRANSPORTATION,
RALEIGH, NORTH CAROLINA**

The Bidder has carefully examined the location of the proposed work to be known as Contract No. **DE00090**; has carefully examined the plans and specifications, which are acknowledged to be part of the proposal, the special provisions, the proposal, the form of contract, and the forms of contract payment bond and contract performance bond; and thoroughly understands the stipulations, requirements and provisions. The undersigned bidder agrees to bound upon his execution of the bid and subsequent award to him by the Department of Transportation in accordance with this proposal to provide the necessary contract payment bond and contract performance bond within fourteen days after the written notice of award is received by him. The undersigned Bidder further agrees to provide all necessary machinery, tools, labor, and other means of construction; and to do all the work and to furnish all materials, except as otherwise noted, necessary to perform and complete the said contract in accordance with *the 2012 Standard Specifications for Roads and Structures* by the dates(s) specified in the Project Special Provisions and in accordance with the requirements of the Engineer, and at the unit or lump sum prices, as the case may be, for the various items given on the sheets contained herein.

The Bidder shall provide and furnish all the materials, machinery, implements, appliances and tools, and perform the work and required labor to construct and complete State Highway Contract No. **DE00090** in **Vance and Warren Counties**, for the unit or lump sum prices, as the case may be, bid by the Bidder in his bid and according to the proposal, plans, and specifications prepared by said Department, which proposal, plans, and specifications show the details covering this project, and hereby become a part of this contract.

The published volume entitled *North Carolina Department of Transportation, Raleigh, Standard Specifications for Roads and Structures, January 2012* with all amendments and supplements thereto, is by reference incorporated into and made a part of this contract; that, except as herein modified, all the construction and work included in this contract is to be done in accordance with the specifications contained in said volume, and amendments and supplements thereto, under the direction of the Engineer.

If the proposal is accepted and the award is made, the contract is valid only when signed either by the Contract Officer or such other person as may be designated by the Secretary to sign for the Department of Transportation. The conditions and provisions herein cannot be changed except over the signature of the said Contract Officer or Division Engineer.

The quantities shown in the itemized proposal for the project are considered to be approximate only and are given as the basis for comparison of bids. The Department of Transportation may increase or decrease the quantity of any item or portion of the work as may be deemed necessary or expedient.

An increase or decrease in the quantity of an item will not be regarded as sufficient ground for an increase or decrease in the unit prices, nor in the time allowed for the completion of the work, except as provided for the contract.

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INSTRUCTIONS TO BIDDERS

PLEASE READ ALL INSTRUCTIONS CAREFULLY BEFORE PREPARING AND SUBMITTING YOUR BID.

All bids shall be prepared and submitted in accordance with the following requirements, except that bids may be prepared by electronic means as described elsewhere in the proposal. Failure to comply with any requirement shall cause the bid to be considered irregular and shall be grounds for rejection of the bid.

1. The bid sheet furnished by NCDOT with the proposal shall be used and shall not be altered in any manner. **DO NOT SEPARATE THE BID SHEET FROM THE PROPOSAL!**
2. All entries on the bid sheet, including signatures, shall be written in ink.
3. The Bidder shall submit a unit price for every item on the bid form. The unit prices for the various contract items shall be written in figures. *****Unit Prices shall be rounded off by the bidder to contain no more than FOUR decimal places.*****
4. An amount bid shall be entered on the bid sheet for every item. The amount bid for each item shall be determined by multiplying each unit bid by the quantity for that item, and shall be written in figures in the "Amount Bid" column of the sheet.
5. The total amount bid shall be written in figures in the proper place on the bid sheet. The total amount shall be determined by adding the amounts bid for each 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 Bidder shall initial the change in ink.
7. The bid shall be properly executed. All bids shall show the following information:
 - a. Name of individual, firm, corporation, partnership, or joint venture submitting bid.
 - b. Name and signature of individual or representative submitting bid and position or title.
 - c. Name, signature, and position or title of witness.
 - d. Federal Identification Number (or Social Security Number of Individual)
 - e. Contractor's License Number (if Applicable)
8. Bids submitted by corporations shall bear the seal of the corporation.
9. The bid shall not contain any unauthorized additions, deletions, or conditional bids.
10. The bidder shall not add any provision reserving the right to accept or reject an award, or to enter into a contract pursuant to an award.
11. **THE PROPOSAL WITH THE BID SHEET STILL ATTACHED SHALL BE PLACED IN A SEALED ENVELOPE AND SHALL HAVE BEEN DELIVERED TO AND RECEIVED IN THE DIVISION 5 ENGINEER'S OFFICE AT 2612 N. Duke Street, Durham, NC 27704 BY 2:00 P.M. ON Wednesday, July 23, 2014.**
12. The sealed bid must display the following statement on the front of the sealed envelope:

**QUOTATION FOR WBS ELEMENT 38688.3.FS4 DESCRIPTION I-85 IN Vance and Warren
Counties TO BE OPENED AT 2:00 P.M. ON Wednesday, July 23, 2014.**

13. If delivered by mail, the sealed envelope shall be placed in another sealed envelope and the outer envelope shall be addressed as follows:

**N. C. DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS, DIVISION 5
ATTN: Michael J. Kneis, PE
2612 N. Duke Street
Durham, NC 27704**

PROJECT SPECIAL PROVISIONS**GENERAL****COMPUTER BID PREPARATION (OPTIONAL):**

(7-18-11)

102

SPI 1-18

The bidder may elect to prepare his bid and MBE/WBE or DBE participation electronically by means of a personal computer. For electronic bid preparation the Contractor shall download the Expedite program from the NCDOT "Project Letting" website. Then download the appropriate .ebs electronic file of line items and quantities unique to each project from the Division Office's website.

The only entries into the program which will be permitted by the Bidder are the appropriate unit or lump sum prices for those items which must be bid in order to provide a complete bid for the project, and any MBE/WBE or DBE participation in the appropriate section of the Expedite program. When these entries have been made, the program will automatically prepare a complete set of itemized proposal sheets which will include the amount bid for the various items and the total amount bid for the project in addition to the unit or lump sum prices bid. The computer generated itemized proposal sheets shall be printed and signed by a duly authorized representative in accordance with Subarticle 102-8(A)(8). This set of itemized proposal sheets, when submitted together with the appropriate proposal, will constitute the bid and shall be delivered to the appropriate Division Office or location specified in the INSTRUCTIONS TO BIDDERS. If the Bidder submits his bid on computer generated itemized proposal sheets, bid prices shall not be written on the itemized proposal sheets bound in the proposal. The computer generated itemized proposal sheets (.ebs bid file) shall also be copied to a compact disk (CD) furnished by the Contractor and shall be submitted to the Department with the bid.

In the case of a discrepancy between the unit or lump sum prices submitted on the itemized proposal sheets and those contained on the CD furnished by the Contractor, the unit or lump sum prices submitted on the printed and signed itemized proposal sheets shall prevail.

The requirements of the INSTRUCTIONS TO BIDDERS will apply to the preparation of bids except that a bid may be submitted on computer generated itemized proposal sheets in which case the entries on the itemized proposal sheets will not be required to be in ink. Changes to any entry on the computer generated itemized proposal sheets shall be made in accordance with requirement Number (6) of the INSTRUCTIONS TO BIDDERS. When the computer generated itemized proposal sheets are not signed and received with the proposal, the bid will be considered irregular.

CONTRACT TIME AND LIQUIDATED DAMAGES:

(7-1-95) (Rev. 12-18-07)

108

SPI G10 A

The date of availability for this contract is **August 18, 2014**.

The completion date for this contract is **March 20, 2015**.

Except where otherwise provided by the contract, observation periods required by the contract will not be a part of the work to be completed by the completion date and/or intermediate contract times stated in the contract. The acceptable completion of the observation periods that extend beyond the final completion date shall be a part of the work covered by the performance and payment bonds.

The liquidated damages for this contract are **One Thousand Dollars (\$ 1000.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 1 AND LIQUIDATED DAMAGES:

(2-20-07)

108

SPI G14 A

The Contractor shall complete the required work of installing, maintaining, and removing the traffic control devices for lane closures and restoring traffic to the existing traffic pattern. The Contractor shall not close or narrow a lane of traffic on **I-85 and Ramps** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday through Friday 6:00 AM to 9:00 AM
Monday through Friday 4:00 PM to 7:00 PM

In addition, the Contractor shall not close or narrow a lane of traffic on **I-85 and Ramps**, detain and/or alter the traffic flow on or during holidays, holiday weekends, special events, or any other time when traffic is unusually heavy, including the following schedules:

HOLIDAY AND HOLIDAY WEEKEND LANE CLOSURE RESTRICTIONS

1. For **unexpected occurrence** that creates unusually high traffic volumes, as directed by the Engineer.
2. For **New Year's Day**, between the hours of **4:00 PM** December 31st and **9:00 AM** January 2nd. If New Year's Day is on a Friday, Saturday, Sunday or Monday, then until **9:00 AM** the following Tuesday.
3. For **Easter**, between the hours of **4:00 PM** Thursday and **9:00 AM** Monday.
4. For **Memorial Day**, between the hours of **4:00 PM** Friday and **9:00 AM** Tuesday.
5. For **Independence Day**, between the hours of **4:00 PM** the day before Independence Day and **9:00 AM** the day after Independence Day.

If **Independence Day** is on a Friday, Saturday, Sunday or Monday, then between the hours of **4:00 PM** the Thursday before Independence Day and **9:00 AM** the Tuesday after Independence Day.

6. For **Labor Day**, between the hours of **4:00 PM** Friday and **9:00 AM** Tuesday.

7. For **Thanksgiving Day**, between the hours of **4:00 PM** Tuesday and **9:00 AM** Monday.
8. For **Christmas**, between the hours of **4:00 PM** the Friday before the week of Christmas Day and **9:00 AM** the following Tuesday after the week of Christmas Day.

Holidays and holiday weekends shall include New Year's, Easter, Memorial Day, Independence Day, Labor Day, Thanksgiving, and Christmas. The Contractor shall schedule his work so that lane closures will not be required during these periods, unless otherwise directed by the Engineer.

The time of availability for this intermediate contract work shall be the time the Contractor begins to install all traffic control devices for lane closures according to the time restrictions listed herein.

The completion time for this intermediate contract work shall be the time the Contractor is required to complete the removal of all traffic control devices for lane closures according to the time restrictions stated above and place traffic in the existing traffic pattern.

The liquidated damages are **One Thousand Dollars (\$ 1000.00)** per fifteen minutes or portion thereof.

INTERMEDIATE CONTRACT TIME NUMBER 2 AND LIQUIDATED DAMAGES:

(2-20-07) (Rev. 10-15-13)

108

SP1 G14 E

The Contractor shall complete the required work of installing, maintaining and removing the traffic control devices for road closures and restoring traffic to the existing traffic pattern. The Contractor shall not close **I-85** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Sunday to Saturday from 5:00 AM to 12:00 Midnight

The maximum allowable time for **For Overhead Removal of DMS and DMS Structure** is **20** minutes for **I-85**. The Contractor shall reopen the travel lanes to traffic until any resulting traffic queue is depleted.

The time of availability for this intermediate contract time will be the time the Contractor begins to install traffic control devices required for the road closures according to the time restrictions stated herein.

The completion time for this intermediate contract time will be the time the Contractor is required to complete the removal of traffic control devices required for the road closures according to the time restrictions stated herein and restore traffic to the existing traffic pattern.

The liquidated damages are **Five Thousand Dollars (\$ 5000.00)** per **15** minute time period.

INTERMEDIATE CONTRACT TIME NUMBER 3 AND LIQUIDATED DAMAGES:

(2-20-07) (Rev. 6-18-13)

108

SP1 G14 H

The Contractor shall complete the work required of **Removing Existing DMS 2 and Make Operational in New Location** as shown on Sheet(s) **24**.

The date of availability for this intermediate contract time is the date the Contractor elects to render the existing sign inactive.

The completion date for this intermediate contract time is the date which is **Seven (7)** consecutive calendar days after and including the date the Contractor begins this work.

The liquidated damages are **One Thousand Dollars (\$ 1000.00)** per calendar day.

NO MAJOR CONTRACT ITEMS:

(2-19-02) (Rev. 8-21-07)

104

SP1 G31

None of the items included in this contract will be major items.

NO SPECIALTY ITEMS:

(7-1-95)

108-6

SP1 G34

None of the items included in this contract will be specialty items (see Article 108-6 of the *2012 Standard Specifications*).

FUEL PRICE ADJUSTMENT:

(11-15-05) (Rev. 2-18-14)

109-8

SP1 G43

Revise the *2012 Standard Specifications* as follows:

Page 1-83, Article 109-8, Fuel Price Adjustments, add the following:

The base index price for DIESEL #2 FUEL is \$ **2.9971** per gallon. Where any of the following are included as pay items in the contract, they will be eligible for fuel price adjustment.

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

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

| | | |
|--|---------|-------|
| Sand Asphalt Surface Course, Type _____ | Gal/Ton | 2.90 |
| Aggregate for Cement Treated Base Course | Gal/Ton | 0.55 |
| Portland Cement for Cement Treated Base Course | Gal/Ton | 0.55 |
| ____ " Portland Cement Concrete Pavement | Gal/SY | 0.245 |
| Concrete Shoulders Adjacent to ____ " Pavement | Gal/SY | 0.245 |

SCHEDULE OF ESTIMATED COMPLETION PROGRESS:

(7-15-08) (Rev. 5-20-14)

108-2

SP1 G58

The Contractor's attention is directed to the Standard Special Provision entitled *Availability of Funds Termination of Contracts* included elsewhere in this proposal. The Department of Transportation's schedule of estimated completion progress for this project as required by that Standard Special Provision is as follows:

| | | |
|------|---------------------|----------------------------------|
| 2015 | (7/01/14 - 6/30/15) | 100 % of Total Amount Bid |
|------|---------------------|----------------------------------|

The Contractor shall also furnish his own progress schedule in accordance with Article 108-2 of the *2012 Standard Specifications*. Any acceleration of the progress as shown by the Contractor's progress schedule over the progress as shown above shall be subject to the approval of the Engineer.

DISADVANTAGED BUSINESS ENTERPRISE (DIVISIONS):

(10-16-07)(Rev.12-17-13)

102-15(J)

SP1 G62

Description

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

Definitions

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

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

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

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

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

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

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

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

North Carolina Unified Certification Program (NCUCP) - A program that provides comprehensive services and information to applicants for DBE certification, such that an applicant is required to apply only once for a DBE certification that will be honored by all recipients of USDOT funds in the state and not limited to the Department of Transportation only. The Certification Program is in accordance with 49 CFR Part 26.

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

Forms and Websites Referenced in this Provision

DBE Payment Tracking System - On-line system in which the Contractor enters the payments made to DBE subcontractors who have performed work on the project.
<https://apps.dot.state.nc.us/Vendor/PaymentTracking/>

DBE-IS Subcontractor Payment Information - Form for reporting the payments made to all DBE firms working on the project. This form is for paper bid projects only.
<http://www.ncdot.org/doh/forms/files/DBE-IS.xls>

RF-1 DBE Replacement Request Form - Form for replacing a committed DBE.
<http://connect.ncdot.gov/projects/construction/Construction%20Forms/DBE%20MBE%20WBE%20Replacement%20Request%20Form.pdf>

SAF Subcontract Approval Form - Form required for approval to sublet the contract.
<http://connect.ncdot.gov/projects/construction/Construction%20Forms/Subcontract%20Approval%20Form%20Rev.%202012.zip>

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

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

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

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

Listing of DBE Subcontractors Form - Form for entering DBE subcontractors on a project that will meet this DBE goal. This form is for paper bids only.

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

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

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

DBE Goal

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

Disadvantaged Business Enterprises **0.0 %**

- (A) *If the DBE goal is more than zero*, the Contractor shall exercise all necessary and reasonable steps to ensure that DBEs participate in at least the percent of the contract as set forth above as the DBE goal.
- (B) *If the DBE goal is zero*, the Contractor shall make an effort to recruit and use DBEs during the performance of the contract. Any DBE participation obtained shall be reported to the Department.

Directory of Transportation Firms (Directory)

Real-time information is available about firms doing business with the Department and firms that are certified through NCUCP in the Directory of Transportation Firms. Only firms identified in the Directory as DBE certified shall be used to meet the DBE goal. The Directory can be found at the following link. <https://partner.ncdot.gov/VendorDirectory/default.html>

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

Listing of DBE Subcontractors

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

- (A) *If the DBE goal is more than zero,*
- (1) Bidders, at the time the bid proposal is submitted, shall submit a listing of DBE participation, including the names and addresses on *Listing of DBE Subcontractors* contained elsewhere in the contract documents in order for the bid to be considered responsive. Bidders shall indicate the total dollar value of the DBE participation for the contract.
 - (2) If bidders have no DBE participation, they shall indicate this on the *Listing of DBE Subcontractors* by entering the word "None" or the number "0." This form shall be completed in its entirety. **Blank forms will not be deemed to represent zero participation.** Bids submitted that do not have DBE participation indicated on the appropriate form will not be read publicly during the opening of bids. The Department will not consider these bids for award and the proposal will be rejected.
 - (3) The bidder shall be responsible for ensuring that the DBE is certified at the time of bid by checking the Directory of Transportation Firms. If the firm is not certified at the time of the bid-letting, that DBE's participation will not count towards achieving the DBE goal.
- (B) *If the DBE goal is zero,* entries on the *Listing of DBE Subcontractors* are not required, however any DBE participation that is achieved during the project shall be reported in accordance with requirements contained elsewhere in the special provision.

DBE Prime Contractor

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

For example, if the DBE goal is 45% and the DBE bidder will only perform 40% of the contract work, the prime will list itself at 40%, and the additional 5% shall be obtained through additional DBE participation with DBE subcontractors or documented through a good faith effort.

DBE prime contractors shall also follow Sections A or B listed under *Listing of DBE Subcontractor* just as a non-DBE bidder would.

Written Documentation – Letter of Intent

The bidder shall submit written documentation for each DBE that will be used to meet the DBE goal of the contract, indicating the bidder's commitment to use the DBE in the contract. This documentation shall be submitted on the Department's form titled *Letter of Intent*.

The documentation shall be received in the office of the Engineer no later than 12:00 noon of the sixth calendar day following opening of bids, unless the sixth day falls on Saturday, Sunday or an official state holiday. In that situation, it is due in the office of the Engineer no later than 12:00 noon on the next official state business day.

If the bidder fails to submit the Letter of Intent from each committed DBE to be used toward the DBE goal, or if the form is incomplete (i.e. both signatures are not present), the DBE participation will not count toward meeting the DBE goal. If the lack of this participation drops the commitment below the DBE goal, the Contractor shall submit evidence of good faith efforts, completed in its entirety, to the Engineer no later than 12:00 noon on the eighth calendar day following opening of bids, unless the eighth day falls on Saturday, Sunday or an official state holiday. In that situation, it is due in the office of the Engineer no later than 12:00 noon on the next official state business day.

Submission of Good Faith Effort

If the bidder fails to meet or exceed the DBE goal the apparent lowest responsive bidder shall submit to the Department documentation of adequate good faith efforts made to reach the DBE goal.

One complete set and 9 copies of this information shall be received in the office of the Engineer no later than 12:00 noon of the sixth calendar day following opening of bids, unless the sixth day falls on Saturday, Sunday or an official state holiday. In that situation, it is due in the office of the Engineer no later than 12:00 noon on the next official state business day.

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

Consideration of Good Faith Effort for Projects with DBE Goals More Than Zero

Adequate good faith efforts mean that the bidder took all necessary and reasonable steps to achieve the goal which, by their scope, intensity, and appropriateness, could reasonably be expected to obtain sufficient DBE participation. Adequate good faith efforts also mean that the bidder actively and aggressively sought DBE participation. Mere *pro forma* efforts are not considered good faith efforts.

The Department will consider the quality, quantity, and intensity of the different kinds of efforts a bidder has made. Listed below are examples of the types of actions a bidder will take in making a good faith effort to meet the goal and are not intended to be exclusive or exhaustive, nor is it intended to be a mandatory checklist.

- (A) Soliciting through all reasonable and available means (e.g. attendance at pre-bid meetings, advertising, written notices, use of verifiable electronic means through the use of the NCDOT Directory of Transportation Firms) the interest of all certified DBEs who have the capability to perform the work of the contract. The bidder must solicit this interest within at least 10 days prior to bid opening to allow the DBEs to respond to the solicitation. Solicitation shall provide the opportunity to DBEs within the Division and surrounding Divisions where the project is located. The bidder must determine with certainty if the DBEs are interested by taking appropriate steps to follow up initial solicitations.
- (B) Selecting portions of the work to be performed by DBEs in order to increase the likelihood that the DBE goals will be achieved.
 - (1) Where appropriate, break out contract work items into economically feasible units to facilitate DBE participation, even when the prime contractor might otherwise prefer to perform these work items with its own forces.
 - (2) Negotiate with subcontractors to assume part of the responsibility to meet the contract DBE goal when the work to be sublet includes potential for DBE participation (2nd and 3rd tier subcontractors).
- (C) Providing interested DBEs with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.
- (D) (1) Negotiating in good faith with interested DBEs. It is the bidder's responsibility to make a portion of the work available to DBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DBE subcontractors and suppliers, so as to facilitate DBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of DBEs that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and

evidence as to why additional agreements could not be reached for DBEs to perform the work.

- (2) A bidder using good business judgment would consider a number of factors in negotiating with subcontractors, including DBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using DBEs is not in itself sufficient reason for a bidder's failure to meet the contract DBE goal, as long as such costs are reasonable. Also, the ability or desire of a prime contractor to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Bidding contractors are not, however, required to accept higher quotes from DBEs if the price difference is excessive or unreasonable.
- (E) Not rejecting DBEs as being unqualified without sound reasons based on a thorough investigation of their capabilities. The bidder's standing within its industry, membership in specific groups, organizations, or associates and political or social affiliations (for example, union vs. non-union employee status) are not legitimate causes for the rejection or non-solicitation of bids in the bidder's efforts to meet the project goal.
- (F) Making efforts to assist interested DBEs in obtaining bonding, lines of credit, or insurance as required by the recipient or bidder.
- (G) Making efforts to assist interested DBEs in obtaining necessary equipment, supplies, materials, or related assistance or services.
- (H) Effectively using the services of available minority/women community organizations; minority/women contractors' groups; Federal, State, and local minority/women business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of DBEs. Contact within 7 days from the bid opening the Business Development Manager in the Business Opportunity and Work Force Development Unit to give notification of the bidder's inability to get DBE quotes.
- (I) Any other evidence that the bidder submits which shows that the bidder has made reasonable good faith efforts to meet the DBE goal.

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

- (1) Whether the bidder's documentation reflects a clear and realistic plan for achieving the DBE goal.
- (2) The bidders' past performance in meeting the DBE goals.
- (3) The performance of other bidders in meeting the DBE goal. For example, when the apparent successful bidder fails to meet the DBE goal, but others meet it, you may reasonably raise the question of whether, with additional reasonable efforts

the apparent successful bidder could have met the goal. If the apparent successful bidder fails to meet the DBE goal, but meets or exceeds the average DBE participation obtained by other bidders, the Department may view this, in conjunction with other factors, as evidence of the apparent successful bidder having made a good faith effort.

If the Department does not award the contract to the apparent lowest responsive bidder, the Department reserves the right to award the contract to the next lowest responsive bidder that can satisfy to the Department that the DBE goal can be met or that an adequate good faith effort has been made to meet the DBE goal.

Non-Good Faith Appeal

The Engineer will notify the contractor verbally and in writing of non-good faith. A contractor may appeal a determination of non-good faith made by the Goal Compliance Committee. If a contractor wishes to appeal the determination made by the Committee, they shall provide written notification to the Engineer. The appeal shall be made within 2 business days of notification of the determination of non-good faith.

Counting DBE Participation Toward Meeting DBE Goal

(A) Participation

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

(B) Joint Checks

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

(C) Subcontracts (Non-Trucking)

A DBE may enter into subcontracts. Work that a DBE subcontracts to another DBE firm may be counted toward the contract goal requirement. Work that a DBE subcontracts to a non-DBE firm does not count toward the contract goal requirement. If a DBE contractor or subcontractor subcontracts a significantly greater portion of the work of the contract than would be expected on the basis of standard industry practices, it shall be presumed that the DBE is not performing a commercially useful function. The DBE may present evidence to rebut this presumption to the Department. The Department's decision on the rebuttal of this presumption is subject to review by the Federal Highway Administration but is not administratively appealable to USDOT.

(D) Joint Venture

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

(E) Suppliers

A contractor may count toward its DBE requirement 60 percent of its expenditures for materials and supplies required to complete the contract and obtained from a DBE regular dealer and 100 percent of such expenditures from a DBE manufacturer.

(F) Manufacturers and Regular Dealers

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

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

Commercially Useful Function

(A) DBE Utilization

The Contractor may count toward its contract goal requirement only expenditures to DBEs that perform a commercially useful function in the work of a contract. A DBE performs a commercially useful function when it is responsible for execution of the work of the contract and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. To perform a commercially useful function, the DBE shall also be responsible with respect to materials and supplies used on the contract, for negotiating price, determining quality and quantity, ordering the material and installing (where applicable) and paying for the material itself. To determine

whether a DBE is performing a commercially useful function, the Department will evaluate the amount of work subcontracted, industry practices, whether the amount the firm is to be paid under the contract is commensurate with the work it is actually performing and the DBE credit claimed for its performance of the work, and any other relevant factors.

(B) DBE Utilization in Trucking

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

- (1) The DBE shall be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract, and there shall not be a contrived arrangement for the purpose of meeting DBE goals.
- (2) The DBE shall itself own and operate at least one fully licensed, insured, and operational truck used on the contract.
- (3) The DBE receives credit for the total value of the transportation services it provides on the contract using trucks it owns, insures, and operates using drivers it employs.
- (4) The DBE may subcontract the work to another DBE firm, including an owner-operator who is certified as a DBE. The DBE who subcontracts work to another DBE receives credit for the total value of the transportation services the subcontracted DBE provides on the contract.
- (5) The DBE may also subcontract the work to a non-DBE firm, including from an owner-operator. The DBE who subcontracts the work to a non-DBE is entitled to credit for the total value of transportation services provided by the non-DBE subcontractor not to exceed the value of transportation services provided by DBE-owned trucks on the contract. Additional participation by non-DBE subcontractors receives credit only for the fee or commission it receives as a result of the subcontract arrangement. The value of services performed under subcontract agreements between the DBE and the Contractor will not count towards the DBE contract requirement.
- (6) A DBE may lease truck(s) from an established equipment leasing business open to the general public. The lease must indicate that the DBE has exclusive use of and control over the truck. This requirement does not preclude the leased truck from working for others during the term of the lease with the consent of the DBE, so long as the lease gives the DBE absolute priority for use of the leased truck. This type of lease may count toward the DBE's credit as long as the driver is under the DBE's payroll.

- (7) Subcontracted/leased trucks shall display clearly on the dashboard the name of the DBE that they are subcontracted/leased to and their own company name if it is not identified on the truck itself. Magnetic door signs are not permitted.

DBE Replacement

When a Contractor has relied on a commitment to a DBE firm (or an approved substitute DBE firm) to meet all or part of a contract goal requirement, the contractor shall not terminate the DBE for convenience. This includes, but is not limited to, instances in which the Contractor seeks to perform the work of the terminated subcontractor with another DBE subcontractor, a non-DBE subcontractor, or with the Contractor's own forces or those of an affiliate. A DBE may only be terminated after receiving the Engineer's written approval based upon a finding of good cause for the termination.

All requests for replacement of a committed DBE firm shall be submitted to the Engineer for approval on Form RF-1 (*DBE Replacement Request*). If the Contractor fails to follow this procedure, the Contractor may be disqualified from further bidding for a period of up to 6 months.

The Contractor shall comply with the following for replacement of a committed DBE:

(A) Performance Related Replacement

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

If a replacement DBE is not found that can perform at least the same amount of work as the terminated DBE, the Contractor shall submit a good faith effort documenting the steps taken. Such documentation shall include, but not be limited to, the following:

- (1) Copies of written notification to DBEs that their interest is solicited in contracting the work defaulted by the previous DBE or in subcontracting other items of work in the contract.
- (2) Efforts to negotiate with DBEs for specific subbids including, at a minimum:
 - (a) The names, addresses, and telephone numbers of DBEs who were contacted.
 - (b) A description of the information provided to DBEs regarding the plans and specifications for portions of the work to be performed.
- (3) A list of reasons why DBE quotes were not accepted.

- (4) Efforts made to assist the DBEs contacted, if needed, in obtaining bonding or insurance required by the Contractor.
- (B) Decertification Replacement
- (1) When a committed DBE is decertified by the Department after the SAF (*Subcontract Approval Form*) has been received by the Department, the Department will not require the Contractor to solicit replacement DBE participation equal to the remaining work to be performed by the decertified firm. The participation equal to the remaining work performed by the decertified firm will count toward the contract goal requirement.
 - (2) When a committed DBE is decertified prior to the Department receiving the SAF (*Subcontract Approval Form*) for the named DBE firm, the Contractor shall take all necessary and reasonable steps to replace the DBE subcontractor with another DBE subcontractor to perform at least the same amount of work to meet the DBE goal requirement. If a DBE firm is not found to do the same amount of work, a good faith effort must be submitted to NCDOT (see A herein for required documentation).

Changes in the Work

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

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

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

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

Reports and Documentation

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

When using transportation services to meet the contract commitment, the Contractor shall submit a proposed trucking plan in addition to the SAF. The plan shall be submitted prior to beginning construction on the project. The plan shall include the names of all trucking firms proposed for use, their certification type(s), the number of trucks owned by the firm, as well as the individual truck identification numbers, and the line item(s) being performed.

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

Reporting Disadvantaged Business Enterprise Participation

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

- (A) Withholding of money due in the next partial pay estimate; or
- (B) Removal of an approved contractor from the prequalified bidders' list or the removal of other entities from the approved subcontractors list.

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

Failure on the part of the Contractor to submit the required information in the time frame specified may result in the disqualification of that contractor and any affiliate companies from further bidding until the required information is submitted.

Failure on the part of any subcontractor to submit the required information in the time frame specified may result in the disqualification of that contractor and any affiliate companies from being approved for work on future projects until the required information is submitted.

Contractors reporting transportation services provided by non-DBE lessees shall evaluate the value of services provided during the month of the reporting period only.

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

The Contractor shall report the accounting of payments on the Department's DBE-IS (*Subcontractor Payment Information*) with each invoice. Invoices will not be processed for payment until the DBE-IS is received.

Failure to Meet Contract Requirements

Failure to meet contract requirements in accordance with Subarticle 102-15(J) of the *2012 Standard Specifications* may be cause to disqualify the Contractor.

CERTIFICATION FOR FEDERAL-AID CONTRACTS:

(3-21-90)

SP1 G85

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

- (A) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- (B) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, *Disclosure Form to Report Lobbying*, in accordance with its instructions.

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

The prospective participant also agrees by submitting his or her bid or proposal that he or she shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such subrecipients shall certify and disclose accordingly.

U.S. DEPARTMENT OF TRANSPORTATION HOTLINE:

(11-22-94)

108-5

SP1 G100

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

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

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

LOCATING EXISTING UNDERGROUND UTILITIES:

(3-20-12)

105

SP1 G115

Revise the *2012 Standard Specifications* as follows:

Page 1-43, Article 105-8, line 28, after the first sentence, add the following:

Identify excavation locations by means of pre-marking with white paint, flags, or stakes or provide a specific written description of the location in the locate request.

RESOURCE CONSERVATION:

(5-21-13)

104-13

SP1 G118

In accordance with North Carolina Executive Order 156, NCGS 130A-309.14(2), and NCGS 136-28.8, it is the policy of the Department to aid in the reduction of materials that become a part of our solid waste stream, to divert materials from landfills, and to find ways to recycle and reuse materials for the benefit of the Citizens of North Carolina.

Initiate, develop and use products and construction methods that incorporate the use of recycled or solid waste products in accordance with Article 104-13 of the *2012 Standard Specifications*. Report the quantities of reused or recycled materials either incorporated in the project or diverted from landfills on the Project Construction Reuse and Recycling Reporting Form.

A location-based tool for finding local recycling facilities and the Project Construction Reuse and Recycling Reporting Form are available at:

<http://connect.ncdot.gov/resources/Environmental/Pages/North-Carolina-Recycling-Locations.aspx>

DOMESTIC STEEL:

(4-16-13)

106

SP1 G120

Revise the *2012 Standard Specifications* as follows:

Page 1-49, Subarticle 106-1(B) Domestic Steel, lines 2-7, replace the first paragraph with the following:

All steel and iron products that 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 material cost of the items involved does not exceed 0.1% of the total amount bid for the entire project or \$2,500, whichever is greater. If invoices showing the cost of the material are not provided, the amount of the bid item involving the foreign material will be used for calculations. This minimal amount of foreign produced steel and iron products

permitted for use is not applicable to high strength fasteners. Domestically produced high strength fasteners are required.

COOPERATION BETWEEN CONTRACTORS:

(7-1-95)

105-7

SP1 G133

The Contractor's attention is directed to Article 105-7 of the *2012 Standard Specifications*.

[Other Project Location-See Insert]

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

GIFTS FROM VENDORS AND CONTRACTORS:

(12-15-09)

107-1

SP1 G152

By Executive Order 24, issued by Governor Perdue, and *N.C.G.S. § 133-32*, it is unlawful for any vendor or contractor (i.e. architect, bidder, contractor, construction manager, design professional, engineer, landlord, offeror, seller, subcontractor, supplier, or vendor), to make gifts or to give favors to any State employee of the Governor's Cabinet Agencies (i.e. Administration, Commerce, Correction, Crime Control and Public Safety, Cultural Resources, Environment and Natural Resources, Health and Human Services, Juvenile Justice and Delinquency Prevention, Revenue, Transportation, and the Office of the Governor). This prohibition covers those vendors and contractors who:

- (A) Have a contract with a governmental agency; or
- (B) Have performed under such a contract within the past year; or
- (C) Anticipate bidding on such a contract in the future.

For additional information regarding the specific requirements and exemptions, vendors and contractors are encouraged to review Executive Order 24 and *N.C.G.S. § 133-32*.

Executive Order 24 also encouraged and invited other State Agencies to implement the requirements and prohibitions of the Executive Order to their agencies. Vendors and contractors should contact other State Agencies to determine if those agencies have adopted Executive Order 24.

LIABILITY INSURANCE:

(5-20-14)

SP1 G160

Revise the *2012 Standard Specifications* as follows:

Page 1-60, Article 107-15 LIABILITY INSURANCE, line 16, add the following as the second sentence of the third paragraph:

Prior to beginning services, all contractors shall provide proof of coverage issued by a workers' compensation insurance carrier, or a certificate of compliance issued by the Department of

Insurance for self-insured subcontractors, irrespective of whether having regularly in service fewer than three employees.

EMPLOYMENT:

(11-15-11) (Rev. 1-17-12)

108, 102

SP1 G184

Revise the *2012 Standard Specifications* as follows:

Page 1-20, Subarticle 102-15(O), delete and replace with the following:

(O) Failure to restrict a former Department employee as prohibited by Article 108-5.

Page 1-65, Article 108-5 Character of Workmen, Methods, and Equipment, line 32, delete all of line 32, the first sentence of the second paragraph and the first word of the second sentence of the second paragraph.

STATE HIGHWAY ADMINISTRATOR TITLE CHANGE:

(9-18-12)

SP1 G185

Revise the *2012 Standard Specifications* as follows:

Replace all references to “State Highway Administrator” with “Chief Engineer”.

BIDS OVER LIMIT:

(01-30-14)

SPD 01-400

In accordance with GS 136-28.1(b), if the total bid amount of the contract exceeds \$2.5 million, the bid will not be considered for award.

DIVISION LET CONTRACT PREQUALIFICATION:

(07-01-14)

SPD 01-410

Any firm that wishes to bid as a prime contractor shall be prequalified as a Bidder or PO Prime Contractor prior to submitting a bid. Information regarding prequalification can be found at: <https://connect.ncdot.gov/business/Prequal/Pages/default.aspx>.

CONTRACT PAYMENT AND PERFORMANCE BOND:

(01-30-14)

102-8, 102-10

SPD 01-420

A performance bond in the amount of one hundred percent (100%) of the contract amount, conditioned upon the faithful performance of the contract in accordance with specifications and conditions of the contract is required for contracts of \$500,000 or more. Such bond shall be solely for the protection of the North Carolina Department of Transportation and the State of North Carolina.

A payment bond in the amount of one hundred percent (100%) of the contract amount, conditioned upon the prompt payment for all labor or materials for which the Contractor, or his subcontractors, are liable is required for Construction contracts greater than \$500,000. The payment bond shall be solely for the protection of persons or firms furnishing materials or performing labor for this contract for which the Contractor is liable.

The successful bidder, within fourteen (14) days after notice of award, 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.

CONTRACTOR CLAIM SUBMITTAL FORM:

(2-12-14)

104-3

SPD 01-440

If the Contractor elects to file a written claim or requests an extension of contract time, it shall be submitted on the *Contractor Claim Submittal Form (CCSF)* available through the Construction Unit or at <https://connect.ncdot.gov/projects/construction/Pages/Construction-Resources.aspx> as Form CCSF under Construction Forms.

Any claims for additional compensation and/or extensions of the completion date shall be submitted to the Division Engineer in writing, with detailed justification, prior to submitting the final invoice payment. Once an invoice is received and accepted that is marked as “Final”, the Contractor shall be barred from recovery.

PROJECT SPECIAL PROVISIONS**ROADWAY****GUARDRAIL ANCHOR UNITS, TYPE 350:**

(4-20-04) (Rev. 8-16-11)

862

SP8 R65

Description

Furnish and install guardrail anchor units in accordance with the details in the plans, the applicable requirements of Section 862 of the *2012 Standard Specifications*, and at locations shown in the plans.

Materials

The Contractor may at his option, furnish any one of the guardrail anchor units or approved equal.

Guardrail anchor unit (ET-Plus) as manufactured by:

Trinity Industries, Inc.
2525 N. Stemmons Freeway
Dallas, Texas 75207
Telephone: 800-644-7976

The guardrail anchor unit (SKT 350) as manufactured by:

Road Systems, Inc.
3616 Old Howard County Airport
Big Spring, Texas 79720
Telephone: 915-263-2435

Prior to installation the Contractor shall submit to the Engineer:

- (A) FHWA acceptance letter for each guardrail anchor unit certifying it meets the requirements of NCHRP Report 350, Test Level 3, in accordance with Article 106-2 of the *2012 Standard Specifications*.
- (B) Certified working drawings and assembling instructions from the manufacturer for each guardrail anchor unit in accordance with Article 105-2 of the *2012 Standard Specifications*.

No modifications shall be made to the guardrail anchor unit without the express written permission from the manufacturer. Perform installation in accordance with the details in the plans, and details and assembling instructions furnished by the manufacturer.

Construction Methods

Guardrail end delineation is required on all approach and trailing end sections for both temporary and permanent installations. Guardrail end delineation consists of yellow reflective sheeting applied to the entire end section of the guardrail in accordance with Article 1088-3 of the *2012 Standard Specifications* and is incidental to the cost of the guardrail anchor unit.

Measurement and Payment

Measurement and payment will be made in accordance with Article 862-6 of the *2012 Standard Specifications*.

Payment will be made under:

Pay Item
Guardrail Anchor Units, Type 350

Pay Unit
Each

MATERIALS:

(2-21-12) (Rev. 5-20-14)

1000, 1002, 1005, 1024, 1050, 1056, 1074, 1078, 1080, 1081, 1086, 1084, 1087, 1092

SP10 R01

Revise the 2012 *Standard Specifications* as follows:

Page 10-1, Article 1000-1, DESCRIPTION, lines 9-10, replace the last sentence of the first paragraph with the following:

Type IL, IP, IS or IT blended cement may be used instead of Portland cement.

Page 10-1, Article 1000-1, DESCRIPTION, line 14, add the following:

Use materials which do not produce a mottled appearance through rusting or other staining of the finished concrete surface.

Page 10-5, Table 1000-1, REQUIREMENTS FOR CONCRETE, replace with the following:

| Class of Concrete | Min. Comp. Strength at 28 days | Maximum Water-Cement Ratio | | | | Consistency Max. Slump | | Cement Content | | | |
|-------------------------------|--|----------------------------|-------------------|----------------------------|-------------------|---------------------------------|--------------------|----------------|--------------|--------------|--------------|
| | | Air-Entrained Concrete | | Non Air-Entrained Concrete | | Vibrated | Non-Vibrated | Vibrated | | Non-Vibrated | |
| | | Rounded Aggregate | Angular Aggregate | Rounded Aggregate | Angular Aggregate | | | Min. | Max. | Min. | Max. |
| <i>Units</i> | <i>psi</i> | | | | | <i>inch</i> | <i>inch</i> | <i>lb/cy</i> | <i>lb/cy</i> | <i>lb/cy</i> | <i>lb/cy</i> |
| AA | 4,500 | 0.381 | 0.426 | - | - | 3.5 | - | 639 | 715 | - | - |
| AA Slip Form | 4,500 | 0.381 | 0.426 | - | - | 1.5 | - | 639 | 715 | - | - |
| Drilled Pier | 4,500 | - | - | 0.450 | 0.450 | - | 5-7 dry 7-9 wet | - | - | 640 | 800 |
| A | 3,000 | 0.488 | 0.532 | 0.550 | 0.594 | 3.5 | 4 | 564 | - | 602 | - |
| B | 2,500 | 0.488 | 0.567 | 0.559 | 0.630 | 2.5 | 4 | 508 | - | 545 | - |
| B Slip Formed | 2,500 | 0.488 | 0.567 | - | - | 1.5 | - | 508 | - | - | - |
| Sand Lightweight | 4,500 | - | 0.420 | - | - | 4 | - | 715 | - | - | - |
| Latex Modified | 3,000 7 day | 0.400 | 0.400 | - | - | 6 | - | 658 | - | - | - |
| Flowable Fill excavatable | 150 max. at 56 days | as needed | as needed | as needed | as needed | - | Flowable | - | - | 40 | 100 |
| Flowable Fill non-excavatable | 125 | as needed | as needed | as needed | as needed | - | Flowable | - | - | 100 | as needed |
| Pavement | 4,500 design, field 650 flexural, design only | 0.559 | 0.559 | - | - | 1.5 slip form 3.0 hand place | - | 526 | - | - | - |
| Precast | See Table 1077-1 | as needed | as needed | - | - | 6 | as needed | as needed | as needed | as needed | as needed |
| Prestress | per contract | See Table 1078-1 | See Table 1078-1 | - | - | 8 | - | 564 | as needed | - | - |

Page 10-1, Article 1000-2, MATERIALS, line 16; Page 10-8, Subarticle 1000-7(A), MATERIALS, line 8; and Page 10-18, Article 1002-2, MATERIALS, line 9, add the following to the table of item references:

Item
Type IL Blended Cement

Section
1024-1

Page 10-23, Table 1005-1, AGGREGATE GRADATION-COARSE AGGREGATE, replace with the following:

| TABLE 1005-1 AGGREGATE GRADATION - COARSE AGGREGATE | | | | | | | | | | | | | |
|--|-----------|---------------|-----------|-------------|-------------|-------------|-----------|-----------|------------|------------|------------|-------------------|--|
| Percentage of Total by Weight Passing | | | | | | | | | | | | | |
| Std. Size # | 2" | 1 1/2" | 1" | 3/4" | 1/2" | 3/8" | #4 | #8 | #10 | #16 | #40 | #200 | Remarks |
| 4 | 100 | 90-100 | 20-55 | 0-15 | - | 0-5 | - | - | - | - | - | A | Asphalt Plant Mix |
| 467M | 100 | 95-100 | - | 35-70 | - | 0-30 | 0-5 | - | - | - | - | A | Asphalt Plant Mix |
| 5 | - | 100 | 90-100 | 20-55 | 0-10 | 0-5 | - | - | - | - | - | A | AST, Sediment Control Stone |
| 57 | - | 100 | 95-100 | - | 25-60 | - | 0-10 | 0-5 | - | - | - | A | AST, Str. Concrete, Shoulder Drain, Sediment Control Stone |
| 57M | - | 100 | 95-100 | - | 25-45 | - | 0-10 | 0-5 | - | - | - | A | AST, Concrete Pavement |
| 6M | - | - | 100 | 90-100 | 20-55 | 0-20 | 0-8 | - | - | - | - | A | AST |
| 67 | - | - | 100 | 90-100 | - | 20-55 | 0-10 | 0-5 | - | - | - | A | AST, Str. Concrete, Asphalt Plant Mix |
| 78M | - | - | - | 100 | 98-100 | 75-100 | 20-45 | 0-15 | - | - | - | A | Asphalt Plant Mix, AST, Str. Conc, Weep Hole Drains |
| 14M | - | - | - | - | - | 100 | 35-70 | 5-20 | - | 0-8 | - | A | Asphalt Plant Mix, AST, Weep Hole Drains, Str. Concrete |
| 9 | - | - | - | - | - | 100 | 85-100 | 10-40 | - | 0-10 | - | A | AST |
| ABC | - | 100 | 75-97 | - | 55-80 | - | 35-55 | - | 25-45 | - | 14-30 | 4-12 ^B | Aggregate Base Course, Aggregate Stabilization |
| ABC (M) | - | 100 | 75-100 | - | 45-79 | - | 20-40 | - | 0-25 | - | - | 0-12 ^B | Maintenance Stabilization |
| Light-C weight | - | - | - | - | 100 | 80-100 | 5-40 | 0-20 | - | 0-10 | - | 0-2.5 | AST |

- A. See Subarticle 1005-4(A).
- B. See Subarticle 1005-4(B).
- C. For Lightweight Aggregate used in Structural Concrete, see Subarticle 1014-2(E)(6).

Page 10-46, Article 1024-1, PORTLAND CEMENT, line 33, add the following as the ninth paragraph:

Use Type IL blended cement that meets AASHTO M 240, except that the limestone content is limited to between 5 and 12% by weight and the constituents shall be interground. Class F fly ash can replace a portion of Type IL blended cement and shall be replaced as outlined in Subarticle 1000-4(I) for Portland cement. For mixes that contain cement with alkali content

between 0.6% and 1.0% and for mixes that contain a reactive aggregate documented by the Department, use a pozzolan in the amount shown in Table 1024-1.

Page 10-65, Article 1050-1, GENERAL, line 41, replace the first sentence with the following:

All fencing material and accessories shall meet Section 106.

Page 10-73, Article 1056-1 DESCRIPTION, lines 7-8, delete the first sentence of the second paragraph and replace with the following:

Use geotextile fabrics that are on the NCDOT Approved Products List.

Page 10-73, Article 1056-2 HANDLING AND STORING, line 17, replace “mechanically stabilized earth (MSE) wall faces” with “temporary wall faces”.

Page 10-74, TABLE 1056-1 GEOTEXTILE REQUIREMENTS, replace table with the following:

| TABLE 1056-1 GEOTEXTILE REQUIREMENTS | | | | | | |
|---|---|-----------------------------------|-----------------------------|-----------------------------------|---|-------------|
| Property | Requirement (MARV ^A) | | | | | Test Method |
| | Type 1 | Type 2 | Type 3 ^B | Type 4 | Type 5 ^C | |
| <i>Typical Application</i> | <i>Shoulder Drains</i> | <i>Under Rip Rap</i> | <i>Temporary Silt Fence</i> | <i>Soil Stabilization</i> | <i>Temporary Walls</i> | |
| Elongation (MD & CD) | ≥ 50% | ≥ 50% | ≤ 25% | < 50% | < 50% | ASTM D4632 |
| Grab Strength (MD & CD) | Table 1 ^D , Class 3 | Table 1 ^D , Class 1 | 100 lb | Table 1 ^D , Class 3 | - | ASTM D4632 |
| Tear Strength (MD & CD) | | | - | | - | ASTM D4533 |
| Puncture Strength | | | - | | - | ASTM D6241 |
| Ultimate Tensile Strength (MD & CD) | - | - | - | - | 2,400 lb/ft (unless required otherwise in the contract) | ASTM D4595 |
| Permittivity | Table 2 ^D , 15% to 50% <i>in Situ</i> Soil Passing No. 200 ^E | | Table 7 ^D | Table 5 ^D | 0.20 sec ⁻¹ | ASTM D4491 |
| Apparent Opening Size | | | | | No. 30 ^E | ASTM D4751 |
| UV Stability (Retained Strength) | | | | | 70% | ASTM D4355 |

- A. MARV does not apply to elongation
- B. Minimum roll width of 36" required
- C. Minimum roll width of 13 ft required
- D. AASHTO M 288
- E. US Sieve No. per AASHTO M 92

Page 10-115, Subarticle 1074-7(B), Gray Iron Castings, lines 10-11, replace with the first two sentences with the following:

Supply gray iron castings meeting all facets of AASHTO M 306 excluding proof load. Proof load testing will only be required for new casting designs during the design process, and conformance to M306 loading (40,000 lbs.) will be required only when noted on the design documents.

Page 10-126, Table 1078-1, REQUIREMENTS FOR CONCRETE, replace with the following:

| Property | 28 Day Design Compressive Strength 6,000 psi or less | 28 Day Design Compressive Strength greater than 6,000 psi |
|---|---|---|
| Maximum Water/Cementitious Material Ratio | 0.45 | 0.40 |
| Maximum Slump without HRWR | 3.5" | 3.5" |
| Maximum Slump with HRWR | 8" | 8" |
| Air Content (upon discharge into forms) | 5 + 2% | 5 + 2% |

Page 10-151, Article 1080-4 Inspection and Sampling, lines 18-22, replace (B), (C) and (D) with the following:

- (B) At least 3 panels prepared as specified in 5.5.10 of AASHTO M 300, Bullet Hole Immersion Test.
- (C) At least 3 panels of 4"x6"x1/4" for the Elcometer Adhesion Pull Off Test, ASTM D4541.
- (D) A certified test report from an approved independent testing laboratory for the Salt Fog Resistance Test, Cyclic Weathering Resistance Test, and Bullet Hole Immersion Test as specified in AASHTO M 300.
- (E) A certified test report from an approved independent testing laboratory that the product has been tested for slip coefficient and meets AASHTO M253, Class B.

Page 10-161, Subarticle 1081-1(A) Classifications, lines 29-33, delete first 3 sentences of the description for Type 2 and replace with the following:

Type 2 - A low-modulus, general-purpose adhesive used in epoxy mortar repairs. It may be used to patch spalled, cracked or broken concrete where vibration, shock or expansion and contraction are expected.

Page 10-162, Subarticle 1081-1(A) Classifications, lines 4-7, delete the second and third sentences of the description for Type 3A. **Lines 16-22,** delete Types 6A, 6B and 6C.

Page 10-162, Subarticle 1081-1(B) Requirements, lines 26-30, replace the second paragraph with the following:

For epoxy resin systems used for embedding dowel bars, threaded rods, rebar, anchor bolts and other fixtures in hardened concrete, the manufacturer shall submit test results showing that the bonding system will obtain 125% of the specified required yield strength of the fixture. Furnish certification that, for the particular bolt grade, diameter and embedment depth required, the

anchor system will not fail by adhesive failure and that there is no movement of the anchor bolt. For certification and anchorage, use 3,000 psi as the minimum Portland cement concrete compressive strength used in this test. Use adhesives that meet Section 1081.

List the properties of the adhesive on the container and include density, minimum and maximum temperature application, setting time, shelf life, pot life, shear strength and compressive strength.

Page 10-163, Table 1081-1 Properties of Mixed Epoxy Resin Systems, replace table with the following:

| Table 1081-1 Properties of Mixed Epoxy Resin Systems | | | | | | | |
|--|--------------|---------|--------|--------------|---------|---------|--------|
| Property | Type 1 | Type 2 | Type 3 | Type 3A | Type 4A | Type 4B | Type 5 |
| Viscosity-Poises at 77°F ± 2°F | Gel | 10-30 | 25-75 | Gel | 40-150 | 40-150 | 1-6 |
| Spindle No. | - | 3 | 4 | -- | 4 | 4 | 2 |
| Speed (RPM) | - | 20 | 20 | -- | 10 | 10 | 50 |
| Pot Life (Minutes) | 20-50 | 30-60 | 20-50 | 5-50 | 40-80 | 40-80 | 20-60 |
| Minimum Tensile Strength at 7 days (psi) | 1,500 | 2,000 | 4,000 | 4,000 | 1,500 | 1,500 | 4,000 |
| Tensile Elongation at 7 days (%) | 30 min. | 30 min. | 2-5 | 2-5 | 5-15 | 5-15 | 2-5 |
| Min. Compressive Strength of 2" mortar cubes at 24 hours | 3,000 (Neat) | 4,000- | 6,000- | 6,000 (Neat) | 3,000 | 3,000 | 6,000 |
| Min. Compressive Strength of 2" mortar cubes at 7 days | 5,000 (Neat) | - | - | - | - | 5,000 | - |
| Maximum Water Absorption (%) | 1.5 | 1.0 | 1.0 | 1.5 | 1.0 | 1.0 | 1.0 |
| Min. Bond Strength Slant Shear Test at 14 days (psi) | 1,500 | 1,500 | 2,000 | 2,000 | 1,500 | 1,500 | 1,500 |

Page 10-164, Subarticle 1081-1(E) Prequalification, lines 31-33, replace the second sentence of the first paragraph with the following:

Manufacturers choosing to supply material for Department jobs must submit an application through the Value Management Unit with the following information for each type and brand name:

Page 10-164, Subarticle 1081-1(E)(3), line 37, replace this subarticle with the following:

(3) Type of the material in accordance with Articles 1081-1 and 1081-4,

Page 10-165, Subarticle 1081-1(E)(6), line 1, in the first sentence of the first paragraph replace “AASHTO M 237” with “the specifications”.

Page 10-165, Subarticle 1081-1(E) Prequalification, line 9-10, delete the second sentence of the last paragraph.

Page 10-165, Subarticle 1081-1(F) Acceptance, line 14, in the first sentence of the first paragraph replace “Type 1” with “Type 3”.

Page 10-169, Subarticle 1081-3(G) Anchor Bolt Adhesives, delete this subarticle.

Page 10-170, Article 1081-3 Hot Bitumen, line 9, add the following at the end of Section 1081:

1081-4 EPOXY RESIN ADHESIVE FOR BONDING TRAFFIC MARKINGS

(A) General

This section covers epoxy resin adhesive for bonding traffic markers to pavement surfaces.

(B) Classification

The types of epoxies and their uses are as shown below:

Type I – Rapid Setting, High Viscosity, Epoxy Adhesive. This type of adhesive provides rapid adherence to traffic markers to the surface of pavement.

Type II – Standard Setting, High Viscosity, Epoxy Adhesive. This type of adhesive is recommended for adherence of traffic markers to pavement surfaces when rapid set is not required.

Type III – Rapid Setting, Low Viscosity, Water Resistant, Epoxy Adhesive. This type of rapid setting adhesive, due to its low viscosity, is appropriate only for use with embedded traffic markers.

Type IV – Standard Set Epoxy for Blade Deflecting-Type Plowable Markers.

(C) Requirements

Epoxies shall conform to the requirements set forth in AASHTO M 237.

(D) Prequalification

Refer to Subarticle 1081-1(E).

(E) Acceptance

Refer to Subarticle 1081-1(F).

Page 10-173, Article 1084-2 STEEL SHEET PILES, lines 37-38, replace first paragraph with the following:

Steel sheet piles detailed for permanent applications shall be hot rolled and meet ASTM A572 or ASTM A690 unless otherwise required by the plans. Steel sheet piles shall be coated as required by the plans. Galvanized sheet piles shall be coated in accordance with Section 1076.

Metallized sheet piles shall be metallized in accordance to the Project Special Provision “Thermal Sprayed Coatings (Metallization)” with an 8 mil, 99.9% aluminum alloy coating and a 0.5 mil seal coating. Any portion of the metallized sheet piling encased in concrete shall receive a barrier coat. The barrier coat shall be an approved waterborne coating with a low-viscosity which readily absorbs into the pores of the aluminum thermal sprayed coating.

The waterborne coating shall be applied at a spreading rate that results in a theoretical 1.5 mil dry film thickness. The manufacturer shall issue a letter of certification that the resin chemistry of the waterborne coating is compatible with the 99.9% aluminum thermal sprayed alloy and suitable for tidal water applications.

Page 10-174, Subarticle 1086-1(B)(1) Epoxy, lines 18-24, replace this subarticle with the following:

The epoxy shall meet Article 1081-4.

The 2 types of epoxy adhesive which may be used are Type I, Rapid Setting, and Type II, Standard Setting. Use Type II when the pavement temperature is above 60°F or per the manufacturer’s recommendations whichever is more stringent. Use Type I when the pavement temperature is between 50°F and 60°F or per the manufacturer’s recommendations whichever is more stringent. Epoxy adhesive Type I, Cold Set, may be used to attach temporary pavement markers to the pavement surface when the pavement temperature is between 32°F and 50°F or per the manufacturer’s recommendations whichever is more stringent.

Page 10-175, Subarticle 1086-2(E) Epoxy Adhesives, line 27, replace “Section 1081” with “Article 1081-4”.

Page 10-177, Subarticle 1086-3(E) Epoxy Adhesives, line 22, replace “Section 1081” with “Article 1081-4”.

Page 10-179, Subarticle 1087-4(A) Composition, lines 39-41, replace the third paragraph with the following:

All intermixed and drop-on glass beads shall not contain more than 75 ppm arsenic or 200 ppm lead.

Page 10-180, Subarticle 1087-4(B) Physical Characteristics, line 8, replace the second paragraph with the following:

All intermixed and drop-on glass beads shall comply with NCGS § 136-30.2 and 23 USC § 109(r).

Page 10-181, Subarticle 1087-7(A) Intermixed and Drop-on Glass Beads, line 24, add the following after the first paragraph:

Use X-ray Fluorescence for the normal sampling procedure for intermixed and drop-on beads, without crushing, to check for any levels of arsenic and lead. If any arsenic or lead is detected, the sample shall be crushed and repeat the test using X-ray Fluorescence. If the X-ray Fluorescence test shows more than a LOD of 5 ppm, test the beads using United States Environmental Protection Agency Method 6010B, 6010C or 3052 for no more than 75 ppm arsenic or 200 ppm lead.

Page 10-204, Subarticle 1092-2(A) Performance and Test Requirements, replace **Table 1092-3 Minimum Coefficient of Retroreflection for NC Grade A** with the following:

| Observation Angle, degrees | Entrance Angle, degrees | White | Yellow | Green | Red | Blue | Fluorescent Yellow Green | Fluorescent Yellow |
|-----------------------------------|--------------------------------|--------------|---------------|--------------|------------|-------------|---------------------------------|---------------------------|
| 0.2 | -4.0 | 525 | 395 | 52 | 95 | 30 | 420 | 315 |
| 0.2 | 30.0 | 215 | 162 | 22 | 43 | 10 | 170 | 130 |
| 0.5 | -4.0 | 310 | 230 | 31 | 56 | 18 | 245 | 185 |
| 0.5 | 30.0 | 135 | 100 | 14 | 27 | 6 | 110 | 81 |
| 1.0 | -4.0 | 120 | 60 | 8 | 16 | 3.6 | 64 | 48 |
| 1.0 | 30.0 | 45 | 34 | 4.5 | 9 | 2 | 36 | 27 |

PROJECT SPECIAL PROVISIONS

TRAFFIC CONTROL

Law Enforcement:

(02/06/2013)

Description

Furnish Law Enforcement Officers and marked Law Enforcement vehicles to direct traffic in accordance with the contract.

Construction Methods

Use uniformed Law Enforcement Officers and marked Law Enforcement vehicles equipped with blue lights mounted on top of the vehicle, and Law Enforcement vehicle emblems to direct or control traffic as required by the plans or by the Engineer.

Measurement and Payment

Law Enforcement will be measured and paid for in the actual number of hours that each Law Enforcement Officer is provided during the life of the project as approved by the Engineer. There will be no direct payment for marked Law Enforcement vehicles as they are considered incidental to the pay item.

Payment will be made under:

Pay Item

Law Enforcement

Pay Unit

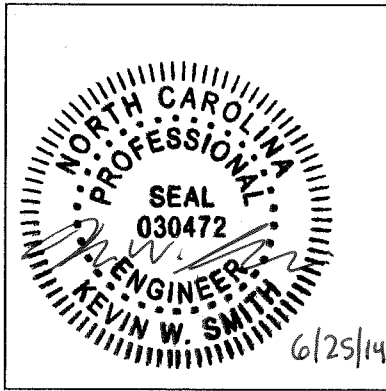
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John S. Kite, Jr.
2/4/14

PROJECT SPECIAL PROVISIONS

INTELLIGENT TRANSPORTATION SYSTEMS



I-0914BC
INTELLIGENT TRANSPORTATION SYSTEMS
CCTV AND DMS INSTALLATIONS

FINAL
PROJECT SPECIAL PROVISIONS

Not Valid Unless Signed

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1. GENERAL REQUIREMENTS

1.1.DESCRPTION

A. General

Conform to these Project Special Provisions, Project Plans, and the *2012 Standard Specifications for Roads and Structures* (also referred to hereinafter as the “Standard Specifications”). The current edition of these specifications and publications in effect on the date of advertisement will apply.

In the event of a conflict between these Project Special Provisions and the Standard Specifications, these Project Special Provisions govern.

B. Scope

The scope of this project includes the installation new fiber optic cable communications and the installation and integration of two (2) new pedestal mount dynamic message signs (DMS), fifteen (15) new closed circuit television (CCTV) cameras, one (1) existing highway advisory radio (HAR), and one (1) existing flashing beacon assembly. In addition, one (1) existing DMS will be removed from an existing overhead span structure and installed on a new pedestal mount structure. New fiber optic cables will be installed in new underground conduit. All field devices will be integrated with new field Ethernet switches that are connected by new fiber optic cables. Those devices not on the new fiber optic cable routing will be integrated with Department-furnished 4G cellular modems or new wireless radios to the nearest fiber optic connection. New electrical service will be installed at each new device, with the exception of one CCTV camera that will be powered from a modified existing electrical service. The Contractor shall coordinate with the appropriate electric utility company in the area and as noted in the Plans to establish service.

Note that the locations of each proposed device shown in the Plans are an approximation. Locate and mark proposed device locations in the field and receive approval from the Regional ITS Engineer before beginning construction.

Integrate the new fiber optic cables that terminate in the new communications hub with a new hub Ethernet switch and Department-furnished broadband service so that the new DMS and CCTV devices as well as the existing HAR and flashing beacons are accessible and controlled by the existing computer and network hardware and software at the NCDOT Triangle Regional Transportation Management Center (TRTMC) located at 1636 Goldstar Drive in Raleigh.

Conduct device and system tests as described in these Project Special Provisions.

This project will be constructed in advance of and within the project limits of future roadway projects I-0914BA and I-0914BC. As such, this project designed device locations, conduit routing, conduit installation depths, and junction box locations to avoid impacts associated with the planned earthwork, paving, and drainage of the future roadway projects. The roadway design features shown on the Plans represent proposed work for the I-0914BA and I-0914BC projects at the time of advertisement for this Project and may change in the future.

1.2.MATERIAL

A. Qualified Products

Furnish new equipment, materials, and hardware unless otherwise required. Inscribe manufacturer's name, model number, serial number, and any additional information needed for proper identification on each piece of equipment housed in a case or housing.

Furnish factory assembled cables without adapters, unless otherwise approved by the Engineer, for all cables required to interconnect any field or central equipment.

Certain equipment listed in these Project Special Provisions must be pre-approved on the Department's ITS & Signals Qualified Products List (QPL) by the date of installation. Equipment, material, and hardware not pre-approved when required will not be allowed for use on the project.

The QPL is available on the Department's website. The QPL website is:

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

B. Plan of Record Documentation

Comply with all requirements of Article 1098-1(F) of the Standard Specifications for providing plan of record documentation for all work performed under this Project.

2. MOBILIZATION

2.1. Description

This work consists of preparatory work and operations, including but not limited to the movement of personnel, equipment, supplies, and incidentals to the project site, for the establishment of offices, buildings, and other facilities necessary for work on the project; the removal and disbandment of those personnel, equipment, supplies, incidentals, or other facilities that were established for the prosecution of work on the project; and for all other work and operations which must be performed for costs incurred prior to beginning work on the various items on the project site.

2.2. Measurement and Payment

Mobilization will be measured and paid for at the contract lump sum price.

Partial payments for Mobilization will be made with the first and second partial pay estimates paid on the contract and will be made at the rate of 50% lump sum price on each of these partial pay estimates, provided the amount bid for Mobilization does not exceed 5% of the total amount bid for the contract. Where the amount bid for Mobilization exceeds 5% of the total amount bid for the contract, 2.5% of the total amount bid will be paid on each of the first 2 partial pay estimates. That portion exceeding 5% will be paid on the last partial pay estimate.

Such price and payment includes, but is not limited to, the movement of personnel, equipment, supplies and incidentals to the project site, for the establishment of offices, buildings and other facilities necessary for work on the project; the removal and disbandment of those personnel, equipment, supplies, incidentals or other facilities that were established for the prosecution of work on the project; and for all other work and operations that shall be performed for costs incurred before beginning work on the various items on the project site.

Payment will be made under:

| Pay Item | Pay Unit |
|-------------------|-----------------|
| Mobilization..... | Lump Sum |

3. GUARDRAIL

3.1.DESCRPTION

Construct either permanent steel beam guardrail, in accordance with the contract and at the locations designated in the plans or as directed by the Engineer.

Construct cable guiderail, in accordance with the contract and at the locations designated in the plans or as directed by the Engineer.

Dismantle, remove and dispose of existing guardrail, guiderail and anchors of any type at locations shown in the plans or established by the Engineer.

3.2.MATERIAL

Refer to Sections 862-2 and 865-2 of the Standard Specifications.

3.3.CONSTRUCTION METHODS

Install guardrail in compliance with all requirements of Section 862-3 of the Standard Specifications and as shown in the Plans.

Install cable guiderail in compliance with all requirements of Section 865-3 of the Standard Specifications and as shown in the Plans.

Remove existing guardrail and guiderail in compliance with all requirements of Section 863-3 of the Standard Specifications and as shown in the Plans.

3.4.MEASUREMENT AND PAYMENT

Steel Beam Guardrail will be measured and paid in linear feet of guardrail that has been satisfactorily completed and accepted exclusive of that length of guardrail that is within the pay limits of guardrail anchors. Measurement will be made from center to center of the outermost post in the length of guardrail being measured.

Guardrail Anchor Units, Type _____ will be measured and paid as units of each completed and accepted. No separate measurement will be made of any rail, terminal sections, posts, offset blocks, concrete, hardware or any other components of the completed unit that are within the pay limits shown in the plans for the unit as all such components will be considered to be part of the unit.

There will be no measurement or payment made for guardrail delineators or guardrail end delineation as they are incidental to the other pay items in this section.

Such price and payment includes, but is not limited to, furnishing and erecting posts, offset blocks, rail, terminal sections, miscellaneous hardware and all other materials; field curving and shop curving of the rail; removing temporary guardrail; excavation; furnishing and installing additional guardrail posts and additional offset blocks; backfilling; fabrication; welding; galvanizing; and furnishing and installing guardrail delineators and end delineation.

Cable Guiderail Anchor Units will be measured and paid in units of each completed and accepted.

No separate measurement will be made of any cable, posts, concrete, hardware or any other components of the completed anchor units that are within the pay limits shown in the plans.

Remove Existing Guardrail and *Remove Existing Guiderail* will be measured and paid in linear feet of guardrail or guiderail that has been satisfactorily removed. Measurement will be made to the nearest 1.0 foot from center to center of the outermost post or end shoe center bolt in the length of the guardrail or guiderail being removed. Measurement will be made before removing the guardrail or guiderail.

The work to fill any void or fix all damage created by post or anchor removal is incidental to the work of this section.

Payment will be made under:

| Pay Item | Pay Unit |
|--|-----------------|
| Steel Beam Guardrail | Linear Foot |
| Guardrail Anchor Units, Type 350 | Each |
| Guardrail Anchor Units, Type CAT-1 | Each |
| Guardrail Anchor Units, Type B-77 | Each |
| Cable Guiderail Anchor Units | Each |
| Remove Existing Guardrail..... | Linear Foot |
| Remove Existing Guiderail..... | Linear Foot |

4. UNDERGROUND CONDUIT

4.1.DESCRPTION

Furnish and install conduit for underground installation with tracer wire, miscellaneous fittings, all necessary hardware, marker tape, backfill, graded stone, paving materials, and seeding and mulching in accordance with Section 1715 of the Standard Specifications

4.2.MATERIAL

A. General

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department's QPL.

Refer to Articles 1091-3 (Conduit), 1091-4 (Duct and Conduit Sealer), 1018-2 (Backfill), and 545-2 and 545-3 (Graded Stone) of the Standard Specifications.

Furnish underground HDPE conduits as shown in the Plans. All vertical conduits (entrance to electrical service and equipment disconnect and pole mounted cabinet) must be rigid galvanized steel.

B. Mechanical Couplings

Provide mechanical couplings that are both watertight and airtight for joining two segments of HDPE conduit of like diameter. Provide couplings designed to accommodate pneumatic methods of cable installation. Provide couplings suitable for burial underground and which meet the following requirements:

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

4.3.CONSTRUCTION METHODS

A. General

Install underground conduit in compliance with all requirements of Section 1715-3 of the Standard Specifications and the Plans.

As shown in the Plans, some conduit may need to be installed at bury depths greater than those given in the Standard Specifications to avoid existing or future drainage facilities.

B. Coupling

Install a continuous HDPE conduit free from splices or couplings between junction boxes whenever possible. However, coupling of HDPE conduit may be permitted, **subject to the prior approval of the Engineer**, in the following situations:

- To complete an underground HDPE conduit run when the end of a reel is reached. However, coupling in the middle of a directional drill operation is prohibited.
- When transitioning from directional drill to trenching or from trenching to directional drill in an underground run while maintaining the same quantity and size of conduits in the run.

Join the HDPE conduit ends by installing mechanical couplings in accordance with the manufacturer's instructions. Submit the proposed method of coupling the conduits to the Engineer for review and approval prior to joining any HDPE conduits.

A maximum of two (2) mechanical couplings shall be installed per 1,500 feet of underground conduit, unless otherwise approved by the Engineer prior to installation.

4.4.MEASUREMENT AND PAYMENT

Tracer wire will be measured along the horizontal linear feet of tracer wire furnished, installed, and accepted. Measurement will be along the approximate centerline of the conduit system. Payment will be made in linear feet. No payment will be made for excess tracer wire in junction boxes and/or cabinets.

Unpaved Trenching (qty) (size) will be measured horizontal linear feet of trenching for underground conduit installation of each type furnished, installed, and accepted. Measurement will be along the approximate centerline of the conduit system. Payment will be in linear feet.

Directional Drill (qty) (size) will be measured horizontal linear feet of directional drill for underground conduit installation furnished, installed, and accepted. Measurement will be along the approximate centerline of the conduit system. Payment will be in linear feet.

No measurement will be made of vertical segments, non-metallic conduit, metallic conduit, conduit sealing material, backfill, graded stone, paved materials, mechanical couplings, miscellaneous fittings, non-detectable marker tape, pull lines, seeding and mulching as these will be considered incidental to conduit installation.

Payment will be made under:

| Pay Item | Pay Unit |
|---|-----------------|
| Tracer Wire | Linear Foot |
| Unpaved Trenching (1) (1.5")..... | Linear Foot |
| Unpaved Trenching (2) (1.5")..... | Linear Foot |
| Unpaved Trenching (2) (2")..... | Linear Foot |
| Unpaved Trenching (2) (1.5") (2) (2") | Linear Foot |
| Directional Drill (1) (1.5") | Linear Foot |
| Directional Drill (2) (1.5") | Linear Foot |

Directional Drill (2) (2'')Linear Foot
Directional Drill (2) (1.5'') (2) (2'').....Linear Foot

5. JUNCTION BOXES

5.1.DESCRPTION

Furnish and install junction boxes (pull boxes) with covers, graded stone, grounding systems, and all necessary hardware. Comply with Section 1716 of the Standard Specifications.

5.2.MATERIAL

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department's QPL.

Refer to Article 1098-5 (Junction Boxes) and Section 545 (Graded Stone) of the Standard Specifications.

5.3.CONSTRUCTION METHODS

Install junction boxes in compliance with all requirements of Section 1716-3 of the Standard Specifications.

Install oversized heavy-duty junction boxes with minimum inside dimensions of 30" x 15" (length x width) for storage of fiber optic communications cables. Install special oversized heavy-duty junction boxes with minimum inside dimensions of 36" x 36" (length x width) for underground splice enclosures.

5.4.MEASUREMENT AND PAYMENT

Junction Box (____) will be measured and paid in actual number of junction boxes of each size and type furnished, installed, and accepted.

No measurement will be made of covers, graded stone, and grounding systems as these will be considered incidental to furnishing and installing junction boxes.

Payment will be made under:

| Pay Item | Pay Unit |
|---|-----------------|
| Junction Box (Standard Size)..... | Each |
| Junction Box (Oversized) | Each |
| Junction Box (Special Oversized Heavy-Duty) | Each |

6. WOOD POLES

6.1.DESCRPTION

Furnish and install wood poles with grounding systems and all necessary hardware in accordance with Section 1720 of the Standard Specifications.

6.2.MATERIAL

A. General

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department's QPL.

Refer to Articles 1082-3 (Treated Timber and Lumber), 1082-4 (Preservative Treatment), 1091-2 (Wire), and 1091-6 (Grounding Electrodes) of the Standard Specifications.

B. Wood Pedestal

Furnish 6" x 6" x 8' wood pedestals for electrical service equipment as shown in the Plans.

C. Wood Pole

Furnish 40' Class 4 or better wood poles for mounting electrical service equipment as shown in the Plans.

D. CCTV Wood Pole

Furnish Class 3 or better wood poles to mount CCTV cameras and cabinets that are a minimum of 60' long to permit the CCTV camera to be mounted 45 feet above the ground at the pole.

6.3.CONSTRUCTION METHOD

Install wood poles and wood posts in compliance with all requirements of Section 1720-3 of the Standard Specifications.

6.4.MEASUREMENT AND PAYMENT

Wood Pedestal will be measured and paid as the actual number of 8' wood pedestals furnished, installed, and accepted.

Wood Pole will be measured and paid as the actual number of 40' wood poles furnished, installed, and accepted.

CCTV Wood Pole will be measured and paid as the actual number of 60' wood poles furnished, installed, and accepted.

No measurement will be made for installing grounding systems as these will be incidental to furnishing and installing poles.

Payment will be made under:

| Pay Item | Pay Unit |
|---------------------|-----------------|
| Wood Pedestal | Each |
| Wood Pole..... | Each |

CCTV Wood PoleEach

7. RISER ASSEMBLIES

7.1.DESCRPTION

Furnish and install riser assemblies with clamp-on, aluminum weatherheads or heat shrink tubing, galvanized pole attachment fittings and all necessary hardware.

7.2.MATERIAL

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department's QPL.

Refer to 1091-2 (Wire), 1091-3 (Rigid Metallic Conduit), 1091-6 (Grounding Electrodes), 1098-4 (Riser Sealing Devices), and 1098-6 (Pole Line Hardware) of the Standard Specifications.

7.3.CONSTRUCTION METHOD

Install riser assemblies in compliance with all requirements of Section 1722-3 of the Standard Specifications.

7.4.MEASUREMENT AND PAYMENT

___" *Riser with* ___ will be measured and paid as the actual number of risers of each type and size furnished, installed and accepted. No measurement will be made of weatherheads, heat shrink tubing or pole attachment fittings as these will be incidental to furnishing and installing risers.

Payment will be made under:

| Pay Item | Pay Unit |
|------------------------------------|-----------------|
| 1.25" Riser with Weatherhead | Each |

8. FIBER-OPTIC CABLE

8.1.DESCRPTION

Furnish and install single mode fiber-optic (SMFO) communications cable and drop cable assemblies with grounding systems, fiber-optic cable storage racks (snow shoes), communications cable identification markers, lashing wire, and all necessary hardware.

8.2.MATERIAL

Furnish material, equipment, and hardware under this section that is pre-approved on the Department's QPL.

Refer to Articles 1098-10(A) (SMFO Communications Cable), 1098-10(C) (Communications Cable Identification Markers), 1098-10(D) (Fiber-Optic Cable Storage Guides), and 1098-6 (Pole Line Hardware) of the Standard Specifications.

Provide communications cable identification markers with 919-477-2914 as the contact telephone number.

8.3.CONSTRUCTION METHODS

Install fiber-optic cable in compliance with all requirements of Section 1730-3 of the Standard Specifications.

Do not install any communications cables in the same conduit or junction box as power cables.

Store 30 feet of each fiber optic cable entering a junction box. Store 100 feet of each fiber optic cable being spliced in an underground splice enclosure located in a junction box. Coil all stored cable in the bottom of the junction box and in a manner that does not violate the maximum bending radius of the cable.

8.4.MEASUREMENT AND PAYMENT

Communications cable (____-fiber) will be measured and paid as the actual linear feet of fiber-optic cable of each fiber count furnished, installed, and accepted. Measurement will be made by calculating the difference in length markings located on outer jacket from start of run to end of run for each run. Terminate all fibers before determining length of cable run.

Drop Cable will be measured and paid as linear feet of fiber-optic drop cable (12-fiber) assemblies furnished, installed and accepted. Sag and vertical segments will not be paid as these distances are incidental to the installation of drop cable assemblies.

No measurement will be made for terminating, splicing, and testing fiber-optic cable, communications cable identification markers, or fiber-optic cable storage racks, as these will be considered incidental to the installation of fiber-optic cable.

Payment will be made under:

| Pay Item | Pay Unit |
|---------------------------------------|-----------------|
| Communications Cable (48-Fiber) | Linear Foot |
| Drop Cable | Linear Foot |

9. DELINEATOR MARKERS

9.1.DESCRPTION

Furnish and install delineator markers with all necessary hardware.

9.2.MATERIALS

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department's QPL. Refer to Article 1098-13 (Delineator Markers) of the Standard Specifications.

Provide delineator markers with 919-477-2914 as the contact telephone number.

9.3.CONSTRUCTION METHODS

Install delineator markers in compliance with all requirements of Section 1733-3 of the Standard Specifications.

9.4.MEASUREMENT AND PAYMENT

Delineator marker will be paid for by the actual number furnished, installed, and accepted.

Payment will be made under:

| Pay Item | Pay Unit |
|-------------------------|-----------------|
| Delineator Marker | Each |

10. FIBER-OPTIC SPLICE CENTERS

10.1. DESCRIPTION

Furnish and install fiber-optic interconnect centers, fiber-optic splice enclosures, and all necessary hardware.

10.2. MATERIALS

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department's QPL.

Refer to Article 1098-11 (Fiber-Optic Splice Centers) of the Standard Specifications.

10.3. CONSTRUCTION METHODS

Install fiber-optic splice centers, perform termination and splicing, and test in compliance with all requirements of Section 1731-3 of the Standard Specifications.

10.4. MEASUREMENT AND PAYMENT

Interconnect center will be measured and paid as the actual number of fiber-optic interconnect centers furnished, installed, and accepted.

Splice enclosure will be measured and paid as the actual number of fiber-optic splice enclosures furnished, installed, and accepted. No measurement will be made between aerial, underground, manhole, or junction box installation of the fiber-optic splice enclosure.

No measurement will be made of splice trays, pigtails, jumpers, connector panels, testing and any corrective actions, repairs and replacements needed for exceeding maximum allowable attenuation or other defects, as these will be considered incidental to furnishing and installing fiber-optic interconnect centers and splice enclosures and modifying splice enclosures.

Payment will be made under:

| Pay Item | Pay Unit |
|--------------------------|-----------------|
| Interconnect Center..... | Each |
| Splice Enclosure..... | Each |

11. WIRELESS ETHERNET RADIO SYSTEM

11.1. DESCRIPTION

Furnish and install a spread spectrum wireless Ethernet radio system with all necessary hardware and signage in accordance with the Plans and Project Special Provisions to provide a data link between field devices. Provide a radio system with a bi-directional, full duplex communications channel between multiple “line-of-sight” antennas to the fiber optic network using license free, spread spectrum technology. Radio systems for transmission of compressed digital video shall operate at the 2.4 / 5.8 GHz frequency.

Furnish material and workmanship conforming to the *National Electrical Code* (NEC), the *National Electrical Safety Code* (NEC), Underwriter’s Laboratories (UL) or a third-party listing agency accredited by the North Carolina Department of Insurance, and all local safety codes in effect on the date of advertisement.

11.2. MATERIALS

A. 2.4/5.8 GHz Wireless Radio System:

Furnish license free 2.4/5.8 GHz wireless broadband Ethernet radio system with antennas, cabling and mounting hardware, and configuration software. Design radio modem to work in “point-to-point”, “point-to-multipoint”, “multipoint-to-point”, and “multipoint-to-multipoint” configurations. Ensure the wireless broadband Ethernet radio meets the following minimum requirements:

- Frequency – 2.4 GHz ISM & 5.8 GHz ISM, Dynamic Frequency Selection (DFS)
- Wireless Technology – OFDM and DSSS
- Range – greater than 20 Miles (LOS)
- Receiver Sensitivity (dBm) – -70 to -93
- Bandwidth – minimum of 6 Mbps at -94 dBm, capable of 54 Mbps at -74 dBm
- Interface – 10/100 Base-T Ethernet with RJ-45 connector
- Networking – STP, DHCP, NTP, Firewall and NAT, Routing, QOS, VPN, VLAN, SNMP
- Standards Compliance – 802.3, 802.11i, 802.11a
- Security – AES-CCM encryption, 64 bit and 128 bit WEP encryption, WPA, WPA2, , MAC address authentication
- Transmit Power – 23 dB, 600 mW
- Power System – Power-over-Ethernet
- Input: 100-240 AC, 50-60 Hz, Output: 18V, .4A.
- Operating Temperature – -20°F to 140°F
- Operating Humidity – Max 95% non-condensing

- Shelf mounted design

B. Wireless Repeater Standalone Radio System:

Furnish an operational wireless repeater radio system installed in a NEMA Type 3R enclosure for pole mounting. As a minimum, ensure the Wireless repeater radio meets the specifications provided above.

C. Software:

Furnish units with a Window Based™ software program that uses a GUI (Graphical User Interface) to provide “remote programming, radio configuration, remote maintenance, diagnostics and spectrum analyzer” features. Ensure the software will operate on Microsoft® Windows Operating Platforms. Provide configuration software that can be upgraded in the future at no additional charge.

Ensure the radio modem is configurable from a single location (i.e. master radio location) via supplied software (no extra cost). Furnish software supplied with drivers to allow easy set-up with all field devices that will be utilized on this project.

D. Directional Antenna (Yagi):

For 2.4 / 5.8 GHz radio systems, furnish a 13 dBd Gain directional antenna that will allow the system to function as designed.

All antennas furnished shall meet the following minimum specifications:

| | |
|---|---|
| Lightning Protection | DC Ground |
| Termination | Coaxial pigtail with a Standard N-Type Female Connector |
| Rated Wind Velocity | 125 mph |
| Rated Wind Velocity (with 0.5 inch radial ice) | 100 mph |
| Allows for Vertical or Horizontal polarization | |
| Minimum separation distance from persons installing and using an active device | 9’ |
| Minimum separation distance from other RF sources including radios and antennas | 6.5’ |
| Welded construction | |

Furnish mounting hardware with the antenna that will secure the antenna to a mounting pipe that has a 1.5” Nominal Pipe Size (approximately 2” OD pipe diameter), as recommended by the manufacturer of the antenna and as approved by the Engineer.

E. Omni Directional Antenna:

For 2.4 / 5.8 GHz radio systems, furnish a 7.5 dBd Gain omni directional antenna that will allow the system to function as designed.

All antennas furnished shall meet the following minimum specifications:

| | |
|---|---|
| Lightning Protection | DC Ground |
| Termination | Coaxial pigtail with a Standard N-Type Female Connector |
| Rated Wind Velocity | 125 mph |
| Rated Wind Velocity (with 0.5 inch radial ice) | 100 mph |
| Allows for Vertical or Horizontal polarization | |
| Minimum separation distance from persons installing and using an active device | 9" |
| Minimum separation distance from other RF sources including radios and antennas | 6.5' |
| Welded construction | |

Furnish mounting hardware with the antenna that will secure the antenna to a mounting pipe that has a 1.5" Nominal Pipe Size (approximately 2" OD pipe diameter), as recommended by the manufacturer of the antenna and as approved by the Engineer.

F. Antenna Mounting Hardware Kit:

Furnish an antenna mounting kit to support the antenna when attached to a metal pole, mast arm, or wood pole. Furnish PELCO – “Antenna Mount, Cable Astro-Brac for Yagi Antenna” or an approved equivalent.

Ensure the Antenna Mounting Hardware Kit includes a minimum of a 96" galvanized cable with stainless steel bolt with a nut and lock washer assembly on each end. Ensure the pole base plate accepts a 1 1/2" NPT aluminum pipe, and provides a surface that is a minimum of 6 3/4 inch long by 4 1/4" to provide contact with the pole. Ensure the pole base plate is designed to allow both ends of the 96" galvanized cable to be secured and tightened to the base plate. Provide a 90 degree elbow with internal treads on both ends to accommodate 1 1/2" NPT aluminum pipes. Provide a 1 1/2" * 18" long aluminum pipe threaded on both ends and a 1 1/2" * 24" aluminum pipe threaded on 1 end with an end cap.

| PELCO PART #'s | DESCRIPTION | QUANTITY |
|----------------|--|----------|
| AB-3034-96-PNC | Astro-Brac Clamp Kit, 1 1/2" NPS, Galv Cable, Alum | 1 |
| AB-0260 | TUBE CAP, PLASTIC | 1 |
| SE-0436-18 | NIPPLE, 1 1/2" x 18" LONG, ALUM, THREADED ON BOTH ENDS | 1 |
| SE-0457-DS-PNC | ELL, SERRATED, 1 1/2", DOUBLE SET SCREW, DIE CAST ALUM | 1 |
| SE-0326-24 | SUPPORT TUBE, SCH 40, 1 1/2" NPS x 24" LONG, ALUM, THREADED ON ONE END | 1 |

G. Coaxial Cable:

Furnish 400 Series coaxial cable to provide a link between the antenna and the lightning arrestor that meets the following minimum specifications:

| | |
|---|--|
| Attenuation (dB per 100 feet) @ 900 MHz | 3.9 dB |
| Power Rating @ 900 MHz | 0.58 kW |
| Center Conductor | 0.108” Copper Clad Aluminum |
| Dielectric: Cellular PE | 0.285” |
| Shield | Aluminum Tape – 0.291” Tinned Copper Braid – 0.320” |
| Jacket | Black UV protected polyethylene |
| Bend Radius | 1” with less than 1 ohm impedance change at bend |
| Impedance | 50 ohms |
| Capacitance per foot | 23.9 pf/ft |
| End Connectors | Standard N-Type Male Connectors on both ends |

H. Standard N-Type Male Connector:

Furnish Standard N-Type Male Connector(s) of proper sizing to mate with the 400 series coaxial cable and utilize a crimping method to secure the connector to the coaxial cable. Furnish a connector that meets the following minimum specifications:

- Center Contact: Gold Plated Beryllium Copper-(spring loaded – Non-solder)
- Outer Contact: Silver Plated Brass
- Body: Silver Plated Brass
- Crimp Sleeve: Silver Plated Copper
- Dielectric: Teflon PTFE
- Water Proofing Sleeve: Adhesive Lined Polyolefin – Heat Shrink
- Attachment Size: Crimp Size 0.429” (minimum) hex

Electrical Properties:

- Impedance: 50 ohms
- Working Voltage: 1000 vrms (max)
- Insertion loss: $0.1 \times \sqrt{F}$ ghz
- VSWR: 1.25:1 (max) up to 3GHz

Provide instructions on properly installing the connector.

I. Coaxial Cable Shield Grounding and Weatherproofing Kits:

Furnish a Coaxial Cable Shield Grounding Kit containing components that will adequately bond and ground the cable shield to the pole ground. Ensure the grounding kit complies with MIL-STD-188-124A Specifications “Military Standard for Grounding, Bonding and Shielding” for coaxial cable and protects the cable from lightning currents in excess of 200kA. Ensure each kit is supplied, as a minimum, with the following:

- Preformed Strap: 24 Gauge copper strap that is a minimum of 1 5/8 inch long and is sized to mate with the 400 series coaxial cable
- Tensioning Hardware: Copper nuts and lock washers
- Grounding Lead Cable: #6 AWG, stranded, insulated copper wire
- Instructions on properly installing the shield grounding system

Furnish a Weatherproofing Kit containing components that will protect the coaxial cable shield grounding system against the ingress of moisture and prevent vibrations from loosening the connections. Ensure the weatherproofing kit is supplied, as a minimum, with the following:

- Butyl Mastic Tape: 3 3/4 inches wide by 24 inches long (approximately)

- Electrical Tape: 2 inch wide by 20 inches long (approximately)
- Instructions on properly installing the weatherproofing system

J. Lightning Arrestor:

Furnish a lightning arrestor installed in line between each antenna and its designated radio modem inside the equipment cabinet. Furnish a Polyphaser Model # DSXL-BF lightning arrestor or an approved equivalent that meets the following minimum specifications:

- Filter Type – DC Block (None gas tube design)
- Surge: 20kA, 800MHz to 2.0GHz $\leq 1.1 : 1$ VSWR
 18kA, 800MHz to 2.3GHz $\leq 1.1 : 1$ VSWR
 700MHz to 2.7GHz $\leq 1.2 : 1$ VSWR
- Insertion Loss: ≤ 0.1 dB over frequency range
- Max Power: 500 w @ 920MHz (750 W @ at 122° F)
- RF Power: 300 Watts
- Let Through Voltage: $\leq \pm 3$ Volts for 3kA @ 8/20 μ s Waveform
- Throughput energy: $\leq 0.5 \mu$ J for 3kA @ 8/20 μ s Waveform
- Temperature: -40 to 185° F Storage/Operating 122° F
- Vibration: 1G at 5 Hz up to 100Hz
- Unit Impedance: 50 Ω
- VSWR: 1.1:1
- Frequency Range: 800 MHz to 2200 MHz
- Multistrike capability
- Low strike throughput energy
- Flange mount and bulkhead mount options
- Standard N-Type Female Connector on both the surge side and protected side connectors

K. Coaxial Cable – Power Divider (Splitter):

Furnish a coaxial cable – power divider for repeater radio sites. Ensure the power divider accommodates a single primary input RF source and divides/splits the signal (power) equally between two output ports. Furnish a Telewave Inc., Model ANT-PD29 power divider or an approved equivalent that meets the following minimum specifications.

| | |
|---------------------------|-------------------------|
| Power Division | 2 – Way |
| Frequency | 900 – 1100 MHz |
| Insertion Loss | 0.22 dB |
| Impedance | 50 Ohm |
| VSWR ref. to 50 Ohm (max) | 1.3:1 |
| Max. Input Power | 500 Watts |
| Connectors | Standard N-Type Female |
| Dimension | 2.5”W x 5”L |
| Weight | 1.5 lbs (approximately) |

11.3. CONSTRUCTION METHODS

A. General

Perform a radio path Site Survey test before installing any equipment. All radio path site surveys shall be completed during full foliage conditions. Ensure the test evaluates the Signal Strength (dBm), Fade Margin (dB), Signal-to-Noise Ratio, Data Integrity (poll test), and a complete frequency spectrum scan. Ensure the radio path site survey test is performed using the supplied brand of radio equipment to be deployed. During the initial radio path signal strength test it may be determined that a repeater station may be necessary to complete the intended link. Provide the test results to the Engineer for review and approval. Submit copies of the test results and colored copies of the frequency spectrum scan along with an electronic copy of this information. The Engineer will approve final locations of antennas and any necessary repeater stations. Install a coaxial cable – power divider, antenna splitter cable and additional antenna at locations where it is determined that a dual antenna configuration is necessary to accommodate communications in multiple directions.

Install the antenna in such a manner that avoids conflicts with other utilities (separation distances in accordance with the guidelines of the NESC) and as specified in the antenna manufacturer's recommendations. Secure the antenna mounting hardware to the pole and route the coaxial cable such that no strain is placed on the N-Type Male coaxial connectors. On wood pole installations, bond the antenna mounting hardware to the pole ground using # 6 AWG bare copper wire using split bolt or compression type fitting.

Install the coaxial cable shield grounding system by carefully removing the outer jacket of the coaxial cable without damaging the cable shield. Install the shield grounding system following the cable manufacturer's recommendations. Install and weatherproof the connection using the appropriate weatherproofing materials and following the manufacturer's recommendations. On wood poles, secure the #6 AWG grounding lead cable to the pole ground using split bolt or compression type fitting or an Engineer approved method. On metal poles, secure the #6 AWG grounding lead cable to the pole using an Engineer approved method.

Do not exceed the 1-inch bend radius of the coaxial cable as it traverses from the cabinet to the antenna assembly. Connect the lightning arrestor to the coaxial cable in the equipment cabinet. Properly ground and secure the arrestor in the cabinet. Permanently label all cables entering the cabinet. Ensure the power supply for the radio system is **NOT** connected to the GFCI receptacle circuit located in the cabinet. Place a copy of all manufacturer equipment specifications and instruction and maintenance manuals in the equipment cabinet.

At certain locations it may be necessary to integrate the radio system with a fiber optic system. Follow the details shown in the fiber optic splice plans.

B. Repeater Cabinets:

Do not obstruct the sight distance of vehicles when locating and installing cabinets.

Install the pole-mounted cabinet approximately five feet from the ground line to the top of the cabinet. Secure the cabinet to the pole using 'Band-It' brackets or a method approved by the Engineer. Leave the RS-232 data interface cable in the cabinet.

11.4. MEASUREMENT AND PAYMENT

Wireless Ethernet Radio System will be measured and paid for as the actual number of wireless radio systems furnished, installed and accepted. A system is defined as a point-to-point or point-to-multipoint configuration of wireless radios that are integrated with the fiber optic network.

This item includes the appropriate sized antennas, radios, power supplies and injectors, disconnect/snap switches, signs, decals, interface cabling, coaxial cabling, lightning arrestors, radio frequency signal jumpers, coaxial cable power dividers (Splitter), coaxial cable connectors, coaxial cable shield grounding systems with weatherproofing, and labeling. Any integration between the wireless radio system and a fiber optic network, installation materials and configuration software necessary to complete this work, including the radio path Site Survey test and warranties, will be incidental.

Wireless Ethernet Repeater Standalone Radio System will be measured and paid for as the actual number of wireless repeater standalone radio systems furnished, installed and accepted.

This item includes the appropriate sized NEMA 3R cabinet, conduit, vertical risers, antennas, radios, power supplies and injectors, disconnect/snap switch, signs, decals, interface cabling, coaxial cabling, lightning arrestors, radio frequency signal jumpers, coaxial cable power dividers (Splitter), coaxial cable connectors, coaxial cable shield grounding systems with weatherproofing, and labeling. Any integration, installation materials and configuration software necessary to complete this work, including the radio path Site Survey test and warranties, will be incidental.

Payment will be made under:

| Pay Item | Pay Unit |
|---|-----------------|
| Wireless Ethernet Radio System..... | Each |
| Wireless Ethernet Repeater Standalone Radio System..... | Each |

12. SOLAR POWER ASSEMBLY

12.1. DESCRIPTION

Furnish and install new solar power assembly equipment in a NEMA Type 3R enclosure and all necessary hardware in accordance with these Project Special Provisions and the Plans. Comply with the provisions of Section 1700 of the Standard Specifications.

Furnish material and workmanship conforming to the National Electrical Code (NEC), the National Electrical Safety Code (NESC), Underwriter's Laboratories (UL) or a third-party listing agency accredited by the North Carolina Department of Insurance, and all local safety codes in effect on the date of advertisement.

12.2. MATERIALS

A. General

Furnish a Solar Power Assembly consisting of the following:

- Solar Array
- Solar Charge Controller
- Load Controller
- Battery(ies)
- NEMA 3R Equipment Cabinet
- Concrete Cabinet Pad

Ensure that DC disconnects are supplied between the Solar Array and the Solar Charge Controller, and between the Solar Charge Controller and the Battery(ies), and between the Battery(ies) and any other equipment.

B. Solar Power System Design Requirements

Provide to the Engineer for Approval, a submittal package with Engineering Calculations consisting of, as a minimum, schematic drawing, technical data sheets, and supporting documentation. Ensure the documentation demonstrates, in theory, that the battery(ies) will provide for continuous operation for a minimum of ten (10) consecutive days with no additional charging under the following conditions:

- Fully powering the Wireless Repeater Radio operating 24 hours a day with 50% of that time being in a standby (sleep) mode; and 50% of the time being in operational mode.

Provide drawings showing dimension, location of required equipment, cabinet electrical diagrams, part numbers and descriptions of required equipment and accessories to the Engineer.

C. Solar Array

Furnish solar modules made in North America and have a minimum 20 year factory warranty. The solar array should have a minimum peak output of 135 Watts. Solar modules must be UL listed, FM Class I, Div II, Group C&D approved. For the solar array, power wiring should be 10-2, stranded copper, double insulated, sunlight resistant, 600V 90C rated cable. Ensure the solar array

mount is manufactured from an aluminum alloy or stainless steel and is capable of withstanding 125 mph winds.

D. Solar Charger Controller

Furnish a Pulse Width Modulation (PWM) solar charge controller that is UL listed, with a minimum 20A solid state, low voltage disconnect. The solar charge controller must be sealed with internal temperature compensation, lightning protection, reverse polarity protection, and LED indicators. Furnish controllers with the capability of 3 functions: battery charging, load control, and diversion regulation. Controllers must be furnished with fully adjustable DIP switches and RS-232 communications port to adjust the unit's operational modes. Ensure the solar charge controller is listed as a FM Class I, Div. II, Groups ABCD device and has the CE mark.

E. Load Controller

Furnish a load controller that is identical to the solar charger controller provided as part of the solar power assembly. Configure the load controller to regulate the voltage of the assembly according to the manufacturer's recommendation.

F. Batteries

Provide a 12V gel electrolyte, non-spillable, maintenance free battery. The battery(ies) should be able to provide power for 10 days without being charged by the Solar Array. Furnish battery(ies) with a minimum operating temperature of -76 F to 140 F.

G. NEMA 3R Equipment Cabinet

Provide a NEMA 3R type Equipment Cabinet enclosure that is of a base mount design, with compartments to house the battery(ies) and electronic components separately. Ensure that the equipment installed inside the cabinet does not occupy more than 60% of the total cabinet volume.

Ensure that the battery compartment and the electronic equipment compartments are ventilated with a screen and louvered vents. Equip vents with standard-size, replaceable furnace type vent filters. Size the filter tray to adequately house and secure the filter in place. Ensure there are no obstructions on the interior face of the door to interfere with easy removal and replacement of filter.

Provide an enclosure that is fabricated with unpainted, natural, aluminum that complies with Section 7 of NEMA TS-2-1998. Ensure the equipment cabinet enclosure shell is fitted with one (1) Corbin Number 2 Key, lifting handles, exhaust ports. Provide all necessary hardware to mount the enclosure securely to the pole. Provide hardware that is stainless steel or a Department approved non-corrosive alternate including the hinges and lifting handle.

Provide roof with slope (from front to back) at a minimum ratio of 1" drop per 2 feet. Ensure roof is flush with front of the door. Ensure each exterior cabinet plane surface is constructed of a single sheet of seamless aluminum.

Provide a handle and three point latching mechanism designed to be disassembled using hand tools. Provide a shaft connecting the latching plate to the door handle by passing through the door within a bushing, bearing, or equivalent device. Provide a latching plate at least 1/8 inch thick and that mates securely with the lock bolt. Provide a lock bolt with a flat end (no bevel) and that has at least 1/4 inch of length in contact with the latching plate.

Ensure that the handle and lock are positioned so that the lock does not lie in the path of the rotating handle as the door is unlatched and that the handle points down in the latched position.

Provide a main door opening that encompasses the full frontal area of the cabinet shell. Ensure that the cabinet shell is sturdy and does not exhibit noticeable flexing, bending or distortion under normal conditions, except that a minor amount of flexing is permitted in the main door when the cabinet is open. In such case, the flexing must not result in permanent deformation of the door.

A police panel door is not required for these cabinets.

Equipment in the equipment cabinet enclosure will be shelf mounted. Provide one equipment shelf in the cabinet that extends the practical width of the cabinet. Ensure that the shelf can be moved up and down within the cabinet. Do not locate permanently mounted equipment in such a way that will restrict access to terminals. Ensure all components are arranged for easy access during servicing. When modular in construction, provide guides and positive connection devices to ensure proper pin alignment and connection.

Arrange equipment and terminals within the cabinet so that they will not interfere with the entrance, tracing and connection of conductors or other cables. Ensure all incoming and outgoing conductors are connected to terminal blocks. Ensure all field terminals are readily accessible without having to remove equipment to gain access. Ensure terminals are not located on the underside of shelf or at any other place where they are not readily visible or where they may present a hazard to personnel who might inadvertently touch them.

Provide terminal blocks that are made of electrical grade thermoplastic or thermosetting plastic. Ensure each terminal block is of closed back design and has recessed-screw terminals with molded barriers between terminals. Ensure each terminal consists of two terminal screws with removable shorting bar between them. Ensure all terminal blocks and terminals are labeled with their intended functions. Provide labels that are visible and easy to read when the terminal blocks are wired.

12.3. CONSTRUCTION METHODS

Furnish and install new solar power assemblies. Install solar power equipment as shown in the Plans. Provide wiring, disconnect, and all other required equipment as required by Article 690 of the NEC.

Mount the cabinet on a concrete pad Do not obstruct the sight distance of vehicles when locating and installing the equipment cabinet.

Ensure that the equipment cabinet along with solar array(s) and its mounting hardware are capable of surviving sustains winds of 125 MPH. Ensure the solar array(s) does not obstruct the view of traffic and that the array(s) are arranged for optimal sunlight exposure for charging of the battery(ies). Mount the array(s) at a minimum height of 25 feet above ground level.

Run field wiring from the solar power array(s) to the equipment cabinet through 1 inch riser with weatherhead and make connections inside the equipment cabinets as required. Install separate DC disconnects between the solar array and the solar charger controller and between the solar charger controller and the battery(ies), and between the battery(ies) and any other equipment. Ensure the DC disconnect allows personnel working on the system to safely isolate critical items from each other while performing maintenance and trouble shooting. Ensure that all wiring including grounding of the solar photovoltaic system meets the requirements of Article 690 of the National Electric Code (NEC) and these project special provisions.

To protect against high voltage power surges, furnish and install one grounding electrode at the equipment cabinet.

Terminate all wires using spade connectors under binding screws on terminal blocks. Label all terminal blocks and terminals for easy identification. Label all wires and harnesses for easy identification. Neatly secure all wiring and harness inside the cabinet in a method approved by the Engineer.

Provide and leave all data interface cables, installation manuals, and specifications and materials used to program any equipment in the Equipment Cabinet. Program all equipment for operation.

12.4. MEASUREMENT AND PAYMENT

Solar Power Assembly will be measured and paid as the actual number of solar power assemblies furnished, installed and accepted. No measurement will be made for solar arrays, controllers, solar power assembly equipment cabinet, install breakers, inverters, temperature sensors, concrete cabinet pad, mounting system, grounding system, conduits, risers, wiring, and hardware as these will be considered incidental to furnishing and installing the solar power assembly.

Payment will be made under:

| Pay Item | Pay Unit |
|----------------------------|-----------------|
| Solar Power Assembly | Each |

13. ELECTRICAL SERVICE

13.1. DESCRIPTION

Install new electrical service equipment as shown in the Plans. The first item of work on this project is the installation of all electrical service poles and meter base/disconnect combination panels to expedite the power service connections. Comply with the National Electrical Code (NEC), the National Electrical Safety Code (NESC), the Standard Specifications, the Project Special Provisions, and all local ordinances. All work involving electrical service shall be coordinated with the appropriate utility company and the Engineer.

13.2. MATERIAL

A. Meter Base/Disconnect Combination Panel

Furnish and install new meter base/disconnect combination panels as shown in the Plans. Provide meter base/disconnect combination panels that have a minimum of four (4) spaces in the disconnect. Furnish a single pole 15A circuit breaker at CCTV locations. Furnish a double pole 50A circuit breaker at DMS locations. Furnish a double pole 70A circuit breaker at DMS/CCTV locations. Furnish each with a minimum of 10,000 RMS symmetrical amperes short circuit current rating in a lockable NEMA 3R enclosure. Ensure meter base/ disconnect combination panel is listed as meeting UL Standard UL-67 and marked as being suitable for use as service equipment. Ensure circuit breakers are listed as meeting UL-489. Fabricate enclosure from galvanized steel and electrostatically apply dry powder paint finish, light gray in color, to yield a minimum thickness of 2.4 mils. All exterior surfaces must be powder coated steel. Provide ground bus and neutral bus with a minimum of four terminals and a minimum wire capacity range of number 12 through number 3 AWG.

Furnish NEMA Type 3R combinational panel rated 200 Ampere minimum that meets the requirements of the local utility. Provide meter base with sockets' ampere rating based on sockets being wired with a minimum of 167 degrees F insulated wire. Furnish 4 terminal, 600 volt, single phase, 3-wire meter bases that comply with the following:

- Line, Load, and Neutral Terminals accept 4/0 AWG and smaller Copper/Aluminum wire
- With or without horn bypass
- Made of galvanized steel
- Listed as meeting UL Standard US-414
- Overhead or underground service entrance specified.

Furnish 1.25" watertight hub for threaded rigid conduit with meter base.

At the main service disconnect, furnish and install UL-approved lightning arrestors that meet the following requirements:

| | |
|-----------------|------------------------------|
| Type of design | Silicon Oxide Varistor |
| Voltage | 120/240 Single Phase, 3 wire |
| Maximum current | 100,000 amps |

| | |
|--|----------------------|
| Maximum energy | 3000 joules per pole |
| Maximum number of surges | Unlimited |
| Response time one milliamp test | 5 nanoseconds |
| Response time to clamp 10,000 amps | 10 nanoseconds |
| Response time to clamp 50,000 amps | 25 nanoseconds |
| Leak current at double the rated voltage | None |
| Ground wire | Separate |

B. Equipment Cabinet Disconnect

Provide new equipment cabinet disconnects at the locations shown in the Plans. Furnish double pole 50A circuit breakers at DMS locations. Furnish single pole 15A circuit breaker at CCTV locations. Furnish panels that have a minimum of four (4) spaces in the disconnect. Furnish circuit breakers with a minimum of 10,000 RMS symmetrical amperes short circuit current rating in a lockable NEMA 3R enclosure. Ensure meter base/ disconnect combination panel is listed as meeting UL Standard UL-67 and marked as being suitable for use as service equipment. Ensure circuit breakers are listed as meeting UL-489. Fabricate enclosure from galvanized steel and electrostatically apply dry powder paint finish, light gray in color, to yield a minimum thickness of 2.4 mils. All exterior surfaces must be powder coated steel. Provide ground bus and neutral bus with a minimum of four terminals and a minimum wire capacity range of number 12 through number 3 AWG.

C. 3-Wire Copper Service Entrance Conductors

Furnish 3-wire stranded copper service entrance conductors with THWN rating. Provide conductors with black, red, and white insulation that are intended for power circuits at 600 Volts or less and comply with the following:

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

See the Plans for wire sizes and quantities.

D. 4-Wire Copper Feeder Conductors

Furnish 4-wire stranded copper feeder conductors with THWN rating for supplying power to DMS field equipment cabinets. Provide conductors with black, red, white, and green insulation that are intended for power circuits at 600 Volts or less and comply with the following:

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

See the Plans for wire sizes and quantities.

E. 3-Wire Copper Feeder Conductors

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

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

See the Plans for wire sizes and quantities.

F. Grounding System

Furnish 5/8"x10' copper clad steel grounding electrodes (ground rods), #4 AWG solid bare copper conductors, and exothermic welding kits for grounding system installations. Comply with the NEC, Standard Specifications, these Project Special Provisions, and the Plans.

G. Modify Existing Electrical Service Disconnect

Furnish one single pole 15A circuit breaker in the existing electrical service disconnect of the Visitor Center for providing service to CCTV-1151.

13.3. CONSTRUCTION METHODS

A. General

Coordinate with the Engineer and the utility company to de-energize the existing service temporarily prior to starting any modifications.

Permanently label cables at all access points using nylon tags labeled with permanent ink. Ensure each cable has a unique identifier. Label cables immediately upon installation. Use component name and labeling scheme approved by the Engineer.

B. Meter Base/Disconnect Combination Panel

Install meter base/disconnect combination panels with lightning arrestors as called for in the Plans. At all new DMS locations, route the feeder conductors from the meter base/disconnect to the DMS equipment cabinet in conduit. At all new CCTV locations, route the feeder conductors from the meter base/disconnect to the CCTV equipment cabinet in conduit. Provide rigid galvanized conduit for above ground and PVC for below ground installations.

C. Electrical Service Disconnect

Install equipment cabinet disconnects and circuit breakers as called for in the Plans. Install THWN stranded copper feeder conductors as shown in Plans between the electrical service disconnect and the equipment cabinet disconnect. Route the conductors from the equipment cabinet disconnect to the equipment cabinet in rigid galvanized steel conduit. Bond the equipment cabinet disconnect in accordance with the NEC. Ensure that the grounding system complies with the grounding requirements of these Project Special Provisions, the Standard Specifications and the Plans.

D. 3-Wire Copper Service Entrance Conductors

At locations shown in the Plans, furnish and install 3-wire THWN stranded copper service entrance conductors in 1.25 inch rigid galvanized risers as shown in the plans. Install a waterproof hub on top of the electrical service disconnect for riser entrance/exit. Size the conductors as

specified in the Plans. Comply with the Standard Specifications and Standard Drawings and all applicable electrical codes.

E. 4-Wire Copper Feeder Conductors

At locations shown in the Plans, install 4-wire THWN stranded copper feeder conductors to supply 240/120 VAC to the DMS field equipment cabinets. Size the conductors as specified in the Plans. Comply with the Standard Specifications and Standard Drawings and all applicable electrical codes.

F. 3-Wire Copper Feeder Conductors

At locations shown in the Plans, install 3-wire THWN stranded copper feeder conductors to supply 120 VAC to the CCTV field equipment cabinets. Size the conductors as specified in the Plans. Comply with the Standard Specifications and Standard Drawings and all applicable electrical codes.

G. Grounding System

Install ground rods as indicated in the Plans. Connect the #4 AWG grounding conductor to ground rods using an exothermic welding process. Test the system to ensure a ground resistance of 20-ohms or less is achieved. Drive additional ground rods as necessary or as directed by the Engineer to achieve the proper ground resistance.

H. Modify Existing Electrical Service Disconnect

For locations shown in the plans where an existing electrical service is being modified, ensure the existing electrical service has space for one additional circuit breaker in the service disconnect. All existing circuit breakers shall remain in place. Install one (1) new 15 amp circuit breaker for the CCTV cabinet in the existing service disconnect. The circuit breaker must be compatible with existing disconnect. Install new underground conduit between the service disconnect and the CCTV cabinet as shown on the Plans. Use 1.5" rigid galvanized short risers from bottom of disconnect and CCTV cabinet to connect the underground conduit. Route the new conductors from the new 15 amp circuit breaker to the CCTV cabinet through the new underground conduit and short risers. Permanently label the circuit breakers to identify which circuit servers the signal controller cabinet and which servers the CCTV cabinet.

13.4. MEASUREMENT AND PAYMENT

Meter base/disconnect combination panel will be measured and paid as the actual number of complete and functional meter base/disconnect combination panel service locations furnished, installed and accepted. Breakers, lightning arrestors, exposed vertical conduit runs to the cabinet, and any remaining hardware, fittings, and conduit bodies to connect the electrical service to the cabinet will be considered incidental to meter base/disconnect combination panels. All other required feeder conductors will be paid for separately.

Equipment cabinet disconnect will be measured and paid as the actual number of complete and functional equipment cabinet disconnects furnished, installed and accepted. Breakers, exposed vertical conduit runs to the cabinet, ground rods, ground wire and any remaining hardware and conduit to connect the equipment cabinet disconnect to the cabinet will be considered incidental to the equipment cabinet subpanel.

3-Wire copper service entrance conductors will be incidental to furnish and installing the meter base/disconnect combination panel.

4-Wire copper feeder conductors will be measured and paid as the actual linear feet of 4-wire THWN stranded copper feeder conductors furnished, installed and accepted. Payment is for all four conductors. Measurement will be for the actual linear footage of combined conductors after all terminations are complete. No separate payment will be made for each individual conductor. No separate payment will be made for different wire sizes. No payment will be made for excess wire in the cabinets.

3-Wire copper feeder conductors will be measured and paid as the actual linear feet of 3-wire THWN stranded copper feeder conductors furnished, installed and accepted. Payment is for all three conductors. Measurement will be for the actual linear footage of combined conductors after all terminations are complete. No separate payment will be made for each individual conductor. No separate payment will be made for different wire sizes. No payment will be made for excess wire in the cabinets.

5/8" X 10' grounding electrode (ground rod) will be measured and paid as the actual number of 5/8" copper clad steel ground rods furnished, installed and accepted. No separate payment will be made for exothermic welding kit as they will be considered incidental to the installation of the ground rod.

#4 solid bare grounding conductor will be measured and paid as the actual linear feet of #4 AWG solid bare copper grounding conductor furnished, installed and accepted. Measurement will be along the approximate centerline from the base of the electrical service disconnect to the last grounding electrode.

Modify existing electrical service disconnect will be measured and paid as actual number modified and tested. No measurement will be made for circuit breakers, conductors, conduit fittings, bonding, and any remaining hardware to provide power from the existing electrical service to the cabinet as these are considered incidental.

Payment will be made under:

| Pay Item | Pay Unit |
|---|-----------------|
| Meter Base/Disconnect Combination Panel | Each |
| Equipment Cabinet Disconnect..... | Each |
| 3-Wire Copper Service Entrance Conductors..... | Linear Foot |
| 4-Wire Copper Feeder Conductors | Linear Foot |
| 3-Wire Copper Feeder Conductors | Linear Foot |
| 5/8" X 10' Grounding Electrode..... | Each |
| #4 Solid Bare Grounding Conductor | Linear Foot |
| Modify Existing Electrical Service Disconnect | Each |

14. DIGITAL CCTV EQUIPMENT

14.1. DESCRIPTION

Furnish and install digital CCTV equipment described in these Project Special Provisions. All new CCTV cameras shall be fully compatible with the existing Axis P7701 video decoder units installed at the TRTMC. For compatibility with the existing *VideoPro* video management software, existing digital cameras, and existing video decoders currently in use by NCDOT in this Region, furnish Axis Q60 series CCTV cameras.

Contact the Regional ITS Engineer to confirm all CCTV locations prior to beginning construction.

14.2. MATERIAL

A. General

Furnish and install new CCTV camera assemblies at the locations shown on the Plans. Each assembly consists of the following:

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

B. Camera and Lens

1. Cameras

Furnish new charged-coupled device (CCD) color cameras. The camera must meet the following minimum requirements:

- Video Format: NTSC
- Video Resolution: 1280x720 (HDTV 720p)
- Sensor size: 1/3-inch
- Overexposure protection: The camera shall have built-in circuitry or a protection device to prevent any damage to the camera when pointed at strong light sources, including the sun
- Low light condition imaging
- Aspect Ratio: 16:9
- Wide dynamic range (WDR) operation
- Electronic image stabilization
- Automatic focus with manual override

2. Zoom Lens

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

- Focal length: 4.4mm to 132mm, 30X optical zoom, and 12X electronic zoom
- Preset positioning: 64 Presets

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

3. Communication Standards:

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

4. Networking Standards:

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

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

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

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

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

C. Camera Housing

Furnish new dome style enclosure for the CCTV assemblies. Equip each housing with mounting assembly for attachment to the CCTV camera pole. The enclosures must be equipped with a

sunshield and be fabricated from corrosion resistant aluminum and finished in a neutral color of weather resistant enamel. The enclosure must meet or exceed NEMA 4X ratings. The viewing area of the enclosure must be tempered glass.

D. Pan and Tilt Unit

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

- Pan: continuous 360 Degrees
- Tilt: up/down 180 degrees minimum
- Input voltage: 24 VAC 50/60Hz
- Motors: Two-phase induction type, continuous duty, instantaneous reversing
- Preset Positioning: 64 PTZ presets per camera

E. Control Receiver/Driver

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

- Zoom in/out
- Automatic focus with manual override
- Tilt up/down
- Automatic iris with manual override
- Pan right/left
- Minimum 64 preset positions for pan, tilt, and zoom

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

F. Cabling

Do not provide a unified composite cable for connection to the CCTV unit. Furnish an 18/2 electrical cable to power the CCTV unit. Furnish a shielded CAT6 twisted pair cable for Ethernet communications to the CCTV unit. All cables furnished shall be rated for outdoor use meeting outdoor temperature, water blocking, ultraviolet and insulation characteristics.

G. CCTV Camera Attachment to Pole

At locations shown in the Plans where new CCTV cameras are to be installed on new CCTV poles, furnish an attachment assembly for the CCTV camera unit. Use stainless steel banding

approved by the Engineer. Submit shop drawings for review and approval by the Engineer prior to installation.

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

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

H. Surge Suppression

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

Protect the electrical and Ethernet cables from the CCTV unit entering the equipment cabinet with surge protection. Provide an integrated unit that accepts unprotected electrical and Ethernet connections and outputs protected electrical and Ethernet connections. Ethernet connections shall be RJ45 with full gigabit Ethernet transmission speeds and electrical connections shall be #22-#14 AWG screw terminals. The surge protection unit shall comply with EIA/TIA568A and EIA/TIA568B standards for data transmission and automatically reset.

14.3. CONSTRUCTION METHODS

A. General

Mount CCTV camera units at a height sufficient to adequately see traffic in all directions and as approved by the Engineer. The maximum attachment height is 45 feet above ground level.

Mount the CCTV camera units such that a minimum 5 feet of clearance is maintained between the camera and the top of the pole.

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

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

B. Electrical and Mechanical Requirements

Ground all equipment as called for in the Standard Specifications, these Special Provisions, and the Plans.

Install surge protectors on all ungrounded conductors entering the CCTV enclosure. House the protectors in a small, ventilated weatherproof cabinet attached near the CCTV attachment point in a manner approved by the Engineer.

14.4. MEASUREMENT AND PAYMENT

Digital CCTV camera assembly will be measured and paid as the actual number of digital CCTV assemblies furnished, installed, integrated, and accepted. No separate measurement will be made for electrical and Ethernet cabling, connectors, CCTV camera attachment assemblies, conduit, condulets, grounding equipment, surge protectors, CCTV control software, or any other equipment or labor required to install the digital CCTV assembly.

Payment will be made under:

| Pay Item | Pay Unit |
|------------------------------------|-----------------|
| Digital CCTV Camera Assembly | Each |

15. FIELD EQUIPMENT CABINET

15.1. DESCRIPTION

Furnish 336S pole mounted or base mounted cabinets to house CCTV control and/or communications equipment. The cabinets must consist of a cabinet housing, 19-inch EIA mounting cage, and power distribution assembly (PDA #3 as described in the CALTRANS TSCES).

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

The cabinet cage must 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 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 conduits, shelving, mounting adapters, and other equipment as necessary to route cabling, mount equipment, and terminate conduit in equipment cabinet.

15.2. MATERIAL

A. Shelf Drawer

Provide a pull out, hinged-top drawer, having sliding tracks, with lockout and quick disconnect feature, such as a Vent-Rak Retractable Writing Shelf, #D-4090-13 or equivalent in the equipment cabinet. Furnish a pullout drawer that extends a minimum of 14 inches that is capable of being lifted to gain access to the interior of the drawer. Minimum interior dimensions of the drawer are to be 1 inch high, 13 inches deep, and 16 inches wide. Provide drawers capable of supporting a 40-pound device or component when fully extended.

B. Cabinet Light

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

C. Surge Protection for System Equipment

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

1. Main AC Power Input

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

- Maximum AC line voltage: 140 VAC.
- Twenty pulses of peak current, each of which must rise in 8 microseconds and fall in 20 microseconds to ½ the peak: 20000 Amperes.
- The protector must 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 must be separated by a 200 Microhenry (minimum) inductor rated to handle 10 AMP AC Service.
- The first stage clamp must be between Main Line and Ground terminals.
- The second stage clamp must be between Equipment Line Out and Equipment Neutral.
- The protector for the first and second stage clamp must have an MOV or similar solid state device rated at 20 KA and must be of a completely solid state design (i.e., no gas discharge tubes allowed).
- The Main Neutral and Equipment Neutral Out must be connected together internally and must 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 must never exceed 350 volts.
- The Protector must be epoxy-encapsulated in a flame-retardant material.
- Continuous service current: 10 Amps at 120 VAC RMS.
- The Equipment Line Out must provide power to cabinet CCTV and communications equipment and to the 24V power supply.

2. Ground Bus

Provide a neutral bus that is not connected to the earth ground or the logic ground anywhere within the cabinet. Ensure that the earth ground bus and the neutral ground bus each have ten compression type terminals, each of which can accommodate wires ranging from number 14 through number 4 AWG.

3. Uninterruptible Power Supply (UPS)

Furnish and install one rack mounted UPS in each new cabinet that meet the following minimum specifications:

Output

| | |
|----------------------------------|------------------------------|
| Output Power Capacity | 480 Watts / 750 VA |
| Max Configurable Power | 480 Watts / 750 VA |
| Nominal Output Voltage | 120V |
| Output Voltage Distortion | Less than 5% at full load |
| Output Frequency (sync to mains) | 57 - 63 Hz for 60 Hz nominal |
| Crest Factor | up to 5:1 |
| Waveform Type | Sine wave |
| Output Connections | (4) NEMA 5-15R |

Input

| | |
|--|----------------------------------|
| Nominal Input Voltage | 120V |
| Input Frequency | 50/60 Hz +/- 3 Hz (auto sensing) |
| Input Connections | NEMA 5-15P |
| Cord Length | 6 feet |
| Input voltage range for main operations | 82 - 144V |
| Input voltage adjustable range for mains operation | 75 -154 V |

Battery Type

Maintenance-free sealed Lead-Acid battery with suspended electrolyte, leak-proof.

| | |
|-----------------------|---------|
| Typical recharge time | 2 hours |
|-----------------------|---------|

Communications & Management

| | |
|-------------------|---|
| Interface Port(s) | DB-9 RS-232, USB |
| Control panel | LED status display with load and battery bar-graphs |

Surge Protection and Filtering

| | |
|---------------------|------------|
| Surge energy rating | 480 Joules |
|---------------------|------------|

Environmental

| | |
|-----------------------------|-------------|
| Operating Environment | 32 - 104 °F |
| Operating Relative Humidity | 0 - 95% |
| Storage Temperature | 5 - 113 °F |
| Storage Relative Humidity | 0 - 95% |

Conformance

Regulatory Approvals

FCC Part 15 Class A,UL 1778

15.3. CONSTRUCTION METHODS

Install base mounted cabinets as shown on the Plans. Refer to Section 1750 - Signal Cabinet Foundations of the Standard Specifications for installation requirements for the foundations.

For each field equipment cabinet installation, use stainless steel banding or other method approved by the Engineer to fasten cabinet to pole. Install field equipment cabinets so that the height to the middle of the enclosure is 4 feet from ground level. No risers shall enter the top or sides of the equipment cabinet.

Install all conduits, condulets, and attachments to equipment cabinets in a manner that preserves the minimum bending radius of cables and creates water proof connections and seals.

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

15.4. MEASUREMENT AND PAYMENT

Field equipment cabinet will be measured and paid as the actual number of field equipment cabinets furnished, installed and accepted.

No payment will be made for the UPS, cabling, connectors, cabinet attachment assemblies, conduit, condulets, risers, grounding equipment, surge protectors, or any other equipment or labor required to install the field equipment cabinet and integrate the cabinets with the CCTV and/or communications equipment.

Payment will be made under:

| Pay Item | Pay Unit |
|-------------------------------|-----------------|
| Field Equipment Cabinet | Each |

16. CABINET FOUNDATIONS

16.1. DESCRIPTION

Furnish and install cabinet foundations and all necessary hardware. Furnish either poured concrete foundations or preformed cabinet pad foundations and all necessary hardware. Obtain approval of foundation type.

16.2. MATERIALS

Refer to Articles 1000-4 (Portland Cement Concrete) and 1098-15 (Fiber-Optic Splice Centers) of the Standard Specifications.

16.3. CONSTRUCTION METHODS

Install cabinet foundations in compliance with all requirements of Section 1750-3 of the Standard Specifications.

16.4. MEASUREMENT AND PAYMENT

Signal Cabinet Foundation will be measured and paid as the actual number furnished, installed, and accepted.

Payment will be made under:

| Pay Item | Pay Unit |
|--------------------------------|-----------------|
| Signal Cabinet Foundation..... | Each |

17. DYNAMIC MESSAGE SIGN (DMS)

17.1. DESCRIPTION

DMSs used on the State Highway System shall be preapproved on the current NCDOT ITS & Signals 2012 Qualified Products List (QPL) by the date of installation. DMSs not preapproved will not be allowed for use on the project. To ensure compatibility with the existing DMS Control Software deployed in the State, furnish NTCIP compliant DMSs that are fully compatible with Daktronics, Inc. Vanguard V4 software (also referred to hereinafter as the "Control Software").

Furnish and install DMSs compliant with UL standards 48, 50, 879, and 1433.

Add and configure the new DMSs in the system using the Control Software and computer system. Furnish, install, test, integrate and make fully operational the new DMSs at locations shown in the Plans.

Contact the Regional ITS Engineer to confirm all DMS locations prior to beginning construction.

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

- Walk-In Enclosure DMS
 - Full Matrix, 27 pixel high and 90 pixels wide LED Walk-In DMS
 - Pedestal type DMS support structures and mounting hardware
- DMS controllers, Uninterruptible Power Supplies (UPS), cabinets and accessories with interconnect and power cabling and conduit
- Branch circuit conductors and related equipment
- All other equipment and incidentals required for furnishing, installing, and testing the DMS system and system components

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

17.2. MATERIALS

A. Environmental Requirements

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

Design the DMS system to comply with the requirements of Section 2.1 (Environmental and Operating Standards) of NEMA TS 4-2005.

B. Full Matrix 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 feet in advance of the DMS at an eye height of 3.5 feet along the axis.

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

1. DMS Enclosure

Comply with the requirements of Section 3 (Sign Mechanical Construction) of NEMA TS 4-2005 as it applies to walk-in enclosures. The following requirements complement TS 4-2005.

Construct the DMS with a metal walk-in enclosure excluding the face. Provide an aluminum walking platform inside the enclosure that is at least 28 inches wide. Ensure the width of the walking platform is free of obstructions to a height of 7 feet. Construct the enclosure of welded aluminum type 6061-T6, 5052-H38, 5052-H34, or of an Engineer approved alternate at least 1/8-inch thick. Perform all welding of aluminum and aluminum alloys in accordance with the latest edition of AWS D1.2, Structural Welding Code - Aluminum. Continuously weld the seams using Gas Metal Arc Welding (GMAW).

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

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

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

Do not place a manufacturer name, logo, or other information on the front face of the DMS or shield visible to the motorist.

Provide power supply monitoring circuitry to detect power failure in the DMS and to automatically report this fault to the Control Software. This requirement is in addition to reporting power failure at the controller cabinet.

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

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 +/- 10° F of the outdoor ambient temperature. Provide the DMS environmental control system with four primary subsystems as follows:

Internal Temperature Sensors – Provide the DMS with two internally mounted temperature sensors which are equipped with external thermocouples and which the field controller continuously monitors. Design the field controller to use this temperature information to determine when to activate and deactivate the environmental control systems described herein. Locate sensors on opposite ends of the upper 1/3 of the LED display matrix with their external thermocouples attached to and making contact with an LED pixel circuit board. Design the thermocouple and LED board to be easily detachable, in the event that one of the units requires

removal and replacement. Provide sensors capable of measuring temperatures from -40° F to $+185^{\circ}$ F. Design the field controller to automatically shut down the LED display whenever one or both sensors indicates that LED board temperature has exceeded $+140^{\circ}$ F, and to automatically restart the LED display whenever the temperature falls below $+130^{\circ}$ F. Design both shutdown and re-start temperature thresholds to be user-programmable. Design the field controller to report sensor temperatures and DMS shutdown/re-start events to the DMS Control Software.

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

LED Display Cooling System – Provide the DMS with an LED display cooling system which directs air across the LED display modules whenever LED board temperature exceeds a user-programmable threshold. Direct fan-forced air vertically across the backside of the entire LED display matrix using multiple ball-bearing fans. Program the field controller to activate the LED cooling fan system whenever LED board temperature exceeds $+90^{\circ}$ F and to deactivate the system whenever LED board temperature falls to $+85^{\circ}$ F. Locate cooling fans so as not to hinder removal of LED display modules and driver boards.

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

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

3. Front Panel

Protect the DMS face with contiguous, weather-tight, removable panels. These panels must be a polycarbonate material that is ultraviolet protected, have an antireflection coating, and are a minimum of 1/8- inch thick.

Furnish polycarbonate panels with the following characteristics:

- Tensile Strength, Ultimate: 10,000 PSI
- Tensile Strength, Yield: 9,300 PSI
- Tensile Strain at Break: 125%
- Tensile Modulus: 330,000 PSI
- Flexural Modulus: 330,000 PSI
- Impact Strength, Izod (1/8", notched): 17 ft-lbs/inch of notch
- Rockwell Hardness: M75, R118
- Heat Deflection Temperature Under Load: 264 PSI at 270F and 66 PSI at 288F
- Coefficient of Thermal Expansion: 3.9×10^{-5} in/in/F
- Specific Heat: 0.30 BTU/lb/F
- Initial Light Transmittance: 85% minimum
- Change in Light Transmittance, 3 years exposure in a Southern latitude: 3%
- Change in Yellowness Index, 3 years exposure in a Southern latitude: less than 5%

For substitutes, submit one 12" x 12" sample of the proposed material together with a description of the material attributes to the Engineer for review and approval. Install a .09" aluminum mask on the front of the panel (facing the motorists) that contains a circular opening for each LED pixel. Prime and coat the front side of the aluminum mask, which faces the viewing motorists, with automotive-grade flat black acrylic enamel paint or an approved equivalent. Guarantee all painted surfaces provide a minimum outdoor service life of 20 years.

Design the panels so they will not warp nor reduce the legibility of the characters. Differential expansion of the DMS housing and the front panel must not cause damage to any DMS component or allow openings for moisture or dust. Glare from sunlight, roadway lighting, commercial lighting, or vehicle headlights must not reduce the legibility or visibility of the DMS. Install the panels so that a maintenance person can easily remove or open them for cleaning.

4. Display Modules

Manufacture each display module with a standard number of pixels, not to exceed an array of 9 x 5, which can be easily removed. Assemble the modules onto the DMS assemblies contiguously to form a continuous matrix to display the required number of lines, characters, and character height.

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

Construct each display module as a rectangular array of 5 horizontal pixels by 7 to 9 vertical pixels. Provide the module with an equal vertical and horizontal pitch between pixels, and columns that are perpendicular to the rows (i.e., no slant). Design each module to display:

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

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

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

5. Discrete LEDs

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

Provide LEDs that are untinted, non-diffused, high output solid state lamps utilizing indium gallium aluminum phosphide (InGaAlP) technology. No substitutions will be allowed. Provide T1 3/4, 0.2 inch 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° F or below at a specific forward current of 20mA. Discrete LED failure is defined as the point at which the LED's luminous intensity has degraded to 50% or less of its original level.

Obtain the LEDs used in the display from a single LED manufacturer that have a single part number. Obtain them from batches sorted for luminous output, where the highest luminosity LED is not more than fifty percent more luminous than the lowest luminosity LED when the LEDs are driven at the same forward current. Do not use more than two successive and overlapping batches in the LED display. Document the procedure to be used to comply with this requirement as part of the material submittal.

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

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

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

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

6. LED Power Supplies

Power the LED Display by means of multiple regulated switching DC power supplies that operate from 120 volts AC input power and have an output of 48 volts DC or less. Wire the supplies in a redundant parallel configuration that uses multiple power supplies per display. Provide the supplies with current sharing capability that allows equal amounts of current to their portion of the LED display. Provide power supplies rated such that if one supply fails the remaining supplies will be able to operate their portion of the display under full load conditions (i.e. all pixels on at maximum brightness) and at a temperature of 140° F.

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

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

7. LED Pixels

A pixel is defined as the smallest programmable portion of a display module that consists of a cluster of closely spaced discrete LEDs. Design each pixel to be a maximum of 2 inches in diameter.

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

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

Power the LEDs in each pixel in strings. Use a redundant design so that the failure of an LED in one string does not affect the operation of any other string within the pixel. Provide the sign controller with the ability to detect the failure of any LED string and identify which LED string has failed. Submit a complete schematic of the LED power and driver circuits with the material submittals.

8. Character Display

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

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

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

9. 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)

10. DMS Mini Controller

Furnish and install a mini controller inside the DMS that is interconnected with the main controller using a fiber optic cable, CAT-5 cable, or an approved alternate. The mini controller will enable a technician to perform all functions available from the main controller. Provide the mini controller with an LCD/keypad interface. Size the LCD display screen to allow preview of an entire one-page message on one screen. Provide a 4 X 4 keypad.

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

C. DMS Enclosure Structure Mounting

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

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

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 titled “DMS Assemblies” of these Project Special Provisions.

D. DMS / DMS Controller Interconnect

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

E. DMS Controller and DMS Cabinet

Furnish and install one DMS controller with accessories per DMS in a protective cabinet. Mount the controller cabinet on the DMS support structure. Install cabinet so that the height from the ground to the middle of the cabinet is 4 feet. Ensure a minimum of 3 feet level working surface under each cabinet that provides maintenance technicians with a safe working environment.

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

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

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

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

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

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

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

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

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

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

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

Provide a convenient location on the inside of the door to store the cabinet wiring diagrams and other related cabinet drawings. Provide a Corbin #2 main door lock made of non-ferrous or stainless steel material. Key all locks on the project alike, and provide 10 keys to the Engineer. In addition, design the handle to permit pad-locking.

Provide the interior of the cabinet with ample space for housing the controller and all associated equipment and wiring; use no more than 75% of the useable space in the cabinet. Provide ample space in the bottom of the cabinet for the entrance and exit of all power, communications, and grounding conductors and conduit.

Arrange the equipment so as to permit easy installation of the cabling through the conduit so that they will not interfere with the operation, inspection, or maintenance of the unit. Provide adjustable metal shelves, brackets, or other support for the controller unit and auxiliary equipment. Leave a 3 inch minimum clearance from the bottom of the cabinet to all equipment, terminals, and bus bars.

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

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

Mount and wire a 120V ($\pm 10\%$) GFCI duplex receptacle of the 3-wire grounding type in the cabinet in a location that presents no electrical hazard when used by service personnel for the operation of power tools and work lights.

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

Mount a bug-proof and weatherproof thermostatically controlled fan and safety shield in the top of the cabinet. Size the fan to provide at least for two air exchanges per minute. Fuse the fan at 125% of the capacity of the motor. The magnetic field of the fan motor must not affect the performance of the control equipment. Use a fan thermostat that is manually adjustable to turn on between 80°F and 160°F with a differential of not more than 10°F between automatic turn-on and turn-off. Mount it in an easily accessible location, but not within 6 inches of the fan.

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

1. Wiring

The requirements stated herein apply wherever electrical wiring is needed for any DMS system assemblies and subassemblies such as controller cabinet, DMS enclosure, electrical panel boards 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 inches maximum to prevent separation of the individual conductors.

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

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

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

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

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

Label all equipment and equipment controls clearly.

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

2. Power Supply and Circuit Protection

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

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

3. 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.

4. Surge Suppressor

Install and clearly label filtering hybrid power line surge protectors on the load side of the branch circuit breakers in a manner that permits easy servicing. Ground and electrically bond the surge protector to the cabinet within 2 inches.

Provide power line surge protector that meets the following requirements:

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

*Capable of handling the continuous current to the equipment

5. Radio Interference Suppressor

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

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

6. 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 |

7. Lightning Arrester

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

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

8. Uninterruptible Power Supply (UPS)

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

- Input Voltage Range: 120VAC +12%, -25%
- Power Rating: 1000 VA, 700 Watts

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

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

9. Controller Communications Interface

Provide the controller with the following interface ports:

- An EIA/TIA-232E port for remote communication using NTCIP
- An 10/100 Ethernet port for remote communication using NTCIP
- An EIA/TIA-232E port for onsite access using a laptop
- An EIA/TIA-232E auxiliary port for communication with a field device such as a UPS
- Fiber Optic ports for communication with the sign
- RJ45 ports for communication with the sign using CAT-5 cable
- RJ45 ports for communication with mini-controller located inside the sign enclosure

10. Controller Local User Interface

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

- On / Off Switch: controls power to the controller.
- Control Mode Switch: for setting the controller operation mode to either remote or local mode.
- LCD Display and Keypad: Allow user to navigate through the controller menu for configuration (display, communications parameter, etc) running diagnostics, viewing peripherals status, message creation, message preview, message activation, and etc. Furnish a LCD display with a minimum size of 240x64 dots with LED back light.

11. Controller Address

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

12. Controller Functions

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

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

13. DMS Controller Memory

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

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

F. Photo-Electric Sensors

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

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

- The light level emitted by the pixels elements in each Light Level Mode.

- The ambient light level at which each Light Level Mode is activated.

G. Equipment List

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

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

H. Physical Description

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

I. Parts List

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

J. Character Set Submittal

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

K. Wiring Diagrams

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

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

L. Routine of Operation

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

M. Maintenance Procedures

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

N. Repair Procedures

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

Describe accuracy, limits, and tolerances for all electrical, physical, or other applicable measurements. Include instructions for disassemblies, overhaul, and re-assemblies, with shop specifications and performance requirements.

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

O. Field Trial

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

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

17.3. CONSTRUCTION METHODS

A. Description

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

Provide electrical equipment described in this 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.

B. Layout

The Engineer will establish the actual location of each Dynamic Message Sign assemblies. It is the Contractor's responsibility to ensure proper elevation, offset, and orientation of all DMS assemblies. The location of service poles as well as conduit lengths shown in the Plans, are approximate based on available project data. Make actual field measurements to place conduit and equipment at the required location.

C. Construction Submittal

When the work is complete, submit "as built" plans, inventory sheets, and any other data required by the Engineer to show the details of actual construction and installation and any modifications made during installation.

The "as built" plans will show: the DMS, controller, and service pole locations; DMS enclosure and controller cabinet wiring layouts; and wire and conduit routing. Show all underground conduits and cables dimensioned from fixed objects.

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

D. Conduit

Install the conduit system in accordance with section 1715 of Standard Specification and NEC requirements for an approved watertight raceway.

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

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

Attach the conduit system to and install along the structural components of the DMS structure assemblies with beam clamps or stainless steel strapping. Install strapping according to the strapping manufacturer's recommendations. Do not use welding or drilling to fasten conduit to structural components. Space the fasteners at no more than 4 feet for conduit 1.5 inches and larger or 6 feet for conduit smaller than 1.25 inches. Place fasteners no more than 3 feet from the center of bends, fittings, boxes, switches, and devices.

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

Locate underground conduit as shown in the Plans in a manner consistent with these Project Special Provisions.

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

E. Wiring Methods

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

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

Bury underground circuits at the depth shown in the Plans and surround it with at least 3 inches of sand or earth back-fill free of rocks and debris. Compact backfill in 6 inch layers. Do not splice underground circuits unless specifically noted in the Plans.

F. Equipment and Cabinet Mounting

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

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

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

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

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

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

G. Work Site Clean-Up

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

17.4. MEASUREMENT AND PAYMENT

DMS will be measured and paid as the actual number of DMS furnished, installed, and accepted. Each DMS consists of a LED Dynamic Message Sign, spare LED modules, communications equipment, strapping hardware, controller, UPS, controller cabinet, conduit, fittings, couplings, sweeps, conduit bodies, wire, flexible conduit, feeder conductors and communications cable between the controller cabinet and the DMS enclosure, connectors, circuit protection equipment, photo-electric sensors, tools, materials, all related testing, cost of labor, cost of transportation, incidentals, and all other equipment necessary to furnish and install the DMS system.

Payment will be made under:

| Pay Item | Pay Unit |
|-----------------|-----------------|
| DMS | Each |

18. NTCIP REQUIREMENTS

This section defines the detailed NTCIP requirements for the DMSs covered by these Project Special Provisions and Plans.

18.1. REFERENCES

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

Implement the most recent version of the standard including any and all Approved or Recommended Amendments to these standards for each NTCIP Component covered by these project specifications.

Table 1: NTCIP Standards

| Abbreviated Number | Full Number | Title |
|---------------------------|------------------------|---|
| NTCIP 1101 | NTCIP 1101:1997 | <i>Simple Transportation Management Framework</i> |
| NTCIP 1201 | NTCIP 1201:1997 | <i>Global Object Definitions</i> |
| NTCIP 1203 | NTCIP 1203:1997 | <i>Object Definitions for Dynamic Message Signs</i> |
| NTCIP 2001 | NTCIP 2001:1997 | <i>Class B Profile</i> |
| NTCIP 2101 | NTCIP 2101 | <i>SP-PMPP/232 Subnet Profile for PMPP over RS-232</i> |
| NTCIP 2102 | NTCIP 2102 | <i>SP-PMPP/FSK Subnet Profile for PMPP over FSK Modem</i> |
| NTCIP 2103 | NTCIP 2103 | <i>SP-PPP/232 Subnetwork Profile for PPP over RS232 (Dial Up)</i> |
| NTCIP 2104 | NTCIP 2104 | <i>SP-Ethernet Subnet Profile for Ethernet</i> |

| Abbreviated Number | Full Number | Title |
|---------------------------|--------------------|---|
| NTCIP 2201 | NTCIP 2201 | <i>TP-Null</i> <i>Transport Profile</i> |
| NTCIP 2202 | NTCIP 2202 | <i>TP-Internet</i> <i>Internet Transport Profile</i> <i>(TCP/IP and UDP/IP)</i> |
| NTCIP 2301 | NTCIP 2301 | AP-STMF AP for Simple Transportation Management Framework |

A. General Requirements

Subnet Level

Ensure each serial port on each NTCIP Component supports NTCIP 2103 over a dial-up connection with a contractor provided external modem with data rates of 28.8 kbps, 19.2 kbps, 14.4 kbps, 9600 bps, 4800 bps, 2400 bps, 1200 bps, 600 bps, and 300 bps. Enable the NTCIP Component to make outgoing and receive incoming calls as necessary and support the following modem command sets:

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

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

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

Ensure NTCIP components support NTCIP 2102 and NTCIP 2104.

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

Transport Level

Ensure each NTCIP Component complies with NTCIP 2201 and 2202.

NTCIP Components may support additional Transport Profiles at the manufacturer's option. Ensure Response datagrams use the same Transport Profile used in the request. Ensure each NTCIP

Component supports the receipt of datagrams conforming to any of the identified Transport Profiles at any time.

Application Level

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

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

Information Level

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

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

Table 2: Modified Object Ranges for Mandatory Objects

| Object | Reference | Project Requirement |
|-------------------------|-------------------------------|--|
| ModuleTableEntry | NTCIP 1201 Clause 2.2.3 | Contains at least one row with moduleType equal to 3 (software). The moduleMake specifies the name of the manufacturer, the moduleModel specifies the manufacturer's name of the component and the modelVersion indicates the model version number of the component. |
| MaxGroupAddresses | NTCIP 1201 Clause 2.7.1 | At least 1 |
| CommunityNamesMax | NTCIP 1201 Clause 2.8.2 | At least 3 |
| DmsNumPermanentMsg | NTCIP 1203 Clause 2.6.1.1.1.1 | At least 1* |
| DmsMaxChangeableMsg | NTCIP 1203 Clause 2.6.1.1.1.3 | At least 21 |
| DmsFreeChangeableMemory | NTCIP 1203 Clause 2.6.1.1.1.4 | At least 20 when no messages are stored. |

| Object | Reference | Project Requirement |
|-----------------------|------------------------------------|--|
| DmsMessageMultiString | NTCIP 1203 Clause 2.6.1.1.1.8.3 | The DMS supports any valid MULTI string containing any subset of those MULTI tags listed in Table 4 |
| DmsControlMode | NTCIP 1203 Clause 2.7.1.1.1.1 | Support at least the following modes: Local External central CentralOverride |

* Ensure the Permanent Messages display the content shown in Table 3.

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

Table 3: Content of Permanent Messages

| Perm. Msg. Num. | Description |
|-----------------|---|
| 1 | Permanent Message #1 blanks the display (i.e., consist of and empty MULTI string). It has a run-time priority of one (1). |

Table 4: Required MULTI Tags

| Code | Feature |
|--------------|---|
| f1 | field 1 - time (12hr) |
| f2 | field 2 - time (24hr) |
| f8 | field 8 – day of month |
| f9 | field 9 – month |
| f10 | field 10 - 2 digit year |
| f11 | field 11 - 4 digit year |
| fl (and /fl) | flashing text on a line by line basis with flash rates controllable in 0.5 second increments. |
| fo | Font |

| Code | Feature |
|------|--|
| j12 | Justification – line – left |
| j13 | Justification – line – center |
| j14 | Justification – line – right |
| j15 | Justification – line – full |
| jp2 | Justification – page – top |
| jp3 | Justification – page – middle |
| jp4 | Justification – page – bottom |
| Mv | moving text |
| Nl | new line |
| Np | new page, up to 2 instances in a message (i.e., up to 3 pages/frames in a message counting first page) |
| Pt | page times controllable in 0.5 second increments. |

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

Test Heading

a. Time Management

As defined in NTCIP 1201

b. Timebase Event Schedule

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

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

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

c. Report

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

Table 6: Modified Object Ranges for the Report Conformance Group

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

d. PMPP

e. Font Configuration

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

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

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

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

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

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

f. DMS Configuration

As defined in NTCIP 1203.

g. MULTI Configuration

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

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

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

h. Default Message Control as defined in NTCIP 1203

i. Pixel Service Control as defined in NTCIP 1203

- j. **MULTI Error Control** as defined in NTCIP 1203
- k. **Illumination/Brightness Control**

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

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

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

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

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

Table 10: Modified Object Ranges for the Scheduling Conformance Group

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

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

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

Table 11: Some Optional Object Requirements

| Object | Reference | Project Requirement |
|-------------------------------|-----------------------------------|--|
| DefaultFlashOn | NTCIP 1203 Clause 2.5.1.1.1.3 | The DMS supports the full range of these objects with step sizes no larger than 0.5 seconds |
| DefaultFlashOff | NTCIP 1203 Clause 2.5.1.1.1.4 | The DMS supports the full range of these objects with step sizes no larger than 0.5 seconds |
| DmsMultiOtherErrorDescription | NTCIP 1203 Clause 2.7.1.1.1.20 | If the vendor implements any vendor-specific MULTI tags, the DMS shall provide meaningful error messages within this object whenever one of these tags generates an error. |

Documentation

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

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

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

B. NTCIP Acceptance Testing

Test the NTCIP requirements outlined above by a third party testing firm. Submit to the Engineer for approval a portfolio of the selected firm. Include the name, address, and a history of the selected firm in performing NTCIP testing along with references. Also provide a contact person's name and phone number. Submit detailed NTCIP testing plans and procedures, including a list of hardware

and software, to the Engineer for review and approval 10 days in advance of a scheduled testing date. Develop test documents based on the NTCIP requirements of these Project Special Provisions. The acceptance test will use the NTCIP Exerciser, and/or other authorized testing tools and will follow the guidelines established in the ENTERPRISE Test Procedures. Conduct the test in North Carolina on the installed system in the presence of the Engineer. Document and certify the results of the test by the firm conducting the test and submit the Engineer for review and approval. In case of failures, remedy the problem and have the firm retest in North Carolina. Continue process until all failures are resolved. The Department reserves the right to enhance these tests as deemed appropriate to ensure device compliance.

18.2. MEASUREMENT AND PAYMENT

There will be no direct payment for the work covered by this section.

Payment for this work will be covered in the applicable sections of these Project Special Provisions at the contract unit price for “DMS” and will be full compensation for all work listed above.

19. RELOCATE EXISTING DMS

19.1. DESCRIPTION

This Section describes the relocation of the existing DMS from the existing overhead structure to a new pedestal structure as shown in the Plans and as described in these Project Special Provisions.

Notify the Regional ITS Engineer at 919-477-2914 a minimum of 7 days before performing any work at the DMS location.

19.2. MATERIALS

A. General

The material specifications for the new pole-mounted equipment cabinet and cables and wires are detailed in the Dynamic Message Sign section of these Project Special Provisions.

The material specifications for the new pedestal structure are detailed in the DMS Assemblies section of these Project Special Provisions.

19.3. CONSTRUCTION METHODS

A. General

The Contractor shall remove and retain the existing DMS. The Contractor shall remove and dispose of the existing overhead structure. The Contractor shall remove and dispose of the existing base-mounted equipment cabinet, foundation, and electrical service equipment. The Contractor shall install the retained DMS and new equipment cabinet on a new pedestal structure.

The construction method specifications for the new pedestal structure are detailed in the DMS Assemblies section of these Project Special Provisions.

B. Removal of Existing DMS

Prior to removing and disconnecting the existing DMS, the Contractor shall perform the DMS Operational Field Test detailed in the Testing and Acceptance section of these Project Special Provisions under the observation of Department representatives to demonstrate that the DMS is fully operational.

Coordinate with the Engineer and the utility company to de-energize the existing service prior to removing the DMS.

After successful completion of the Operational Field Test, the Contractor shall remove the following items in accordance with direction from the Engineer:

- Dynamic Message Sign
- Attachment hardware, such as nuts, bolts, U-bolts, washers, I-beams, etc.
- Power conductors / cabling from the DMS housing up to the power service point owned by the utility company. This shall include removal of any service poles.
- Communications cabling from the DMS housing to the ground cabinet
- DMS controller and communications equipment

- Base-mounted equipment cabinet, foundation, and exposed conduits
- Overhead support structure and footings

The Contractor shall be responsible for storing the DMS, controller, and other equipment required for local operation of the DMS until such time the Contractor is ready to install the DMS, new pole-mounted equipment cabinet, and all new associated cabling on the new pedestal structure.

The Contractor shall be responsible for returning any communications equipment to the Department. The Contractor shall transport and deliver the equipment to a Department facility or designated maintenance facility as specified by the Engineer.

The Contractor shall be responsible for disposing of all other items removed.

C. Relocation of Existing DMS

Install the retained DMS on the new pedestal structure in accord with the construction methods of the Dynamic Message Sign section of these Project Special Provisions.

Furnish and install all necessary cabling, conduit, and terminal blocks to connect the DMS and the equipment cabinet. Use approved manufacturer's specifications for cable types and sizes. Furnish and install new electrical cables between the DMS and equipment cabinet.

19.4. MEASUREMENT AND PAYMENT

Remove Existing DMS will be measured and paid as the actual number of DMS and related equipment removed in accordance with these Project Special Provisions. Removal and disposal of the existing overhead DMS structure, electrical service, service pole, feeder conductors, conduit, cabling, and any other materials will be considered incidental to Remove Existing DMS. Storage, cost of transportation, tools, materials, all related testing, cost of labor, incidentals and all other equipment necessary to remove the existing structures and materials will be considered incidental to Remove Existing DMS.

Relocate Existing DMS will be measured and paid as the actual number of existing DMS and installed. Installation of the existing DMS including testing, all mounting hardware, pole mounted equipment cabinet, conduits, risers, conduit bodies, stainless steel straps, new electrical cables between the DMS and equipment cabinet, new communications cable to interconnect the DMS and the equipment cabinet, field wiring, grounding systems, concrete pad, cabling, connectors, tools, materials, all related testing, cost of labor, cost of transportation, incidentals and all other equipment necessary to install and make the existing DMS fully operational will be considered incidental to Relocate Existing DMS.

Measurement and payment for the pedestal structure will be under the DMS Assemblies section of these Project Special Provisions.

Payment will be made under:

| Pay Item | Pay Unit |
|----------------------------|-----------------|
| Remove Existing DMS | Each |
| Relocate Existing DMS..... | Each |

20. DMS ASSEMBLIES

20.1. DESCRIPTION

This section includes all design, fabrication, furnishing, and erection of the DMS assemblies, platforms, walkways, CCTV extension poles, ladders for access to the DMS inspection doors, and attachment of the DMS enclosures to the structures in accordance with the requirements of these Project Special Provisions and the Plans. Fabricate the supporting DMS assemblies from tubular steel. Furnish pedestal type DMS assemblies as shown in the Plans. Cantilevered and monotube (horizontal truss) DMS structures will not be allowed.

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

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

The provisions of Section 900 of the Standard Specifications apply to all work covered by this section.

It is the Contractor's responsibility to provide DMS S-dimension elevation drawings for the DMS locations to the Engineer for approval.

20.2. MATERIAL

Use materials that meet the following requirements of the Standard Specifications:

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

20.3. CONSTRUCTION METHODS

A. General

Fabricate the new DMS assemblies, access platforms, walkway platforms, and access ladders in accordance with the details shown in the approved shop drawings and the requirements of these Project Special Provisions.

No welding, cutting, or drilling in any manner will be permitted in the field, unless approved by the Engineer.

Drill bolt holes and slots to finished size. Holes may also be punched to finished size, provided the diameter of the punched holes are at least twice the thickness of the metal being punched. Flame cutting of bolt holes and slots is not permitted.

Erect DMS in accordance with the requirements indicated on the Plans and in these Project Special Provisions. Field drill two holes per connection in the Z bars for attaching the DMS to the

structure. Use two bolts at each connection. Provide two (2) U-bolts at each U-bolt connection such as 1) each truss chord to sign hanger, or 2) each truss chord to platform support. Provide two (2) U-bolts at each U-bolts connection where ends of truss chords are supported. Minimum diameter of all U-bolts is to be ½ inch.

Use two coats of a zinc-rich paint to touch up minor scars on all galvanized materials. See Standard Specifications for Roads and Structures Section 1076-6.

For high strength bolted connections, provide direct tension indicator washer.

B. Shop Drawing

Submit to the Engineer for approval a complete design for the DMS assemblies (including footings) access platforms, walkway platforms, access ladders, DMS assembly hardware, brackets for supporting the DMS and the access platform. Base the design on the line drawings and correct wind speed in accordance with the latest edition of AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals, 5th Edition, 2009" with the latest interim revisions.

The manufacturer of the DMS assembly must ensure that design of the assembly is compatible with the DMSs for mounting and attachment.

Submit six copies of complete detailed shop drawings and one copy of the design computations for the DMS assembly to the Engineer for approval prior to fabrication. Show in the shop drawings complete design and fabrication details including foundations, provisions for attaching the DMS and walkway platform to supporting structures, applicable material specifications, and any other information necessary for procuring and replacing any part of the complete DMS assembly.

Allow a minimum of 40 working 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.

C. Design and Fabrication

1. Dynamic Message Sign Assembly

- Design must be in accordance with the Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 5th Edition, 2009, and the latest Interim Revisions.
- The wind pressure map that is developed from the 3-second gust speeds, as provided in Article 3.8, shall be used.
- The natural wind gust speed in North Carolina shall be assumed to be 5 meters per second or 11.6 mph for inland areas, and 7 meters per second or 15.7 mph for coastal areas. The coastal area shall be defined as any area within 2 miles from the waterfront facing the ocean or sound and all area where the design basic wind speed is above 120 mph, as shown in Figure 3-2.
- The fatigue importance category used in the design, for each type of structure, as provided for in Article 11.6, Fatigue Importance Factors, shall be Category II unless otherwise shown on the contract plans.

- Wind drag coefficient for Dynamic Message Sign enclosures shall be 1.7.

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

- For design of supporting upright posts or columns, the effective length factor for columns “K”, as provided for in Appendix B, Section B.5, shall be taken as the following, unless otherwise approved by the Engineer:
 - Case 1 For a single upright post of span type overhead sign structure, the effective column length factor, “K”, shall be taken as 2.0.
 - Case 2 For twin post truss-type upright post with the post connected to one chord of a horizontal truss, the effective column length factor for that column shall be taken as 2.0.
 - Case 3 For twin post truss-type upright post with the post connected to two truss chords of a horizontal tri-chord or box truss, the effective column length factor for that column shall be taken as 1.65.
- For twin post truss-type upright post, the unbraced length shall be from the chord to post connection to the top of base plate.
- For twin post truss-type upright post that is subject to axial compression, bending moment, shear, and torsion the post shall satisfy Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals Equations 5-17, 5-18 and 5-19. To reduce the effects of secondary bending, in lieu of Equation 5-18, the following equation may be used:

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

Where

fa = Computed axial compression stress at base of post

- The base plate thickness for all uprights and poles shall be a minimum of 2” but not less than that determined by the following criteria and design.
 - Case 1 Circular or rectangular solid base plates with the upright pole welded to the top surface of base plate with full penetration butt weld, and where no stiffeners are provided. A base plate with a small center hole, which is less than 1/5 of the upright diameter, and located concentrically with the upright pole, may be considered as a solid base plate.

The magnitude of bending moment in the base plate, induced by the anchoring force of each anchor bolt shall be calculated using equation $M = (P \times D_1) / 2$.
 - Case 2 Circular or rectangular base plate with the upright pole socketed into and attached to the base plate with two lines of fillet weld, and where no stiffeners

are provided, or any base plate with a center hole that is larger in diameter than 1/5 of the upright diameter.

The magnitude of bending moment induced by the anchoring force of each anchor bolt shall be calculated using equation $M = P \times D_2$.

- M, bending moment at the critical section of the base plate induced by one anchor bolt
 - P, anchoring force of each anchor bolt
 - D_1 , horizontal distance between the center of the anchor bolt and the outer face of the upright, or the difference between the radius of the bolt circle and the outside radius of the upright
 - D_2 , horizontal distance between the face of the upright and the face of the anchor bolt nut
- The critical section shall be located at the face of the anchor bolt and perpendicular to the radius of the bolt circle. The overlapped part of two adjacent critical sections shall be considered ineffective.
 - The thickness of base plate of Case 1 shall not be less than that calculated based on formula for Case 2.
 - Uprights, foundations, and trusses shall be designed in accordance with the DMS Foundation Special Provision for the effects of torsion. Torsion shall be considered from dead load eccentricity of these attachments, as well as for attachments such as walkway platforms, supporting brackets, etc., that add to the torsion in the assembly. Truss vertical and horizontal truss diagonals in particular and any other assembly members shall be appropriately sized for these loads.
 - Uprights, foundations, and trusses shall be designed for the proposed sign wind area and future wind areas. The design shall consider the effect of torsion induced by the eccentric force location of the center of wind force above (or below) the center of the supporting truss. Truss vertical and horizontal truss diagonals in particular and any other assembly members shall be appropriately sized for these loads.

Fabricate the supporting structures using tubular members of either aluminum or steel, using only one type of material throughout the project.

Horizontal components of the supporting structures for overhead DMS must be of a truss design to support the DMS. Truss centerline must coincide with centerline of the DMS design area shown on the structure line drawing. Provide permanent camber in addition to dead load camber in accordance with the "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals." Indicate on the shop drawings the amount of camber provided and the method employed in the fabrication of the support to obtain the camber.

For all U-bolt connections of hanger beams to overhead assembly truss chords, provide all U-bolts with a flat washer, a lock washer and double nuts at each end of the U-bolts. All double nuts

that are on any U-bolt shall be the same thickness and weight. When assembled, the double nuts shall be brought tight against each other by the use of two wrenches.

Fabricate attachment assemblies for the mounting DMS in a manner that allows easy removal of the sign.

2. DMS Maintenance Platform (Walkway)

Provide a maintenance platform (walkway), a minimum of three feet wide with open skid-resistant surface and safety railing on the DMS assemblies for access to the DMS inspection door. Provide platforms with fixed safety railings along both sides from the beginning of the platform to the inspection door.

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

1. The top of the platform grading surface is vertically aligned with the bottom of the DMS door.
2. The DMS door will open 90-degrees from its closed position without any obstruction from the platform or safety handrails.
3. The platform is rigidly and directly connected to the walkway brackets and there is no uneven surface between sections.
4. Install a 4" x 4" safety angle parallel to and along both sides of the platform and extend it the entire length of the platform. Design the safety angle to withstand loading equivalent to the platform.
5. Ensure the platform design allows full access to the DMS enclosure inspection door with no interference or obstructions.

3. DMS Access Ladder

Provide a fixed ladder, of the same material as the pedestal structures, leading to and ending at the access platform. Equip the ladder with a security cover (ladder guard) and lock to prohibit access by unauthorized persons. Design the rungs on 12-inch center to center typical spacing. Start the first ladder rung no more than 18 inches above the landing pad. Attach the security cover approximately 6 feet above the finished ground. Design the ladder and security cover as a permanent part of the DMS assembly and include complete design details in the DMS assembly shop drawings. Fabricate the ladder and cover to meet all OSHA requirements and applicable state and local codes, including but not limited to providing a ladder cage.

Furnish and install a level concrete pad a minimum of 4 inches deep, 24 inches wide, and 36 inches long to service as a landing pad for accessing the ladder. Design the landing pad to be directly below the bottom rung. Access to the ladder shall not be obstructed by the DMS foundation. Provide pre-formed or cast-in place concrete pads.

20.4. MEASUREMENT AND PAYMENT

DMS Pedestal Structure will be measured and paid as the actual number of dynamic message sign assemblies furnished, installed, and accepted. Payment includes all design, fabrication, construction, transportation, and attachment of the complete dynamic message sign assemblies, supporting structure, hardware, access platform, direct tension indicators, preparing and furnishing

shop drawings, additional documentation, incidentals, and all other equipment and features necessary to furnish the system described above.

DMS Access Ladder will be measured and paid as the actual number of DMS access ladders furnished, installed and accepted. Payment includes design, fabrication, transportation, and attachment to the DMS assembly and the concrete landing pad as described above.

Payment will be made under:

| Pay Item | Pay Unit |
|------------------------------|-----------------|
| DMS Pedestal Structure | Each |
| DMS Access Ladder | Each |

21. FOUNDATIONS AND ANCHOR ROD ASSEMBLIES FOR METAL POLES

21.1. DESCRIPTION

Foundations for metal poles include foundations for signals, cameras, overhead and dynamic message signs (DMS) and high mount and low level light standards supported by metal poles or upright trusses. Foundations consist of footings with pedestals and drilled piers with or without grade beams or wings. Anchor rod assemblies consist of anchor rods (also called anchor bolts) with nuts and washers on the exposed ends of rods and nuts and a plate or washers on the other ends of rods embedded in the foundation.

Construct concrete foundations with the required resistances and dimensions and install anchor rod assemblies in accordance with the contract and accepted submittals. Construct drilled piers consisting of cast-in-place reinforced concrete cylindrical sections in excavated holes. Provide temporary casings or polymer slurry as needed to stabilize drilled pier excavations. Use a prequalified Drilled Pier Contractor to construct drilled piers for metal poles. Define "excavation" and "hole" as a drilled pier excavation and "pier" as a drilled pier.

This provision does not apply to materials and anchor rod assemblies for standard foundations for low level light standards. See Section 1405 of the *2012 Standard Specifications* and Standard Drawing No. 1405.01 of the *2012 Roadway Standard Drawings* for materials and anchor rod assemblies for standard foundations. For construction of standard foundations for low level light standards, standard foundations are considered footings in this provision.

This provision does not apply to foundations for signal pedestals; see Section 1743 of the *2012 Standard Specifications* and Standard Drawing No. 1743.01 of the *2012 Roadway Standard Drawings*.

21.2. MATERIAL

Refer to the *2012 Standard Specifications*.

| Item | Section |
|--------------------------|----------------|
| Conduit | 1091-3 |
| Grout, Nonshrink | 1003 |
| Polymer Slurry | 411-2(B) |
| Portland Cement Concrete | 1000 |
| Reinforcing Steel | 1070 |
| Rollers and Chairs | 411-2(C) |
| Temporary Casings | 411-2(A) |

Provide Type 3 material certifications in accordance with Article 106-3 of the *2012 Standard Specifications* for conduit, rollers, chairs and anchor rod assemblies. Store steel materials on blocking at least 12" above the ground and protect it at all times from damage; and when placing in the work make sure it is free from dirt, dust, loose mill scale, loose rust, paint, oil or other foreign materials. Load, transport, unload and store foundation and anchor rod assembly materials so materials are kept clean and free of damage. Damaged or deformed materials will be rejected.

Use conduit type in accordance with the contract. Use Class A concrete for footings and pedestals, Class Drilled Pier concrete for drilled piers and Class AA concrete for grade beams and wings including portions of drilled piers above bottom of wings elevations. Corrugated temporary casings may be accepted at the discretion of the Engineer. A list of approved polymer slurry products is available from:

www.ncdot.org/doh/preconstruct/highway/geotech/leftmenu/Polymer.html

Provide anchor rod assemblies in accordance with the contract consisting of the following:

- A. Straight anchor rods,
- B. Heavy hex top and leveling nuts and flat washers on exposed ends of rods, and
- C. Nuts and either flat plates or washers on the other ends of anchor rods embedded in foundations.

Do not use lock washers. Use steel anchor rods, nuts and washers that meet ASTM F1554 for Grade 55 rods and Grade A nuts. Use steel plates and washers embedded in concrete with a nominal thickness of at least 1/4". Galvanize anchor rods and exposed nuts and washers in accordance with Article 1076-4 of the *2012 Standard Specifications*. It is not necessary to galvanize nuts, plates and washers embedded in concrete.

21.3. CONSTRUCTION METHODS

Install the required size and number of conduits in foundations in accordance with the plans and accepted submittals. Construct top of piers, footings, pedestals, grade beams and wings flat, level and within 1" of elevations shown in the plans or approved by the Engineer. Provide an Ordinary Surface finish in accordance with Subarticle 825-6(B) of the *2012 Standard Specifications* for portions of foundations exposed above finished grade. Do not remove anchor bolt templates or pedestal or grade beam forms or erect metal poles or upright trusses onto foundations until concrete attains a compressive strength of at least 3,000 psi.

A. Drilled Piers

Before starting drilled pier construction, hold a predrill meeting to discuss the installation, monitoring and inspection of the drilled piers. Schedule this meeting after the Drilled Pier Contractor has mobilized to the site. The Resident or Division Traffic Engineer, Contractor and Drilled Pier Contractor Superintendent will attend this predrill meeting.

Do not excavate holes, install piles or allow equipment wheel loads or vibrations within 20 ft of completed piers until 16 hours after Drilled Pier concrete reaches initial set.

Check for correct drilled pier alignment and location before beginning drilling. Check plumbness of holes frequently during drilling.

Construct drilled piers with the minimum required diameters shown in the plans. Install piers with tip elevations no higher than shown in the plans or approved by the Engineer.

Excavate holes with equipment of the sizes required to construct drilled piers. Depending on the subsurface conditions encountered, drilling through rock and boulders may be required. Do not use blasting for drilled pier excavations.

Contain and dispose of drilling spoils and waste concrete as directed and in accordance with Section 802 of the *2012 Standard Specifications*. Drilling spoils consist of all materials and fluids removed from excavations.

If unstable, caving or sloughing materials are anticipated or encountered, stabilize holes with temporary casings and/or polymer slurry. Do not use telescoping temporary casings. If it becomes necessary to replace a temporary casing during drilling, backfill the excavation, insert a larger casing around the casing to be replaced or stabilize the excavation with polymer slurry before removing the temporary casing.

If temporary casings become stuck or the Contractor proposes leaving casings in place, temporary casings should be installed against undisturbed material. Unless otherwise approved, do not leave temporary casings in place for mast arm poles and cantilever signs. The Engineer will determine if casings may remain in place. If the Contractor proposes leaving temporary casings in place, do not begin drilling until a casing installation method is approved.

Use polymer slurry and additives to stabilize holes in accordance with the slurry manufacturer's recommendations. Provide mixing water and equipment suitable for polymer slurry. Maintain polymer slurry at all times so slurry meets Table 411-3 of the *2012 Standard Specifications* except for sand content.

Define a "sample set" as slurry samples collected from mid-height and within 2 ft of the bottom of holes. Take sample sets from excavations to test polymer slurry immediately after filling holes with slurry, at least every 4 hours thereafter and immediately before placing concrete. Do not place Drilled Pier concrete until both slurry samples from an excavation meet the required polymer slurry properties. If any slurry test results do not meet the requirements, the Engineer may suspend drilling until both samples from a sample set meet the required slurry properties.

Remove soft and loose material from bottom of holes using augers to the satisfaction of the Engineer. Assemble rebar cages and place cages and Drilled Pier concrete in accordance with Subarticle 411-4(E) of the *2012 Standard Specifications* except for the following:

- 1) Inspections for tip resistance and bottom cleanliness are not required,
- 2) Temporary casings may remain in place if approved, and
- 3) Concrete placement may be paused near the top of pier elevations for anchor rod assembly installation and conduit placement or
- 4) If applicable, concrete placement may be stopped at bottom of grade beam or wings elevations for grade beam or wing construction.

If wet placement of concrete is anticipated or encountered, do not place Drilled Pier concrete until a concrete placement procedure is approved. If applicable, temporary casings and fluids may be removed when concrete placement is paused or stopped in accordance with the exceptions above provided holes are stable. Remove contaminated concrete from exposed Drilled Pier concrete after removing casings and fluids. If holes are unstable, do not remove temporary casings until a procedure for placing anchor rod assemblies and conduit or constructing grade beams or wings is approved.

Use collars to extend drilled piers above finished grade. Remove collars after Drilled Pier concrete sets and round top edges of piers.

If drilled piers are questionable, pile integrity testing (PIT) and further investigation may be required in accordance with Article 411-5 of the *2012 Standard Specifications*. A drilled pier will be considered defective in accordance with Subarticle 411-5(D) of the *2012 Standard Specifications* and drilled pier acceptance is based in part on the criteria in Article 411-6 of the *2012 Standard Specifications* except for the top of pier tolerances in Subarticle 411-6(C) of the *2012 Standard Specifications*.

If a drilled pier is under further investigation, do not grout core holes, backfill around the pier or perform any work on the drilled pier until the Engineer accepts the pier. If the drilled pier is accepted, dewater and grout core holes and backfill around the pier with approved material to finished grade. If the Engineer determines a pier is unacceptable, remediation is required in accordance with Article 411-6 of the *2012 Standard Specifications*. No extension of completion date or time will be allowed for remediation of unacceptable drilled piers or post repair testing.

Permanently embed a plate in or mark top of piers with the pier diameter and depth, size and number of vertical reinforcing bars and the minimum compressive strength of the concrete mix at 28 days.

B. Footings, Pedestals, Grade Beams and Wings

Excavate as necessary for footings, grade beams and wings in accordance with the plans, accepted submittals and Section 410 of the *2012 Standard Specifications*. If unstable, caving or sloughing materials are anticipated or encountered, shore foundation excavations as needed with an approved method. Notify the Engineer when foundation excavation is complete. Do not place concrete or reinforcing steel until excavation dimensions and foundation material are approved.

Construct cast-in-place reinforced concrete footings, pedestals, grade beams and wings with the dimensions shown in the plans and in accordance with Section 825 of the *2012 Standard Specifications*. Use forms to construct portions of pedestals and grade beams protruding above finished grade. Provide a chamfer with a 3/4" horizontal width for pedestal and grade beam edges exposed above finished grade. Backfill and fill in accordance with Article 410-8 of the *2012 Standard Specifications*. Proper compaction around footings and wings is critical for foundations to resist uplift and torsion forces. Place concrete against undisturbed soil and do not use forms for standard foundations for low level light standards.

C. Anchor Rod Assemblies

Size anchor rods for design and the required projection above top of foundations. Determine required anchor rod projections from nut, washer and base plate thicknesses, the protrusion of 3 to 5 anchor rod threads above top nuts after tightening and the distance of one nut thickness between top of foundations and bottom of leveling nuts.

Protect anchor rod threads from damage during storage and installation of anchor rod assemblies. Before placing anchor rods in foundations, turn nuts onto and off rods past leveling nut locations. Turn nuts with the effort of one workman using an ordinary wrench without a cheater bar. Report any thread damage to the Engineer that requires extra effort to turn nuts.

Arrange anchor rods symmetrically about center of base plate locations as shown in the plans. Set anchor rod elevations based on required projections above top of foundations. Securely brace and hold rods in the correct position, orientation and alignment with a steel template. Do not weld to reinforcing steel, temporary casings or anchor rods.

Install top and leveling (bottom) nuts, washers and the base plate for each anchor rod assembly in accordance with the following procedure:

- 1) Turn leveling nuts onto anchor rods to a distance of one nut thickness between the top of foundation and bottom of leveling nuts. Place washers over anchor rods on top of leveling nuts.
- 2) Determine if nuts are level using a flat rigid template on top of washers. If necessary, lower leveling nuts to level the template in all directions or if applicable, lower nuts to tilt the template so the metal pole or upright truss will lean as shown in the plans. If leveling nuts and washers are not in full contact with the template, replace washers with galvanized beveled washers.
- 3) Verify the distance between the foundation and leveling nuts is no more than one nut thickness.
- 4) Place base plate with metal pole or upright truss over anchor rods on top of washers. High mount luminaires may be attached before erecting metal poles but do not attach cables, mast arms or trusses to metal poles or upright trusses at this time.
- 5) Place washers over anchor rods on top of base plate. Lubricate top nut bearing surfaces and exposed anchor rod threads above washers with beeswax, paraffin or other approved lubricant.
- 6) Turn top nuts onto anchor rods. If nuts are not in full contact with washers or washers are not in full contact with the base plate, replace washers with galvanized beveled washers.
- 7) Tighten top nuts to snug-tight with the full effort of one workman using a 12" wrench. Do not tighten any nut all at once. Turn top nuts in increments. Follow a star pattern cycling through each nut at least twice.
- 8) Repeat (7) for leveling nuts.
- 9) Replace washers above and below the base plate with galvanized beveled washers if the slope of any base plate face exceeds 1:20 (5%), any washer is not in firm contact with the base plate or any nut is not in firm contact with a washer. If any washers are replaced, repeat (7) and (8).
- 10) With top and leveling nuts snug-tight, mark each top nut on a corner at the intersection of 2 flats and a corresponding reference mark on the base plate. Mark top nuts and base plate with ink or paint that is not water-soluble. Use the turn-of-nut method for pretensioning. Do not pretension any nut all at once. Turn top nuts in increments for a total of one flat (1/6 revolution) for anchor rod diameters greater than 1 1/2" and 2 flats (1/3 revolution) for anchor rod diameters 1 1/2" or less. Follow a star pattern cycling through each top nut at least twice.
- 11) Ensure nuts, washers and base plate are in firm contact with each other for each anchor rod. Cables, mast arms and trusses may now be attached to metal poles and upright trusses.
- 12) Between 4 and 14 days after pretensioning top nuts, use a torque wrench calibrated within the last 12 months to check nuts in the presence of the Engineer. Completely erect

mast arm poles and cantilever signs and attach any hardware before checking top nuts for these structures. Check that top nuts meet the following torque requirements:

| TORQUE REQUIREMENTS | |
|---------------------------|--------------------|
| Anchor Rod Diameter, inch | Requirement, ft-lb |
| 7/8 | 180 |
| 1 | 270 |
| 1 1/8 | 380 |
| 1 1/4 | 420 |
| ≥ 1 1/2 | 600 |

If necessary, retighten top nuts in the presence of the Engineer with a calibrated torque wrench to within ± 10 ft-lb of the required torque. Do not overtighten top nuts.

- (13) Do not grout under base plate.

21.4. MEASUREMENT AND PAYMENT

Foundations and anchor rod assemblies for metal poles and upright trusses will be measured and paid for elsewhere in the contract.

No payment will be made for temporary casings that remain in drilled pier excavations. No payment will be made for PIT. No payment will be made for further investigation of defective piers. Further investigation of piers that are not defective will be paid as extra work in accordance with Article 104-7 of the *2012 Standard Specifications*. No payment will be made for remediation of unacceptable drilled piers or post repair testing.

22. OVERHEAD AND DYNAMIC MESSAGE SIGN FOUNDATIONS

22.1. DESCRIPTION

Sign foundations include foundations for overhead and dynamic message signs (DMS) supported by metal poles or upright trusses. Sign foundations consist of footings with pedestals or drilled piers with or without grade beams or wings, conduit and anchor rod assemblies. Construct sign foundations in accordance with the contract and accepted submittals. Define “cantilever sign” as an overhead cantilever sign support in accordance with Figure 1-1 of the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*.

22.2. MATERIAL

Use sign foundation materials that meet the *Foundations and Anchor Rod Assemblies for Metal Poles* provision.

A. Assumed Subsurface Conditions

Assume the following soil parameters and groundwater elevation for sign foundations unless these subsurface conditions are not applicable to sign locations:

- A. Unit weight (γ) = 120 lb/cf,
- B. Friction angle (ϕ) = 30°,
- C. Cohesion (c) = 0 lb/sf, and
- D. Groundwater 7 ft below finished grade.

A subsurface investigation is required if the Engineer determines these assumed subsurface conditions do not apply to a sign location and the sign cannot be moved. Subsurface conditions requiring a subsurface investigation include but are not limited to weathered or hard rock, boulders, very soft or loose soil, muck or shallow groundwater. No extension of completion date or time will be allowed for subsurface investigations.

B. Subsurface Investigations

Use a prequalified geotechnical consultant to perform one standard penetration test (SPT) boring in accordance with ASTM D1586 at each sign location requiring a subsurface investigation. Rough grade sign locations to within 2 ft of finished grade before beginning drilling. Drill borings to 2 drilled pier diameters below anticipated pier tip elevations or refusal, whichever is higher.

Use the computer software gINT version 8.0 or later manufactured by Bentley Systems, Inc. with the current NCDOT gINT library and data template to produce SPT boring logs. Provide boring logs sealed by a geologist or engineer licensed in the state of North Carolina.

C. Sign Foundation Designs

Design sign foundations for the wind zone and clearances shown in the plans and the slope of finished grade at each sign location. Use the assumed soil parameters and groundwater elevation above for sign foundation designs unless a subsurface investigation is required. For sign locations requiring a subsurface investigation, design sign foundations for the subsurface conditions at each sign location. Design footings, pedestals, drilled piers, grade beams and wings in accordance with the 5th Edition of the *AASHTO Standard Specifications for Structural Supports for Highway Signs*,

Luminaires and Traffic Signals. In some instances, conflicts with drainage structures may dictate sign foundation types.

Design footings in accordance with Section 4.4 of the *AASHTO Standard Specifications for Highway Bridges*. Do not use an allowable bearing pressure of more than 3,000 lb/sf for footings.

Design drilled piers for side resistance only in accordance with Section 4.6 of the *AASHTO Standard Specifications for Highway Bridges* except reduce ultimate side resistance by 25% for uplift. Use the computer software LPILE version 5.0 or later manufactured by Ensoft, Inc. to analyze drilled piers. Provide drilled pier designs with a horizontal deflection of less than 1" at top of piers. For cantilever signs with single drilled pier foundations supporting metal poles, use wings to resist torsion forces. Provide drilled pier designs with a factor of safety of at least 2.0 for torsion.

For drilled pier sign foundations supporting upright trusses, use dual drilled piers connected with a grade beam having a moment of inertia approximately equal to that of either pier. The Broms' method is acceptable to analyze drilled piers with grade beams instead of LPILE. Use a safety factor of at least 3.5 for the Broms' design method in accordance with C13.6.1.1 of the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*.

Submit boring logs, if any, working drawings and design calculations for acceptance in accordance with Article 105-2 of the *2012 Standard Specifications*. Submit working drawings showing plan views, required foundation dimensions and elevations and typical sections with reinforcement, conduit and anchor rod assembly details. Include all boring logs, design calculations and LPILE output for sign foundation design submittals. Have sign foundations designed, detailed and sealed by an engineer licensed in the state of North Carolina.

22.3. CONSTRUCTION METHODS

Construct footings, pedestals, drilled piers, grade beams and wings and install anchor rod assemblies for sign foundations in accordance with the *Foundations and Anchor Rod Assemblies for Metal Poles* provision.

22.4. MEASUREMENT AND PAYMENT

ITS Overhead Footings will be measured and paid in cubic yards. Sign foundations will be measured as the cubic yards of foundation concrete for footings, pedestals, drilled piers, grade beams and wings shown on the accepted submittals. The contract unit price for *ITS Overhead Footings* will be full compensation for providing labor, tools, equipment and foundation materials, stabilizing or shoring excavations and supplying concrete, reinforcing steel, conduit, anchor rod assemblies and any incidentals necessary to construct sign foundations. Subsurface investigations required by the Engineer will be paid as extra work in accordance with Article 104-7 of the *2012 Standard Specifications*.

Payment will be made under:

| Pay Item | Pay Unit |
|-----------------------------|-----------------|
| ITS Overhead Footings | Cubic Yards |

23. LOCAL AREA NETWORK EQUIPMENT

23.1. DESCRIPTION

Furnish, install, and fully integrate new local area network (LAN) equipment as called for in the Plans.

23.2. MATERIAL

A. General

Furnish equipment for the LAN that complies with IEEE standard 802. Furnish Ethernet Switches that comply with the following electrical safety requirements: UL60950 or CSA C22.2 No. 60950 (safety requirements for IT equipment) and FCC Part15 Class A for EMI emissions.

B. Central Video CODEC Unit

Furnish central video CODEC units to decode the transmission from the field video CODEC units to analog NTSC video and serial data. Furnish central CODEC units that are card-based and chassis installed. Furnish central COCEC units that are fully compatible with the existing Axis P7701units installed at the TRTMC.

C. Field Ethernet Switch

Furnish Field Ethernet switches fabricated for use in field equipment cabinets that are ruggedized to meet or exceed NEMA TS-2 requirements for temperature, shock, humidity, and vibration.

Furnish Field Ethernet Switches that are DIN rail mounted and come equipped with hardware to permit mounting in an EIA 19" equipment rack.

Furnish Field Ethernet Switches that weigh no more than 15 lbs. and are no more than 250 cubic inches in volume.

Furnish Field Ethernet Switches with the following minimum characteristics and features:

- Eight (8) 10BASE-T/100BASE-TX ports:
- Minimum of two (2) 1000 BaseX Optical uplink ports that utilize small form-factor pluggable (SFP) connectors.
- Furnish SFP modules rated to transmit and receive Ethernet data at a distance up to 40 km. Use SFP modules that are LX and are matched and compatible with the SFP module it is mated with. Furnish attenuators if required to service link without saturation receiving optics.
- Furnish SFP modules rated for use with the new optical cable installed under this project.
- Furnish SFP modules with LC connectors.
- SFP modules shall be considered incidental to the field Ethernet switch.
- Management console port

Furnish Field Ethernet switches with the following features:

- 10/100BaseTX ports:
 - RJ45 connectors
 - Cable type: Category 5e, unshielded twisted pair

- Segment Length: 100m
- Auto-negotiation support (10/100Mbps)
- Auto MDIX crossover capability
- Full Duplex operation (IEEE 802.3x)
- TVS (transient voltage suppression) between Line +/-, Line +/-ground, and Line - ground to protect the circuitry

Furnish Field Ethernet switches with the following networking requirements:

- The switch shall support automatic address learning of up to 8192 MAC addresses.
- The switch shall support the following advanced layer 2 functions:
 - IEEE 802.1Q VLAN, with support for up to 4096 VLANs
 - IEEE 802.1p priority queuing
 - IEEE 802.1w rapid spanning tree
 - IEEE 802.1s multiple spanning tree
 - IEEE802.1AD link aggregation
 - IEEE 802.3x flow control
 - IGMPv2 with 256 IGMP groups
 - Port Rate Limiting
 - Configuration via test file which can be modified through standard text editor
 - Forwarding/filtering rate shall be 14,880 packets per second (PPS) for 10Mps, 148,800 for 100Mps, 1,488,000 for 1000Mps
 - DHCP Option 82

Furnish Field Ethernet switches with the following network management functionality requirements:

- SNMPv2, SNMPv3
- RMON
- GVRP
- Port Mirroring
- 802.1x port security
- Radius Server
- TACACS+ Server
- SSL – Secure Socket Layer
- SSH – Secure Shell
- TFTP

- Network Time Protocol (NTP)
- Simple Network Time Protocol (SNTP)
- Management via web or Telnet

D. Hub Ethernet Switch

Furnish a hub Ethernet switch that meets all of the requirements for the field Ethernet switch with the following exceptions:

- Minimum of six (6) 1000 BaseX Optical uplink ports that utilize small form-factor pluggable (SFP) connectors.

E. HAR Ethernet Module

Furnish digital communications controller with Ethernet module for integration with the Department's existing highway advisory radio (HAR) transmitter and existing flashing beacon sign. Furnish controller that is fully compatible with the existing HAR equipment and meets the following minimum requirements:

- Communications: Ethernet (TCP/IP)
- Interfaces: RJ45 (Ethernet), RJ11 (Telephone), DB9 (Serial Data)
- Power: 12VDC
- Physical: compatible with the existing HAR rack enclosure

The controller shall be capable of downloading messages over the Ethernet connection from central and sending monitoring data about status and mode to central. The controller shall also be capable of activating and deactivating flashing beacons.

23.3. CONSTRUCTION METHODS

A. General

Furnish media access control (MAC) addresses for all equipment utilized as part of this project. Affix MAC Address label to each device utilized. Furnish IP addresses for all equipment utilized as part of this project. Affix final IP address each device utilized. Use labels that do not smear or fade.

In field equipment cabinets, fully integrate new Ethernet switches with the fiber optic interconnect centers. Integrate all field equipment as call for.

Fully integrate LAN to accomplish local device failover and fault tolerance.

Fully integrate LAN equipment to provide virus protection, user authentication, and security functions to prevent unauthorized users and data from entering the LAN.

B. Requirements Definition Document

Prior to commencing work, the Contractor shall develop a Requirements Definition Document (RDD) that will form the basis for the overall network architecture and design.

- Complete description of the proposed implementation of the access, distribution and core layers for the network as described in the Plans and these Project Special Provisions

- Development of an IP Design Scheme with ranges assigned to each node to be integrated by the Contractor (address ranges, geographic distribution, standards for addresses within each cabinet)
- Proposed IP subnet definition and addressing including any and all masks
- Proposed IP multicast configuration including multicast routing (i.e., PIM sparse or dense) and Rendezvous Point (RP) designation as necessary
- Proposed recommendations for failover and redundancy including network device power, supervisor cards, and network ports
- Proposed configuration and guidelines for L3 routing (OSPF, VRRP, EIGRP, RIP, etc.);
- Proposed configuration and guidelines for Virtual LAN assignments including management VLANs, device VLANs and routing VLANs; and
- Proposed configuration and guidelines for L2 broadcast storm prevention, loop prevention and fault tolerance mechanisms. (Spanning Tree diagram with designated, blocking and forwarding ports indicated. Root bridge and backup root bridge must also be specified.) Incorporation of Multiple Spanning Tree Protocol.
- Proposed configuration and guidelines to mitigate common security threats such as denial of service, man in the middle, MAC/IP spoofing and brute force dictionary attacks.
- Proposed configuration and guidelines for 802.1p Class of Service (COS) queue assignments
- Proposed configuration and guidelines for specific port assignments on each of the L2 and L3 devices

The RDD shall be prepared and signed by a qualified networking professional (minimum CCNA or a manufacturer-approved equivalent based on the approved hardware vendor) and will be approved by the Engineer. The Qualified network professional will be present during the installation and testing of the local area network as well as during system testing.

C. Central Video CODEC Unit

Install the central video CODEC units in the existing rack cabinet at the TRTMC as shown in the Plans. Integrate the CODEC units with the rack cabinet power supply and UPS. Integrate the decoder with the existing core Ethernet switch. Integrate the CODEC video outputs with the inputs on the existing video matrix switch at the TRTMC.

D. Field Ethernet Switch

Install and integrate all field Ethernet switches at field locations as depicted in the diagrams and tables and called for in these Project Special Provisions. Integrate with equipment cabinet hardware and new fiber optic communications equipment, new wireless radios, or Department-furnished cellular modems.

E. Hub Ethernet Switch

Install and integrate the hub Ethernet switch in the new hub cabinet as depicted in the Plans and called for in these Project Special Provisions. Integrate with equipment cabinet hardware and fiber optic communications equipment. Integrate the hub Ethernet switch the network interface device (NID) being provided by others for broadband service.

F. HAR Ethernet Module

Configure the digital communications controller with Ethernet module to be fully compatible with the field Ethernet switch and HAR transmitter and flashing beacon equipment.

Install the digital communications controller with Ethernet module in the existing HAR transmitter cabinet and integrate with the existing HAR transmitter according to the manufacturer’s recommendations. Integrate the Ethernet module with the new field Ethernet switch.

Install the digital communications controller with Ethernet module in the new HAR flashing beacon cabinet and integrate with the existing flashing beacon equipment according to the manufacturer’s recommendations. Integrate the Ethernet module with the new field Ethernet switch.

23.4. MEASUREMENT AND PAYMENT

Central Video CODEC Unit will be measured and paid for as the actual number of units, furnished, installed, integrated, and accepted. All cabling and patch cables, integration, and configuration required to install the video CODEC unit shall be incidental and not be paid for separately.

Field Ethernet Switch will be measured and paid as the actual number furnished, installed, integrated, and accepted. All SFP modules, optics, cabling, attenuators, configuration, and testing or other labor or materials required to install and integrate the Ethernet Switch will be considered incidental and not be paid for separately.

Hub Ethernet Switch will be measured and paid as the actual number furnished, installed, integrated, and accepted. All SFP modules, optics, cabling, attenuators, configuration, and testing or other labor or materials required to install and integrate the Ethernet Switch will be considered incidental and not be paid for separately.

HAR Ethernet Module will be measured and paid as the actual number furnished, installed, integrated, and accepted. All interfaces, cabling, configuration, and testing or other labor or materials required to install and integrate the module with the existing HAR will be considered incidental and not be paid for separately.

Payment for all LAN integration, RDD development, cabling, jumpers, adapters, sockets, LAN patch panels, and other hardware shall be considered incidental and no separate payment will be made.

No measurement will be made for communications equipment or services provided by the Department. The integration of the equipment will be considered incidental to the installation and integration of the corresponding CCTV or DMS equipment.

Payment will be made under:

| Pay Item | Pay Unit |
|--------------------------------|-----------------|
| Central Video CODEC Unit | Each |
| Field Ethernet Switch..... | Each |
| Hub Ethernet Switch..... | Each |
| HAR Ethernet Module | Each |

24. ETHERNET CABLE (OUTDOOR RATED)

24.1. Description

Furnish and install Ethernet cable to serve as interconnect between Ethernet switches and/or field devices routed in underground conduit.

24.2. Materials

Furnish CAT5E Ethernet cable that is suitable for outdoor installation and meets or exceeds the following standards:

- 4-pair shielded twisted pair cable
- 24AWG (minimum) solid bare copper conductor
- Meets or exceeds CAT5E specifications
- High-density polyethylene insulation, PVC jacket
- Compliant with EIA/TIA standards
- UL/CSA listed
- UV Stabilized PE Jacket
- Gel Filled
- Meets TIA/EIA 568B.2 Networking Standard
- Supports 10/100/1000/10,000Mbps
- Mean Power Sum for Equal Level Far End Crosstalk (ELFEXT): 45dB/kft (minimum) at 772kHz
- Worst Pair Power Sum for ELFEXT: 40dB/kft (minimum) at 772kHz
- Mean Power Sum for Near-end Crosstalk (NEXT): 42dB/kft (minimum) at 772 kHz
- Operating Temperature: Rated from -10 to +60 Celsius
- Average mutual capacitance: 90nf/mile (maximum)

Have the manufacturer factory test the Ethernet cable on reels for each pair's mutual capacitance, crosstalk loss, insulation resistance, and conductor resistance. Furnish the Engineer with a certified report for each reel showing compliance with these Project Special Provisions, the factory test results, and the manufactured date of the cable. The contractor shall not use Ethernet cable manufactured more than one year before the date of installation.

Cables where both ends will terminate in an RJ-45 connector, both ends should be installed with punchdown female jacks at both ends of the factory-manufactured cable, to be connected at both ends with short 3-6' patch cables.

Cable length with end patch connectors shall not exceed 295 feet.

24.3. Construction Methods

A. General

Install Ethernet cable in conduits at locations shown in the Plans. Allow a minimum of 10 feet (3 meters) of cable slack.

Ethernet cables shall not be spliced.

All cables shall be labeled with water proof, smear resistant labels that denote the equipment cabinets or housing they are run from and the device and identifier for that device they are connected to.

Install underground Ethernet cable in conduit described in these Special Provisions and as shown in the Plans.

The contractor shall not exceed 80 percent of the manufacturer's maximum pulling tension when installing underground Ethernet cable. Use a clutch device (dynamometer) so as not to exceed the allowable pulling tension if the cable is pulled by mechanical means. Do not use a motorized vehicle to generate cable-pulling forces.

Keep tension on the cable reel and the pulling line at the start of each pull. Do not release the tension in the cable if the pulling operation is halted. Restart the pulling operation by gradually increasing the tension until the cable is in motion.

24.4. Measurement and Payment

Ethernet cable (outdoor rated) will be measured and paid as linear feet of outdoor rated Ethernet cable furnished, installed, and accepted. Sag and vertical segments will not be paid for as these distances are considered incidental to the installation of the cable.

Ethernet cabling installed within equipment cabinets, within rooms, and within buildings are incidental and will not be paid for under this item.

No measurement will be made for terminating and testing of the cable, connectors, cable identification markers, and grounding, as these will be considered incidental to the installation of the Ethernet cable.

Payment will be made under:

Ethernet Cable (Outdoor Rated) Linear Feet

25. INTEGRATION AND CONFIGURATION

25.1. DESCRIPTION

Install and fully integrate new central equipment at the TRTMC. Fully configure existing central hardware and software at the TRTMC to establish communications with new CCTV and DMS devices as well as the existing HAR and flashing beacon devices.

Coordinate the working hours and building access for all central configuration activities with the Engineer.

25.2. CENTRAL INTEGRATION

A. General

Furnish media access control (MAC) addresses for all equipment utilized as part of this project. Affix MAC Address label to each device utilized. Furnish IP addresses for all equipment utilized as part of this project. Affix final IP address each device utilized. Use labels that do not smear or fade.

Install central video CODEC units in the existing rack cabinets at the TRTMC as shown on the Block Diagram in the Plans.

Integrate the existing core Ethernet switch with the Department-furnished broadband service equipment. Configure the core Ethernet switch and ports as required to establish communications to field Ethernet switches.

Integrate the central video CODEC units with the existing core Ethernet switch and existing video matrix switch. Configure the video matrix switch to add the new CCTV devices as new inputs to the switch.

Configure the existing CCTV server to recognize the new CCTV units and process the video and control data for sharing with the TRTMC.

Configure the existing DMS server to recognize the new DMS units and process control data for sharing with the TRTMC.

Configure the existing HAR server to recognize the existing HAR transmitter and flashing beacon using Ethernet communications for sharing with the TRTMC.

B. Modify Existing Video Matrix Switch

Furnish equipment to expand the existing Pelco 9780 video matrix switch at the TRTMC to accommodate and additional 32 NTSC video inputs. Furnish equipment and cabling necessary to accomplish the described functionality including video matrix switcher input modules. Modify the video matrix switch CPU database and the CCTV server database to recognize and make fully functional the additional video inputs.

25.3. CENTRAL CONFIGURATION

A. General

The existing DMS central software that controls the DMS units at the TRTMC is Daktronic's Vanguard. Modify the existing DMS central software configuration at the TRTMC to display and

map the new DMS units in the software GUI. Ensure that the software also allows for full communications and control of the DMS unit.

The existing CCTV central software that controls the existing video matrix switch at the TRTMC is Protronix's VideoPro. This software includes on-screen pan-tilt-zoom controls of each camera in the system. Modify the Protronix CCTV central software configuration at the TRTMC to display and map the new CCTV devices so that the CCTV video can be displayed on the existing monitors and display devices at the TRTMC.

Integrate the new CCTV units with NCDOT's regional video sharing and distribution system to allow for remote users to view and control the new CCTV units that terminate on the NCDOT analog video matrix switch through the Ethernet network connection between the remote user and the NCDOT VideoPro server at the TRTMC.

B. Modify Existing HAR Control Software

The existing HAR control software that controls the HAR transmitters at the TRTMC is not fully compatible with the Ethernet communications modules being installed under this project and the existing flashing beacons being integrated under this project. The Contractor shall upgrade the existing HAR control software to the latest version with all applicable licenses for the Department that meets the following requirements:

- Maintains existing server-client configuration
- Maintains existing user account permissions
- Installs on the existing HAR server computer at the TRTMC
- Installs on the existing client workstation at the TRTMC
- Provides a graphical user interface (GUI)
- Fully compatible with the new Ethernet modules installed under this project
- Fully compatible with the existing HAR transmitters being integrated under this project
- Fully compatible with the existing HAR flashing beacons being integrated under this project
- Supports the control of a minimum of three (3) HAR transmitters and six (6) flashing beacons
- Supports a minimum of one (1) client user

Integrate the modified and upgraded HAR control software with the field hardware.

25.4. MEASUREMENT AND PAYMENT

Modify Existing Video Matrix Switch will be measured and paid as the actual number of existing switches modified and accepted. All hardware, cabling, configuration, and testing or other labor or materials required to provide for additional video inputs will be considered incidental and not be paid for separately.

Modify Existing HAR Control Software will be measured and paid as the actual number of existing HAR control software systems modified and accepted. This shall include the furnishing, installation, testing, and all materials, 3rd party software if required, equipment, labor, tools, storage, shipping, and incidentals necessary to upgrade the software, complete system integration, and

provide a complete operating system. No payment will be made for providing software licenses as required in these Project Special Provisions.

Integration and Configuration will be measured and paid as a lump sum price. This item shall include the installation, testing, and all materials, equipment, labor, tools, storage, shipping, and incidentals necessary to complete the integration and configuration of CCTV and DMS devices with the existing systems at the TRTMC.

All cabling, labeling, sockets, or other accessories required to configure, integrate, and interconnect computer equipment shall be considered incidental and shall not be paid for separately.

All central equipment installed for communications to new CCTV and DMS units will be measured and paid for under the applicable Section of these Project Special Provisions.

Payment will be made under:

| Pay Item | Pay Unit |
|--|-----------------|
| Modify Existing Video Matrix Switch | Each |
| Modify Existing HAR Control Software | Each |
| Integration and Configuration..... | Lump Sum |

26. TESTING & ACCEPTANCE

26.1. GENERAL TEST PROCEDURE

Test the DMS and CCTV systems in a series of design approval and functional tests. The results of each test must meet the specified requirements. These tests should not damage the equipment. The Engineer will reject equipment that fails to fulfill the requirements of any test. Resubmit rejected equipment after correcting non-conformities and re-testing; completely document all diagnoses and corrective actions. Modify all equipment furnished under this contract, without additional cost to the North Carolina Department of Transportation, 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 30 days prior to the testing start date.

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

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

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

Conform to these testing requirements and the requirements of these specifications. The Engineer will reject all equipment not tested according to these requirements. It is the Contractor's responsibility to ensure the system functions properly even after the Engineer accepts the DMS test results.

Provide 4 copies of the quantitative test results and data forms containing all data taken, highlighting any non-conforming results and remedies taken, to the Engineer for approval. An authorized representative of the manufacturer must sign the test results and data forms.

26.2. COMPATIBILITY TESTS

A. DMS System

No compatibility test is required.

B. CCTV System

Compatibility Tests are applicable to CCTV cameras and video transceivers that the Contractor wishes to furnish but are of a different manufacturer or model series than the existing units in the field or existing units installed at the TRTMC. If required, the Compatibility Test shall be completed and accepted by the Engineer prior to approval of the material submittal.

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

The Contractor shall provide, install, and integrate a full-functioning unit to be tested. The Department will provide access to existing equipment to facilitate these testing procedures. The Contractor is responsible for configuring proposed equipment at the TRTMC and proving compatibility. The Engineer will determine if the Compatibility Test was acceptable for each proposed device.

C. Fiber Optic Communications

No compatibility test is required.

D. Central Hardware

Compatibility Tests are applicable to central and field Ethernet switches that the Contractor wishes to furnish but are of a different manufacturer or model series than the existing units in the field or existing units installed at the TRTMC. If required, the Compatibility Test shall be completed and accepted by the Engineer prior to approval of the material submittal.

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

The Contractor shall provide, install, and integrate a full-functioning unit to be tested. The Department will provide access to existing equipment to facilitate these testing procedures. The Contractor is responsible for configuring proposed equipment at the TRTMC and proving compatibility. The Engineer will determine if the Compatibility Test was acceptable for each proposed device.

26.3. OPERATIONAL FIELD TEST (ON-SITE COMMISSIONING)

A. DMS System

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

1. Physical Examination

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

Perform the following tests as a minimum:

- Verify that all surfaces are free of dents, scratches, weld burns, or abrasions. Round sharp edges and corners.
- Verify bend radius of cables is not excessive or could potentially cause damage.

- Verify all modules, lamps, and components are properly secured.
- Verify that there are no exposed live terminals.

2. Continuity Tests

Check the wiring to assure it conforms to the requirements of these Project Special Provisions.

3. Functional Tests

Perform the following functional tests:

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

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

B. CCTV System

Perform the following local operational field tests at the camera assembly field site in accordance with the test plans. A laptop computer shall provide camera control and positioning. After completing the installation of the camera assembly, including the camera hardware, video transceiver unit, power supply, and connecting cables:

- Furnish all equipment, appliances, and labor necessary to test the installed cable and to perform the following tests before any connections are made;
- Verify that physical construction has been completed;
- Inspect the quality and tightness of ground and surge protector connections;
- Check the power supply voltages and outputs;
- Connect devices to the power sources;
- Verify installation of specified cables and connections between the camera, PTZ, camera control receiver, and control cabinet;
- Perform the CCTV assembly manufacturer's initial power-on test in accordance with the manufacturer's recommendation;
- Set the camera IP address;
- Verify the presence and quality of the video image with a laptop computer and applicable video viewing software;
- Exercise the pan, tilt, zoom, focus, iris opening, and manual iris control selections, and the operation, preset positioning, and power on/off functions;
- Demonstrate the pan and tilt speeds and extent of movement to meet all applicable standards, specifications, and requirements;
- Verify proper voltage of all power supplies; and
- Interconnect the communication interface device with the communication network's assigned fiber-optic trunk cable and verify that there is a transmission LED illuminated.

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

C. Fiber Optic Communications

Conduct optical time domain reflectometer (OTDR) tests on the cable on the reel and after the cable is installed and terminated. Provide written notification a minimum of ten days before beginning fiber-optic cable testing.

After splicing is completed, perform bi-directional OTDR tests on each fiber, including unused fibers, to ensure the following:

- Fusion splice loss does not exceed 0.05 dB,

- Terminations and connections have a loss of 0.5 dB or less, and
- Reflection loss is 40 dB or greater for each connector.

Install a 1000-foot pre-tested launch cable between the OTDR and fiber-optic cable to be tested.

If exceeded, remake splices until the loss falls below 0.05 dB. The Department will record each attempt for purposes of acceptance.

Furnish durable labeled plots and electronic copies on a CD or DVD of test results for each fiber including engineering calculations demonstrating that OTDR test results meet or exceed the attenuation requirements and that optical properties of the cable have not been impaired. Label all test results (plots and discs) with the manufacturer and model number of the OTDR testing equipment.

Provide a tabular summary or spreadsheet detailing and comparing the loss budget and actual loss calculations per link. Provide test results for fiber-optic cable that demonstrates the loss budget where the fiber originates and the point where the fiber meets an electronic device.

If any fiber exceeds the maximum allowable attenuation or if the fiber-optic properties of the cable have been impaired, take approved corrective action including replacement of complete segments of fiber-optic cable if required. Corrective action will be at no additional cost to the Department.

D. Central Hardware

The Contractor shall perform a Network System Test (NST) on the local area network. During the NST, the Contractor must demonstrate successful local operation of field equipment operating from the field Ethernet switches as well as successful control of the equipment from the TRTMC.

In the event of a failed NST, the Contractor, at his expense, must perform all necessary activities required to provide proper operation of the LAN, which can include full replacement of field equipment or cabling.

The Engineer or his representative will witness all NSTs. Documentation of all testing procedures and activities must be provided to the Engineer prior to full acceptance of the system ring.

26.4. 30-DAY OBSERVATION PERIOD

The 30-Day Observation Period shall **NOT** be considered part of work to be completed by the project completion date.

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

Respond to system or component failures (or reported failures) that occur during the 30-day Observation Period within twenty-four (24) hours. Correct said failures within forty-eight (48) hours. Any failure that affects a major system component as defined below for more than forty-eight

(48) hours will suspend the timing of the 30-day Observation Period beginning at the time when the failure occurred. After the cause of such failures has been corrected, timing of the 30-day Observation Period will resume. System or component failures that necessitate a redesign of any component or failure in any of the major system components exceeding a total of three (3) occurrences will terminate the 30-day Observation Period and cause the 30-day Observation Period to be restarted from day zero when the redesigned components have been installed and/or the failures corrected. The major system components are:

- DMS Field Controller and Display Module
- CCTV Camera, PTZ, and Video Transceivers
- Fiber Optic Communications Cables and Splices
- Local Area Network including Ethernet switches

26.5. FINAL ACCEPTANCE

Final system acceptance is defined as the time when all work and materials described in the Plans and these Project Special Provisions have been furnished and completely installed by the Contractor; all parts of the work have been approved and accepted by the Engineer; and successful completion of the 30-day observation period.

The project will be ready for final acceptance upon the satisfactory completion of all tests detailed in this Section of the Project Special provisions; the rectification of all punch-list discrepancies; and the submittal of all project documentation.

26.6. MEASUREMENT AND PAYMENT

There will be no direct payment for the work covered in this section.

Payment for this work will be covered in the applicable sections of these Project Special Provisions at the contract unit price for other items furnished on this Project.

STANDARD SPECIAL PROVISION
AVAILABILITY OF FUNDS – TERMINATION OF CONTRACTS

(5-20-08)

Z-2

General Statute 143C-6-11. (h) Highway Appropriation is hereby incorporated verbatim in this contract as follows:

(h) Amounts Encumbered. – Transportation project appropriations may be encumbered in the amount of allotments made to the Department of Transportation by the Director for the estimated payments for transportation project contract work to be performed in the appropriation fiscal year. The allotments shall be multiyear allotments and shall be based on estimated revenues and shall be subject to the maximum contract authority contained in *General Statute 143C-6-11(c)*. Payment for transportation project work performed pursuant to contract in any fiscal year other than the current fiscal year is subject to appropriations by the General Assembly. Transportation project contracts shall contain a schedule of estimated completion progress, and any acceleration of this progress shall be subject to the approval of the Department of Transportation provided funds are available. The State reserves the right to terminate or suspend any transportation project contract, and any transportation project contract shall be so terminated or suspended if funds will not be available for payment of the work to be performed during that fiscal year pursuant to the contract. In the event of termination of any contract, the contractor shall be given a written notice of termination at least 60 days before completion of scheduled work for which funds are available. In the event of termination, the contractor shall be paid for the work already performed in accordance with the contract specifications.

Payment will be made on any contract terminated pursuant to the special provision in accordance with Subarticle 108-13(E) of the *2012 Standard Specifications*.

STANDARD SPECIAL PROVISION**ERRATA**

(1-17-12) (Rev. 1-21-14)

Z-4

Revise the 2012 *Standard Specifications* as follows:

Division 2

Page 2-7, line 31, Article 215-2 Construction Methods, replace “Article 107-26” with “Article 107-25”.

Page 2-17, Article 226-3, Measurement and Payment, line 2, delete “pipe culverts”.

Page 2-20, Subarticle 230-4(B), Contractor Furnished Sources, change references as follows: **Line 1**, replace “(4) Buffer Zone” with “(c) Buffer Zone”; **Line 12**, replace “(5) Evaluation for Potential Wetlands and Endangered Species” with “(d) Evaluation for Potential Wetlands and Endangered Species”; and **Line 33**, replace “(6) Approval” with “(4) Approval”.

Division 3

Page 3-1, after line 15, Article 300-2 Materials, replace “1032-9(F)” with “1032-6(F)”.

Division 4

Page 4-77, line 27, Subarticle 452-3(C) Concrete Coping, replace “sheet pile” with “reinforcement”.

Division 6

Page 6-7, line 31, Article 609-3 Field Verification of Mixture and Job Mix Formula Adjustments, replace “30” with “45”.

Page 6-10, line 42, Subarticle 609-6(C)(2), replace “Subarticle 609-6(E)” with “Subarticle 609-6(D)”.

Page 6-11, Table 609-1 Control Limits, replace “Max. Spec. Limit” for the Target Source of $P_{0.075}/P_{be}$ Ratio with “1.0”.

Page 6-40, Article 650-2 Materials, replace “Subarticle 1012-1(F)” with “Subarticle 1012-1(E)”

Division 8

Page 8-23, line 10, Article 838-2 Materials, replace “Portland Cement Concrete, Class B” with “Portland Cement Concrete, Class A”.

Division 12

Page 12-7, Table 1205-3, add “FOR THERMOPLASTIC” to the end of the title.

Page 12-8, Subarticle 1205-5(B), line 13, replace “Table 1205-2” with “Table 1205-4”.

Page 12-8, Table 1205-4 and 1205-5, replace “THERMOPLASTIC” in the title of these tables with “POLYUREA”.

Page 12-9, Subarticle 1205-6(B), line 21, replace “Table 1205-4” with “Table 1205-6”.

Page 12-11, Subarticle 1205-8(C), line 25, replace “Table 1205-5” with “Table 1205-7”.

Division 15

Page 15-4, Subarticle 1505-3(F) Backfilling, line 26, replace “Subarticle 235-4(C)” with “Subarticle 235-3(C)”.

Page 15-6, Subarticle 1510-3(B), after line 21, replace the allowable leakage formula with the following: $W = LD\sqrt{P} \div 148,000$

Page 15-6, Subarticle 1510-3(B), line 32, delete “may be performed concurrently or” and replace with “shall be performed”.

Page 15-17, Subarticle 1540-3(E), line 27, delete “Type 1”.

Division 17

Page 17-26, line 42, Subarticle 1731-3(D) Termination and Splicing within Interconnect Center, delete this subarticle.

Revise the *2012 Roadway Standard Drawings* as follows:

1633.01 Sheet 1 of 1, English Standard Drawing for Matting Installation, replace “1633.01” with “1631.01”.

STANDARD SPECIAL PROVISION**PLANT AND PEST QUARANTINES****(Imported Fire Ant, Gypsy Moth, Witchweed, And Other Noxious Weeds)**

(3-18-03) (Rev. 10-15-13)

Z-04a

Within Quarantined Area

This project may be within a county regulated for plant and/or pests. If the project or any part of the Contractor's operations is located within a quarantined area, thoroughly clean all equipment prior to moving out of the quarantined area. Comply with federal/state regulations by obtaining a certificate or limited permit for any regulated article moving from the quarantined area.

Originating in a Quarantined County

Obtain a certificate or limited permit issued by the N.C. Department of Agriculture/United States Department of Agriculture. Have the certificate or limited permit accompany the article when it arrives at the project site.

Contact

Contact the N.C. Department of Agriculture/United States Department of Agriculture at 1-800-206-9333, 919-733-6932, or <http://www.ncagr.gov/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.

STANDARD SPECIAL PROVISION**AWARD OF CONTRACT**

(6-28-77)

Z-6

“The North Carolina Department of Transportation, in accordance with the provisions of *Title VI of the Civil Rights Act of 1964* (78 Stat. 252) and the Regulations of the Department of Transportation (*49 C.F.R., Part 21*), issued pursuant to such act, hereby notifies all bidders that it will affirmatively insure that the contract entered into pursuant to this advertisement will be awarded to the lowest responsible bidder without discrimination on the ground of race, color, or national origin”.

STANDARD SPECIAL PROVISION**MINORITY AND FEMALE EMPLOYMENT REQUIREMENTS**

Z-7

NOTICE OF REQUIREMENTS FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (*EXECUTIVE NUMBER 11246*)

1. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, see as shown on the attached sheet entitled "Employment Goals for Minority and Female participation".

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its federally involved and nonfederally involved construction.

The Contractor's compliance with the Executive Order and the regulations in *41 CFR Part 60-4* shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in *41 CFR 60-4.3(a)*, and its effort to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project or the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the executive Order and the regulations in *41 CFR Part 60-4*. Compliance with the goals will be measured against the total work hours performed.

2. As used in this Notice and in the contract resulting from this solicitation, the "covered area" is the county or counties shown on the cover sheet of the proposal form and contract.

**EMPLOYMENT GOALS FOR MINORITY
AND FEMALE PARTICIPATION**

Economic Areas

Area 023 29.7%

Bertie County
Camden County
Chowan County
Gates County
Hertford County
Pasquotank County
Perquimans County

Area 024 31.7%

Beaufort County
Carteret County
Craven County
Dare County
Edgecombe County
Green County
Halifax County
Hyde County
Jones County
Lenoir County
Martin County
Nash County
Northampton County
Pamlico County
Pitt County
Tyrrell County
Washington County
Wayne County
Wilson County

Area 025 23.5%

Columbus County
Duplin County
Onslow County
Pender County

Area 026 33.5%

Bladen County
Hoke County
Richmond County
Robeson County
Sampson County
Scotland County

Area 027 24.7%

Chatham County
Franklin County
Granville County
Harnett County
Johnston County
Lee County
Person County
Vance County
Warren County

Area 028 15.5%

Alleghany County
Ashe County
Caswell County
Davie County
Montgomery County
Moore County
Rockingham County
Surry County
Watauga County
Wilkes County

Area 029 15.7%

Alexander County
Anson County
Burke County
Cabarrus County
Caldwell County
Catawba County
Cleveland County
Iredell County
Lincoln County
Polk County
Rowan County
Rutherford County
Stanly County

Area 0480 8.5%

Buncombe County
Madison County

Area 030 6.3%

Avery County
Cherokee County
Clay County
Graham County
Haywood County
Henderson County
Jackson County
McDowell County
Macon County
Mitchell County
Swain County
Transylvania County
Yancey County

SMSA Areas

Area 5720 26.6%

Currituck County

Area 9200 20.7%

Brunswick County
New Hanover County

Area 2560 24.2%

Cumberland County

Area 6640 22.8%

Durham County
Orange County
Wake County

Area 1300 16.2%

Alamance County

Area 3120 16.4%

Davidson County
Forsyth County
Guilford County
Randolph County
Stokes County
Yadkin County

Area 1520 18.3%

Gaston County
Mecklenburg County
Union County

Goals for Female

Participation in Each Trade

(Statewide) 6.9%

STANDARD SPECIAL PROVISION**REQUIRED CONTRACT PROVISIONS FEDERAL - AID CONSTRUCTION CONTRACTS**

FHWA - 1273 Electronic Version - May 1, 2012

Z-8

- I. General
- II. Nondiscrimination
- III. Nonsegregated Facilities
- IV. Davis-Bacon and Related Act Provisions
- V. Contract Work Hours and Safety Standards Act Provisions
- VI. Subletting or Assigning the Contract
- VII. Safety: Accident Prevention
- VIII. False Statements Concerning Highway Projects
- IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
- X. Compliance with Governmentwide Suspension and Debarment Requirements
- XI. Certification Regarding Use of Contract Funds for Lobbying

ATTACHMENTS

- A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).
The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.
Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.
Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).
2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.
3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.
4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

II. NONDISCRIMINATION

The provisions of this section related to 23 CFR Part 230 are applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding \$10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. **Equal Employment Opportunity:** Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are

incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

- a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.
 - b. The contractor will accept as its operating policy the following statement:
"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."
2. **EEO Officer:** The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.
 3. **Dissemination of Policy:** All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:
 - a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.
 - b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.
 - c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.
 - d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.
 - e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.
 4. **Recruitment:** When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.
 - a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.
 - b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.
 - c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.
 5. **Personnel Actions:** Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:
 - a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.
 - b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.
 - c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.
 - d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.
 6. **Training and Promotion:**
 - a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.
 - b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).
 - c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.
 - d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

7. **Unions:** If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:
- The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.
 - The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.
 - The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.
 - In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.
8. **Reasonable Accommodation for Applicants / Employees with Disabilities:** The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.
9. **Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:** The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.
- The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.
 - The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.
10. **Assurance Required by 49 CFR 26.13(b):**
- The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.
 - The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.
11. **Records and Reports:** The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.
- The records kept by the contractor shall document the following:
 - The number and work hours of minority and non-minority group members and women employed in each work classification on the project;
 - The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and
 - The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;
 - The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding \$2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 "Contract provisions and related matters" with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. Minimum wages

- All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the

Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

- b. (1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:
 - (i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
 - (ii) The classification is utilized in the area by the construction industry; and
 - (iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.
 - (2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.
 - (3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.
 - (4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.
- c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.
- d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.
2. **Withholding.** The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.
 3. **Payrolls and basic records**
 - a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.
 - b. (1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the

payrolls shall only need to include an individually identifying number for each employee (e.g. , the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency.

- (2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:
 - (i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;
 - (ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;
 - (iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.
 - (3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.
 - (4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.
- c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and trainees

- a. Apprentices (programs of the USDOL). Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

- b. Trainees (programs of the USDOL). Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

- In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.
- c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.
 - d. Apprentices and Trainees (programs of the U.S. DOT). Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.
5. **Compliance with Copeland Act requirements.** The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.
 6. **Subcontracts.** The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.
 7. **Contract termination:** debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.
 8. **Compliance with Davis-Bacon and Related Act requirements.** All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.
 9. **Disputes concerning labor standards.** Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.
 10. **Certification of eligibility.**
 - a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
 - b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
 - c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

The following clauses apply to any Federal-aid construction contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

1. **Overtime requirements.** No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
2. **Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.
3. **Withholding for unpaid wages and liquidated damages.** The FHWA or the contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.
4. **Subcontracts.** The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).
 - a. The term "perform work with its own organization" refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:
 - (1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;

- (2) the prime contractor remains responsible for the quality of the work of the leased employees;
 - (3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and
 - (4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.
- b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.
2. The contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.
 3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.
 4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.
 5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.
2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).
3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.
2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost \$25,000 or more – as defined in 2 CFR Parts 180 and 1200.

1. Instructions for Certification – First Tier Participants:

- a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.
- b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.
- c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default.
- d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
- e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).
- f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.
- g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.
- h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.
- i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
- j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

* * * * *

2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:

- a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:
 - (1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;
 - (2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
 - (3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification; and
 - (4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.
- b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

2. Instructions for Certification - Lower Tier Participants:

(Applicable to all subcontracts, purchase orders and other lower tier transactions requiring prior FHWA approval or estimated to cost \$25,000 or more - 2 CFR Parts 180 and 1200)

- a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.
- b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

- c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.
- d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contractor). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).
- e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
- f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.
- g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.
- h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
- i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

* * * * *

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.
2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

* * * * *

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000 (49 CFR 20).

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:
 - a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
 - b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.
3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

STANDARD SPECIAL PROVISION**ON-THE-JOB TRAINING**

(10-16-07) (Rev. 5-21-13)

Z-10

Description

The North Carolina Department of Transportation will administer a custom version of the Federal On-the-Job Training (OJT) Program, commonly referred to as the Alternate OJT Program. All contractors (existing and newcomers) will be automatically placed in the Alternate Program. Standard OJT requirements typically associated with individual projects will no longer be applied at the project level. Instead, these requirements will be applicable on an annual basis for each contractor administered by the OJT Program Manager.

On the Job Training shall meet the requirements of 23 CFR 230.107 (b), 23 USC – Section 140, this provision and the On-the-Job Training Program Manual.

The Alternate OJT Program will allow a contractor to train employees on Federal, State and privately funded projects located in North Carolina. However, priority shall be given to training employees on NCDOT Federal-Aid funded projects.

Minorities and Women

Developing, training and upgrading of minorities and women toward journeyman level status is a primary objective of this special training provision. Accordingly, the Contractor shall make every effort to enroll minority and women as trainees to the extent that such persons are available within a reasonable area of recruitment. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training, whether a member of a minority group or not.

Assigning Training Goals

The Department, through the OJT Program Manager, will assign training goals for a calendar year based on the contractors' past three years' activity and the contractors' anticipated upcoming year's activity with the Department. At the beginning of each year, all contractors eligible will be contacted by the Department to determine the number of trainees that will be assigned for the upcoming calendar year. At that time the Contractor shall enter into an agreement with the Department to provide a self-imposed on-the-job training program for the calendar year. This agreement will include a specific number of annual training goals agreed to by both parties. The number of training assignments may range from 1 to 15 per contractor per calendar year. The Contractor shall sign an agreement to fulfill their annual goal for the year. A sample agreement is available at www.ncbowd.com/section/on-the-job-training.

Training Classifications

The Contractor shall provide on-the-job training aimed at developing full journeyman level workers in the construction craft/operator positions. Preference shall be given to providing training in the following skilled work classifications:

| | |
|---------------------|----------------------------------|
| Equipment Operators | Office Engineers |
| Truck Drivers | Estimators |
| Carpenters | Iron / Reinforcing Steel Workers |
| Concrete Finishers | Mechanics |
| Pipe Layers | Welders |

The Department has established common training classifications and their respective training requirements that may be used by the contractors. However, the classifications established are not all-inclusive. Where the training is oriented toward construction applications, training will be allowed in lower-level management positions such as office engineers and estimators. Contractors shall submit new classifications for specific job functions that their employees are performing. The Department will review and recommend for acceptance to FHWA the new classifications proposed by contractors, if applicable. New classifications shall meet the following requirements:

Proposed training classifications are reasonable and realistic based on the job skill classification needs, and

The number of training hours specified in the training classification is consistent with common practices and provides enough time for the trainee to obtain journeyman level status.

The Contractor may allow trainees to be trained by a subcontractor provided that the Contractor retains primary responsibility for meeting the training and this provision is made applicable to the subcontract. However, only the Contractor will receive credit towards the annual goal for the trainee.

Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training. The number of trainees shall be distributed among the work classifications on the basis of the contractor's needs and the availability of journeymen in the various classifications within a reasonable area of recruitment.

No employee shall be employed as a trainee in any classification in which they have successfully completed a training course leading to journeyman level status or in which they have been employed as a journeyman.

Records and Reports

The Contractor shall maintain enrollment, monthly and completion reports documenting company compliance under these contract documents. These documents and any other information as requested shall be submitted to the OJT Program Manager.

Upon completion and graduation of the program, the Contractor shall provide each trainee with a certification Certificate showing the type and length of training satisfactorily completed.

Trainee Interviews

All trainees enrolled in the program will receive an initial and Trainee/Post graduate interview conducted by the OJT program staff.

Trainee Wages

Contractors shall compensate trainees on a graduating pay scale based upon a percentage of the prevailing minimum journeyman wages (Davis-Bacon Act). Minimum pay shall be as follows:

| | |
|------------|---|
| 60 percent | of the journeyman wage for the first half of the training period |
| 75 percent | of the journeyman wage for the third quarter of the training period |
| 90 percent | of the journeyman wage for the last quarter of the training period |

In no instance shall a trainee be paid less than the local minimum wage. The Contractor shall adhere to the minimum hourly wage rate that will satisfy both the NC Department of Labor (NCDOL) and the Department.

Achieving or Failing to Meet Training Goals

The Contractor will be credited for each trainee employed by him on the contract work who is currently enrolled or becomes enrolled in an approved program and who receives training for at least 50 percent of the specific program requirement. Trainees will be allowed to be transferred between projects if required by the Contractor's scheduled workload to meet training goals.

If a contractor fails to attain their training assignments for the calendar year, they may be taken off the NCDOT's Bidders List.

Measurement and Payment

No compensation will be made for providing required training in accordance with these contract documents.

STANDARD SPECIAL PROVISION
MINIMUM WAGES
GENERAL DECISION NC140098 01/03/2014 NC98

Z-98

Date: January 3, 2014

General Decision Number: NC140098 01/03/2014 NC98

Superseded General Decision Numbers: NC20130098

State: North Carolina

Construction Type: HIGHWAY

COUNTIES:

| | | |
|-----------|-------------|--------|
| Caswell | Halifax | Vance |
| Granville | Northampton | Warren |

HIGHWAY CONSTRUCTION PROJECTS (excluding tunnels, building structures in rest area projects, railroad construction, bascule, suspension and spandrel arch bridges designed for commercial navigation, bridges involving marine construction, and other major bridges).

Modification Number
0

Publication Date
01/03/2014

SUNC2011-079 09/16/2011

| | Rates | Fringes |
|---|-------|---------|
| CARPENTER (Form Work Only) | 13.48 | |
| CEMENT MASON/CONCRETE FINISHER | 12.90 | |
| IRONWORKER (Reinforcing) | 13.81 | |
| LABORER | | |
| Asphalt, Asphalt Distributor, Raker, and Spreader | 13.96 | |
| Common or General | | |
| Halifax County | 10.10 | |
| Remaining Counties | 10.79 | |
| Vance County | 11.78 | |
| Concrete Saw | 11.61 | |
| Landscape | 9.57 | |
| Luteman | 12.24 | |
| Mason Tender (Cement/Concrete) | 10.53 | |
| Pipelayer | 9.00 | |
| Traffic Control (Flagger) | 10.31 | |
| POWER EQUIPMENT OPERATORS | | |
| Backhoe/Excavator/Trackhoe | 16.38 | |
| Broom/Sweeper | 12.29 | |
| Bulldozer | 14.95 | |
| Crane | 16.75 | |
| Grader/Blade | 17.07 | |
| Loader | 14.21 | |
| Mechanic | 14.00 | |
| Milling Machine | 14.43 | |
| Oiler | 11.50 | |
| Paver | 14.22 | |
| Roller | 13.63 | |
| Scraper | 12.29 | |
| Screed | 15.82 | |
| Tractor | 13.60 | |
| TRUCK DRIVER | | |
| Dump Truck | 11.88 | |
| Lowboy Truck | 15.71 | |
| Single Axle Truck | 11.77 | |
| Water Truck | 13.82 | |

Welders – Receive rate prescribed for craft performing operation to which welding is incidental.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a)(1)(ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is union or non-union.

Union Identifiers

An identifier enclosed in dotted lines beginning with characters other than "SU" denotes that the union classification and rate have found to be prevailing for that classification. Example: PLUM0198-005 07/01/2011. The first four letters, PLUM, indicate the international union and the four-digit number, 0198, that follows indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2011, following these characters is the effective date of the most current negotiated rate/collective bargaining agreement which would be July 1, 2011 in the above example.

Union prevailing wage rates will be updated to reflect any changes in the collective bargaining agreements governing the rates.

0000/9999: weighted union wage rates will be published annually each January.

Non-Union Identifiers

Classifications listed under an "SU" identifier were derived from survey data by computing average rates and are not union rates; however, the data used in computing these rates may include both union and non-union data. Example: SULA2004-007 5/13/2010. SU indicates the rates are not union rates, LA indicates the State of Louisiana; 2004 is the year of the survey; and 007 is an internal number used in producing the wage determination. A 1993 or later date, 5/13/2010, indicates the classifications and rates under that identifier were issued as a General Wage Determination on that date.

Survey wage rates will remain in effect and will not change until a new survey is conducted.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U. S. Department of Labor
200 Constitution Avenue, N.W.
Washington, D.C. 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, D.C. 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, D.C. 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

| Firm Name and Address | Item No. | Item Description | * Agreed upon Unit Price | ** Dollar Volume of Item |
|----------------------------|----------|------------------|--------------------------|--------------------------|
| Name Address | | | | |
| Name Address | | | | |
| Name Address | | | | |
| Name Address | | | | |
| Name Address | | | | |
| Name Address | | | | |
| Name Address | | | | |

* The Dollar Volume shown in this column shall be the Actual Price Agreed Upon by the Prime Contractor and the DBE subcontractor, and these prices will be used to determine the percentage of the DBE participation in the contract.

** Dollar Volume of DBE Subcontractor Percentage of Total Contract Bid Price:

If firm is a Material Supplier Only, show Dollar Volume as 60% of Agreed Upon Amount from Letter of Intent.

If firm is a Manufacturer, show Dollar Volume as 100% of Agreed Upon Amount from Letter of Intent.

| Firm Name and Address | Item No. | Item Description | * Agreed upon Unit Price | ** Dollar Volume of Item |
|----------------------------|----------|------------------|--------------------------|--------------------------|
| Name Address | | | | |
| Name Address | | | | |
| Name Address | | | | |
| Name Address | | | | |
| Name Address | | | | |
| Name Address | | | | |

* The Dollar Volume shown in this column shall be the Actual Price Agreed Upon by the Prime Contractor and the DBE subcontractor, and these prices will be used to determine the percentage of the DBE participation in the contract.

** Dollar Volume of DBE Subcontractor \$ _____

Percentage of Total Contract Bid Price _____%

** Dollar Volume of DBE Subcontractor Percentage of Total Contract Bid Price:

If firm is a Material Supplier Only, show Dollar Volume as 60% of Agreed Upon Amount from Letter of Intent.

If firm is a Manufacturer, show Dollar Volume as 100% of Agreed Upon Amount from Letter of Intent.

ADDENDUM(S)

ADDENDUM #1

I, _____
(SIGNATURE)

representing _____

Acknowledge receipt of Addendum #1.

ADDENDUM #2

I, _____
(SIGNATURE)

representing _____

Acknowledge receipt of Addendum #2.

ADDENDUM #3

I, _____
(SIGNATURE)

representing _____

Acknowledge receipt of Addendum #3.

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 bidder on indicated projects, the total value of which is more than 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.

County : Warren, Vance

| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|----------------------|--------------|-------|---|-------------|-----------|--------|
| ROADWAY ITEMS | | | | | | |
| 0001 | 0000900000-N | SP | GENERIC MISCELLANEOUS ITEM MOBILIZATION | Lump Sum | L.S. | |
| 0002 | 3270000000-N | SP | GUARDRAIL ANCHOR UNITS, TYPE 350 | 6 EA | | |
| 0003 | 3420000000-E | SP | GENERIC GUARDRAIL ITEM REMOVE EXISTING GUARDRAIL | 40 LF | | |
| 0004 | 3420000000-E | SP | GENERIC GUARDRAIL ITEM REMOVE EXISTING GUIDERAIL | 255 LF | | |
| 0005 | 3420000000-E | SP | GENERIC GUARDRAIL ITEM STEEL BEAM GUARDRAIL | 1,208 LF | | |
| 0006 | 3435000000-N | SP | GENERIC GUARDRAIL ITEM CABLE GUIDERAIL ANCHOR UNIT | 2 EA | | |
| 0007 | 3435000000-N | SP | GENERIC GUARDRAIL ITEM GUARDRAIL ANCHOR UNIT, TYPE B-77 | 2 EA | | |
| 0008 | 3435000000-N | SP | GENERIC GUARDRAIL ITEM GUARDRAIL ANCHOR UNIT, TYPE CA T-1 | 11 EA | | |
| 0009 | 4057000000-E | SP | OVERHEAD FOOTING | 24 CY | | |
| 0010 | 4510000000-N | SP | LAW ENFORCEMENT | 40 HR | | |
| 0011 | 4589000000-N | SP | GENERIC TRAFFIC CONTROL ITEM TEMPORARY TRAFFIC CONTROL | Lump Sum | L.S. | |
| 0012 | 5255000000-N | 1413 | PORTABLE LIGHTING | Lump Sum | L.S. | |
| 0013 | 7980000000-N | SP | GENERIC SIGNAL ITEM 1.25" RISER WITH WEATHERHEAD | 8 EA | | |
| 0014 | 7980000000-N | SP | GENERIC SIGNAL ITEM 5/8" X 10' GROUNDING ELECTRODE | 111 EA | | |
| 0015 | 7980000000-N | SP | GENERIC SIGNAL ITEM CCTV WOOD POLE | 15 EA | | |
| 0016 | 7980000000-N | SP | GENERIC SIGNAL ITEM CENTRAL VIDEO CODEC UNIT | 15 EA | | |
| 0017 | 7980000000-N | SP | GENERIC SIGNAL ITEM DELINEATOR MARKER | 128 EA | | |

County : Warren, Vance

| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|--------|--------------|-------|---|-----------|-----------|--------|
| 0018 | 7980000000-N | SP | GENERIC SIGNAL ITEM DIGITAL CCTV CAMERA ASSEMBLY | 15 EA | | |
| 0019 | 7980000000-N | SP | GENERIC SIGNAL ITEM DMS | 2 EA | | |
| 0020 | 7980000000-N | SP | GENERIC SIGNAL ITEM DMS ACCESS LADDER | 3 EA | | |
| 0021 | 7980000000-N | SP | GENERIC SIGNAL ITEM DMS PEDESTAL STRUCTURE | 3 EA | | |
| 0022 | 7980000000-N | SP | GENERIC SIGNAL ITEM EQUIPMENT CABINET DISCONNECT | 13 EA | | |
| 0023 | 7980000000-N | SP | GENERIC SIGNAL ITEM FIELD EQUIPMENT CABINET | 17 EA | | |
| 0024 | 7980000000-N | SP | GENERIC SIGNAL ITEM FIELD ETHERNET SWITCH | 18 EA | | |
| 0025 | 7980000000-N | SP | GENERIC SIGNAL ITEM HAR ETHERNET MODULE | 2 EA | | |
| 0026 | 7980000000-N | SP | GENERIC SIGNAL ITEM HUB ETHERNET SWITCH | 1 EA | | |
| 0027 | 7980000000-N | SP | GENERIC SIGNAL ITEM INTERCONNECT CENTER | 14 EA | | |
| 0028 | 7980000000-N | SP | GENERIC SIGNAL ITEM JUNCTION BOX (OVERSIZED) | 112 EA | | |
| 0029 | 7980000000-N | SP | GENERIC SIGNAL ITEM JUNCTION BOX (SPECIAL OVERSIZE D HEAVY DUTY) | 16 EA | | |
| 0030 | 7980000000-N | SP | GENERIC SIGNAL ITEM JUNCTION BOX (STANDARD SIZE) | 34 EA | | |
| 0031 | 7980000000-N | SP | GENERIC SIGNAL ITEM METER BASE/DISCONNECT COMBINAT ION PANEL | 16 EA | | |
| 0032 | 7980000000-N | SP | GENERIC SIGNAL ITEM MODIFY EXISTING ELECTRICAL SER VICE DISCONNECT | 1 EA | | |

County : Warren, Vance

| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|--------|--------------|-------|--|-------------|-----------|--------|
| 0033 | 7980000000-N | SP | GENERIC SIGNAL ITEM MODIFY EXISTING HAR CONTROL SO FTWARE | 1 EA | | |
| 0034 | 7980000000-N | SP | GENERIC SIGNAL ITEM MODIFY EXISTING VIDEO MATRIX S WITCH | 1 EA | | |
| 0035 | 7980000000-N | SP | GENERIC SIGNAL ITEM RELOCATE EXISTING DMS | 1 EA | | |
| 0036 | 7980000000-N | SP | GENERIC SIGNAL ITEM REMOVE EXISTING DMS | 1 EA | | |
| 0037 | 7980000000-N | SP | GENERIC SIGNAL ITEM SIGNAL CABINET FOUNDATION | 2 EA | | |
| 0038 | 7980000000-N | SP | GENERIC SIGNAL ITEM SOLAR POWER ASSEMBLY | 6 EA | | |
| 0039 | 7980000000-N | SP | GENERIC SIGNAL ITEM SPLICE ENCLOSURE | 17 EA | | |
| 0040 | 7980000000-N | SP | GENERIC SIGNAL ITEM WIRELESS ETHENET RADIO SYSTEM | 4 EA | | |
| 0041 | 7980000000-N | SP | GENERIC SIGNAL ITEM WIRELESS ETHERNET REPEATER STA NDALONE RADIO SYSTEM | 6 EA | | |
| 0042 | 7980000000-N | SP | GENERIC SIGNAL ITEM WOOD PEDESTAL | 8 EA | | |
| 0043 | 7980000000-N | SP | GENERIC SIGNAL ITEM WOOD POLE | 6 EA | | |
| 0044 | 7985000000-N | SP | GENERIC SIGNAL ITEM INTEGRATION AND CONFIGURATION | Lump Sum | L.S. | |
| 0045 | 7990000000-E | SP | GENERIC SIGNAL ITEM #4 SOLID BARE GROUDING CONDUCT OR | 480 LF | | |
| 0046 | 7990000000-E | SP | GENERIC SIGNAL ITEM 3-WIRE COPPER FEEDER CONDUCTOR S | 3,000 LF | | |
| 0047 | 7990000000-E | SP | GENERIC SIGNAL ITEM 3-WIRE COPPER SERVICE ENTRANCE CONDUCTORS | 150 LF | | |

County : Warren, Vance

| Line # | Item Number | Sec # | Description | Quantity | Unit Cost | Amount |
|--------|--------------|-------|--|----------|-----------|--------|
| 0048 | 7990000000-E | SP | GENERIC SIGNAL ITEM 4-WIRE COPPER FEEDER CONDUCTOR S | 500 | LF | |
| 0049 | 7990000000-E | SP | GENERIC SIGNAL ITEM COMMUNICATIONS CABLE (48-FIBER) | 74,100 | LF | |
| 0050 | 7990000000-E | SP | GENERIC SIGNAL ITEM DIRECTIONAL DRILL (1)(1.5") | 200 | LF | |
| 0051 | 7990000000-E | SP | GENERIC SIGNAL ITEM DIRECTIONAL DRILL (2)(1.5") | 400 | LF | |
| 0052 | 7990000000-E | SP | GENERIC SIGNAL ITEM DIRECTIONAL DRILL (2)(1.5")(2 (2") | 500 | LF | |
| 0053 | 7990000000-E | SP | GENERIC SIGNAL ITEM DIRECTIONAL DRILL (2)(2") | 16,700 | LF | |
| 0054 | 7990000000-E | SP | GENERIC SIGNAL ITEM DROP CABLE | 4,300 | LF | |
| 0055 | 7990000000-E | SP | GENERIC SIGNAL ITEM ETHERNET CABLE (OUTDOOR RATED) | 300 | LF | |
| 0056 | 7990000000-E | SP | GENERIC SIGNAL ITEM TRACER WIRE | 70,300 | LF | |
| 0057 | 7990000000-E | SP | GENERIC SIGNAL ITEM UNPAVED TRENCHING (1)(1.5") | 1,300 | LF | |
| 0058 | 7990000000-E | SP | GENERIC SIGNAL ITEM UNPAVED TRENCHING (2)(1.5") | 200 | LF | |
| 0059 | 7990000000-E | SP | GENERIC SIGNAL ITEM UNPAVED TRENCHING (2)(1.5")(2 (2") | 600 | LF | |
| 0060 | 7990000000-E | SP | GENERIC SIGNAL ITEM UNPAVED TRENCHING (2)(2") | 52,700 | LF | |

CONTRACTOR _____ FEDERAL ID: _____

ADDRESS _____

PHONE _____

AUTHORIZED AGENT _____ TITLE _____

SIGNATURE _____ DATE _____

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

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the bidder has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

N.C.G.S. § 133-32 and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

SIGNATURE OF CONTRACTOR

_____ Full name of Corporation

_____ Address as Prequalified

Attest _____
Secretary/Assistant Secretary
Select appropriate title

By _____
President/Vice President/Assistant Vice President
Select appropriate title

_____ Print or type Signer's name

_____ Print or type Signer's name

CORPORATE SEAL

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: _____

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

PARTNERSHIP

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the bidder has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

N.C.G.S. § 133-32 and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

SIGNATURE OF CONTRACTOR

| | | |
|-----------------------------|----|-----------------------------|
| | By | |
| Signature of Witness | | Signature of Partner |
| | | |
| Print or type Signer's name | | Print or type Signer's name |

AFFIDAVIT MUST BE NOTARIZED

Subscribed and sworn to before me this the _____ day of _____ 20__.

NOTARY SEAL

Signature of Notary Public

of _____ County

State of _____

My Commission Expires: _____

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

LIMITED LIABILITY COMPANY

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the bidder has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

N.C.G.S. § 133-32 and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

SIGNATURE OF CONTRACTOR

_____ Full Name of Firm

_____ Address as Prequalified

_____ Signature of Witness

_____ Signature of Member/Manager/Authorized Agent
Select appropriate title

_____ Print or type Signer's name

_____ Print or type Signer's Name

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
NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN
CERTIFICATION

JOINT VENTURE (2) or (3)

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the bidder has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the bidder has not been convicted of violating N.C.G.S. § 133-24 within the last three years, and that the Bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

N.C.G.S. § 133-32 and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

SIGNATURE OF CONTRACTOR

Instructions: 2 Joint Venturers Fill in lines (1), (2) and (3) and execute. 3 Joint Venturers Fill in lines (1), (2), (3) and (4) and execute. On Line (1), fill in the name of the Joint Venture Company. On Line (2), fill in the name of one of the joint venturers and execute below in the appropriate manner. On Line (3), print or type the name of the other joint venturer and execute below in the appropriate manner. On Line (4), fill in the name of the third joint venturer, if applicable and execute below in the appropriate manner.

Signature of Witness or Attest By Signature of Contractor
Print or type Signer's name Print or type Signer's name
If Corporation, affix Corporate Seal and
Signature of Witness or Attest By Signature of Contractor
Print or type Signer's name Print or type Signer's name
If Corporation, affix Corporate Seal and
Signature of Witness or Attest By Signature of Contractor
Print or type Signer's name Print or type Signer's name

NOTARY SEAL
If Corporation, affix Corporate Seal
Affidavit must be notarized for Line (2)
Subscribed and sworn to before me this
day of 20
Signature of Notary Public
of County
State of
My Commission Expires:

NOTARY SEAL
Affidavit must be notarized for Line (3)
Subscribed and sworn to before me this
day of 20
Signature of Notary Public
of County
State of
My Commission Expires:

NOTARY SEAL
Affidavit must be notarized for Line (4)
Subscribed and sworn to before me this
day of 20
Signature of Notary Public
of County
State of
My Commission Expires:

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

INDIVIDUAL DOING BUSINESS UNDER A FIRM NAME

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the bidder has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

N.C.G.S. § 133-32 and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

SIGNATURE OF CONTRACTOR

Name of Contractor _____
Individual name

Trading and doing business as _____
Full name of Firm

Signature of Witness

Signature of Contractor, Individually

Print or type Signer's name

Print or type Signer's name

AFFIDAVIT MUST BE NOTARIZED

Subscribed and sworn to before me this the _____
_____ day of _____ 20__.

NOTARY SEAL

Signature of Notary Public

of _____ County

State of _____

My Commission Expires: _____

**EXECUTION OF BID
NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN
CERTIFICATION
INDIVIDUAL DOING BUSINESS IN HIS OWN NAME**

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the bidder has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

N.C.G.S. § 133-32 and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

SIGNATURE OF CONTRACTOR

Name of Contractor _____
Print or type Individual name

Address as Prequalified

Signature of Contractor, Individually

Print or type Signer's Name

Signature of Witness

Print or type Signer's name

AFFIDAVIT MUST BE NOTARIZED

Subscribed and sworn to before me this the _____
_____ day of _____ 20__.

NOTARY SEAL

Signature of Notary Public

of _____ County

State of _____

My Commission Expires: _____

DEBARMENT CERTIFICATION

Conditions for certification:

1. The prequalified bidder shall provide immediate written notice to the Department if at any time the bidder learns that his certification was erroneous when he submitted his debarment certification or explanation filed with the Department, or has become erroneous because of changed circumstances.
2. The terms *covered transaction, debarred, suspended, ineligible, lower tier covered transaction, participant, person, primary covered transaction, principal, proposal, and voluntarily excluded*, as used in this provision, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549. A copy of the Federal Rules requiring this certification and detailing the definitions and coverages may be obtained from the Contract Officer of the Department.
3. The prequalified bidder agrees by submitting this form, that he will not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in NCDOT contracts, unless authorized by the Department.
4. For Federal Aid projects, the prequalified bidder further agrees that by submitting this form he will include the Federal-Aid Provision titled *Required Contract Provisions Federal-Aid Construction Contract (Form FHWA PR 1273)* provided by the Department, without subsequent modification, in all lower tier covered transactions.
5. The prequalified bidder may rely upon a certification of a participant in a lower tier covered transaction that he is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless he knows that the certification is erroneous. The bidder may decide the method and frequency by which he will determine the eligibility of his subcontractors.
6. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this provision. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
7. Except as authorized in paragraph 6 herein, the Department may terminate any contract if the bidder knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available by the Federal Government.

DEBARMENT CERTIFICATION

The prequalified bidder certifies to the best of his knowledge and belief, that he and his principals:

- a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
- b. Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records; making false statements; or receiving stolen property;
- c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph b. of this certification; and
- d. Have not within a three-year period preceding this proposal had one or more public transactions (Federal, State or local) terminated for cause or default.
- e. Will submit a revised Debarment Certification immediately if his status changes and will show in his bid proposal an explanation for the change in status.

If the prequalified bidder cannot certify that he is not debarred, he shall provide an explanation with this submittal. An explanation will not necessarily result in denial of participation in a contract.

Failure to submit a non-collusion affidavit and debarment certification will result in the prequalified bidder's bid being considered non-responsive.

Check here if an explanation is attached to this certification.

Execution of Contract

Contract No: DE00090

County: Vance and Warren Counties

ACCEPTED BY THE DEPARTMENT

Proposals Engineer

Date

EXECUTION OF CONTRACT AND BONDS
APPROVED AS TO FORM:

Division Project Manager

Date