

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

PROPOSAL

DATE AND TIME OF BID OPENING: **MAY 19, 2015 AT 2:00 PM**

CONTRACT ID C203622  
WBS 34410.3.FS31

FEDERAL-AID NO. CMS-0485(36)  
COUNTY MECKLENBURG  
T.I.P. NO. R-2248EA  
MILES 6.650  
ROUTE NO. I 485  
LOCATION I-485 FROM CHARLOTTE WESTERN OUTER LOOP WEST OF I-77 TO I-85  
NORTH.  
TYPE OF WORK ITS, CCTV, AND DMS 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.

**BIDS WILL BE RECEIVED AS SHOWN BELOW:**

**THIS IS A SIGNAL PROPOSAL**

**5% BID BOND OR BID DEPOSIT REQUIRED**

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**PROPOSAL FOR THE CONSTRUCTION OF  
CONTRACT No. C203622 IN MECKLENBURG COUNTY, 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. C203622; 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 Board 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. C203622 in Mecklenburg County, 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.

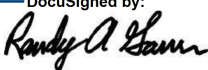
The quantities shown in the itemized proposal for the project are considered to be approximate only and are given as the basis for comparison of bids. The Department of Transportation may increase or decrease the quantity of any item or portion of the work as may be deemed necessary or expedient.

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.

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



State Contract Officer

DocuSigned by:  
 4/9/2015  
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**PROJECT SPECIAL PROVISIONS****GENERAL****CONTRACT TIME AND LIQUIDATED DAMAGES:**

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

108

SP1 G10 B

The date of availability for this contract is **June 29, 2015**.

The completion date for this contract is **April 1, 2016**.

The liquidated damages for this contract are **Six Hundred Dollars (\$ 600.00)** per calendar day.

**INTERMEDIATE CONTRACT TIME NUMBER 1 AND LIQUIDATED DAMAGES:**

(2-20-07)

108

SP1 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 more than one lane of traffic on **I-485** at any time and shall not close or narrow one lane of traffic on **I-485** during the following time restrictions:

**DAY AND TIME RESTRICTIONS****Monday thru Friday****6:00 AM to 9:00 PM****Saturday 10:00 AM to Sunday 9:00 PM**

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 travel lanes on **NC 115, SR 2480, Benfield Rd, SR 2475, Prosperity Ridge Rd, and SR 2467** during the following time restrictions:

**DAY AND TIME RESTRICTIONS****Monday thru Friday****6:00 AM to 9:00 PM****Saturday 10:00 AM to Sunday 9:00 PM**

In addition, the Contractor shall not close or narrow a lane of traffic on **I-485, NC 115, SR 2480, Benfield Rd, SR 2475, Prosperity Ridge Rd, and SR 2467** 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 **6:00 A.M.** December 31st and **9:00 P.M.** January 2nd. If New Year's Day is on a Friday, Saturday, Sunday or Monday, then until **9:00 P.M.** the following Tuesday.
3. For **Easter**, between the hours of **6:00 A.M.** Thursday and **9:00 P.M.** Monday.
4. For **Memorial Day**, between the hours of **6:00 A.M.** Friday and **9:00 P.M.** Tuesday.
5. For **Independence Day**, between the hours of **6:00 A.M.** the day before Independence Day and **9:00 P.M.** the day after Independence Day.  
  
If **Independence Day** is on a Friday, Saturday, Sunday or Monday, then between the hours of **6:00 A.M.** the Thursday before Independence Day and **9:00 P.M.** the Tuesday after Independence Day.
6. For **Labor Day**, between the hours of **6:00 A.M.** Friday and **9:00 P.M.** Tuesday.
7. For **Thanksgiving Day**, between the hours of **6:00 A.M.** Tuesday and **9:00 P.M.** Monday.
8. For **Christmas**, between the hours of **6:00 A.M.** the Friday before the week of Christmas Day and **9:00 P.M.** the following Tuesday after the week of Christmas Day.
9. For **NASCAR event at Charlotte Motor Speedway**, between the hours of **6:00 A.M.** the **Thursday** before the week of the event and **9:00 P.M.** the following **Monday** after the week of the event.
10. For **Carolina Panther's** football game in Charlotte and any games at the **Bobcats Arena**, from three hours before the game until three hours after the game.
11. For any event at the **PNC Music Pavilion, Bank of America Stadium, Charlotte Convention Center, Time Warner Arena** and/or any other arenas in Charlotte, from three hours before the event until three hours after the event.

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 (\$1,000.00)** per hour.

**INTERMEDIATE CONTRACT TIME NUMBER 2 AND LIQUIDATED DAMAGES:**

(2-20-07)

108

SPI G14 C

The Contractor shall complete the required work of installing, maintaining and removing the traffic control devices for shoulder closures and restoring traffic to the existing traffic pattern. The Contractor shall not close or narrow a shoulder on **I-485 (including ramps)** during the following time restrictions:

DAY AND TIME RESTRICTIONS

**Monday thru Friday  
6:00 AM to 9:00 AM &  
4:00 PM to 7:00 PM**

The Contractor shall complete the required work of installing, maintaining and removing the traffic control devices for shoulder closures and restoring traffic to the existing traffic pattern. The Contractor shall not close or narrow a shoulder on **NC 115, SR 2480, Benfield Rd, SR 2475, Prosperity Ridge Rd, and SR 2467** during the following time restrictions:

DAY AND TIME RESTRICTIONS

**Monday thru Friday  
6:00 AM to 9:00 AM &  
4:00 PM to 7:00 PM**

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

The liquidated damages are **Five Hundred Dollars (\$500.00)** per hour.

**MAJOR CONTRACT ITEMS:**

(2-19-02)

104

SP1 G28

The following listed items are the major contract items for this contract (see Article 104-5 of the 2012 Standard Specifications):

Line #	Description
21	Communications Cable (144 Fiber)
34	DMS Pedestal Structure
35	Dynamic Message Sign

**SPECIALTY ITEMS:**

(7-1-95)(Rev. 1-17-12)

108-6

SP1 G37

Items listed below will be the specialty items for this contract (see Article 108-6 of the 2012 Standard Specifications).

Line #	Description
5 - 10	Guardrail

**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 \$ **1.8192** 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
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**SCHEDULE OF ESTIMATED COMPLETION PROGRESS:**

(7-15-08) (Rev. 5-19-15)

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:

2016	(7/01/15 - 6/30/16)	<b>100</b> % of Total Amount Bid
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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:**

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

102-15(J)

SP1 G61

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

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

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

## **DBE Goal**

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

Disadvantaged Business Enterprises **6.0 %**

- (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) Electronic Bids

Bidders shall submit a listing of DBE participation in the appropriate section of Expedite, the bidding software of Bid Express<sup>®</sup>.

- (1) Submit the names and addresses of DBE firms identified to participate in the contract. If the bidder uses the updated listing of DBE firms shown in Expedite, the bidder may use the dropdown menu to access the name and address of the DBE firm.
- (2) Submit the contract line numbers of work to be performed by each DBE firm. When no figures or firms are entered, the bidder will be considered to have no DBE participation.
- (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) Paper Bids

- (1) *If the DBE goal is more than zero,*
  - (a) 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.
  - (b) 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.
  - (c) 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 corresponding goal.

- (2) *If the DBE goal is zero, entries on the Listing of DBE Subcontractors are not required for the zero goal, however any DBE participation that is achieved during the project shall be reported in accordance with requirements contained elsewhere in 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 and 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 State Contractor Utilization Engineer or at DBE@ncdot.gov no later than 12:00 noon of the sixth calendar day following opening of bids, unless the sixth day falls on an official state holiday. In that situation, it is due in the office of the State Contractor Utilization Engineer no later than 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 State Contractor Utilization Engineer or DBE@ncdot.gov no later than 12:00 noon on the eighth calendar day following opening of bids, unless the eighth day falls on an official state holiday. In that situation, it is due in the office of the State Contractor Utilization Engineer no later than 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.

A hard copy and an electronic copy of this information shall be received in the office of the State Contractor Utilization Engineer or at DBE@ncdot.gov no later than 12:00 noon of the sixth calendar day following opening of bids unless the sixth day falls on an official state holiday. In that situation, it is due in the office of the State Contractor Utilization Engineer the next official state business day. If the contractor cannot send the information electronically, then one complete set and 9 copies of this information shall be received under the same time constraints above.

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

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

Adequate good faith efforts mean that the 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 (2<sup>nd</sup> and 3<sup>rd</sup> 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 State Contractor Utilization 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 State Contractual Services Engineer or at [DBE@ncdot.gov](mailto:DBE@ncdot.gov). 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 DOT 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.

- (A) Electronic Bids Reporting

The Contractor shall report the accounting of payments through the Department's DBE Payment Tracking System.

- (B) Paper Bids Reporting

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.

**CONTRACTOR'S LICENSE REQUIREMENTS:**

(7-1-95)

102-14

SP1 G88

If the successful bidder does not hold the proper license to perform any plumbing, heating, air conditioning, or electrical work in this contract, he will be required to sublet such work to a contractor properly licensed in accordance with *Article 2 of Chapter 87 of the General Statutes* (licensing of heating, plumbing, and air conditioning contractors) and *Article 4 of Chapter 87 of the General Statutes* (licensing of electrical contractors).

**U.S. DEPARTMENT OF TRANSPORTATION HOTLINE:**

(11-22-94)

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.

**SUBSURFACE INFORMATION:**

(7-1-95)

450

SP1 G112 A

There is **no** subsurface information available on this project. The Contractor shall make his own investigation of subsurface conditions.

**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.

**VALUE ENGINEERING PROPOSAL:**

(05-19-15)

104

SP01 G116

Revise the *2012 Standard Specifications* as follows:

**Page 1-36, Subarticle 104-12(B) Evaluation of Proposals, lines 42-44, replace the fourth sentence of the second paragraph with the following:**

Pending execution of a formal supplemental agreement implementing an approved VEP and transfer of final plans (hard copy and electronic) sealed by an engineer licensed in the State of North Carolina incorporating an approved VEP to the Resident Engineer and the State Value Management Engineer, the Contractor shall remain obligated to perform the work in accordance with the terms of the existing contract.

**Page 1-37, Subarticle 104-12(D) Preliminary Review, lines 9-12, replace the first sentence of the first paragraph with the following:**

Should the Contractor desire a preliminary review of a possible VEP, before expending considerable time and expense in full development, a copy of the Preliminary VEP shall be submitted to the Resident Engineer and the State Value Management Engineer at ValueManagementUnit@ncdot.gov.



**Page 1-37, Subarticle 104-12(E) Final Proposal, lines 22-23,** replace the first sentence of the first paragraph with the following:

A copy of the Final VEP shall be submitted by the Contractor to the Resident Engineer and the State Value Management Engineer at ValueManagementUnit@ncdot.gov.

**Page 1-38, Subarticle 104-12(F) Modifications, lines 2-8,** replace the first paragraph with the following:

To facilitate the preparation of revisions to contract drawings, the Contractor may purchase reproducible copies of drawings for his use through the Department's Value Management Unit. The preparation of new design drawings by or for the Contractor shall be coordinated with the appropriate Design Branch through the State Value Management Engineer. The Contractor shall provide, at no charge to the Department, one set of reproducible drawings of the approved design needed to implement the VEP. Drawings (hard copy and electronic) which are sealed by an engineer licensed in the State of North Carolina shall be submitted to the State Value Management Engineer no later than ten (10) business days after acceptance of a VEP unless otherwise permitted.

**Page 1-38, Subarticle 104-12(F) Modifications, line 17,** add the following at the end of the third paragraph:

Supplemental agreements executed for design-bid-build contracts shall reflect any realized savings in the corresponding line items. Supplemental agreements executed for design-build contracts shall add one line item deducting the full savings from the total contract price and one line item crediting the Contractor with 50% of the total VEP savings.

**Page 1-38, Subarticle 104-12(F) Modifications, lines 45-47,** replace the eighth paragraph with the following:

Unless and until a supplemental agreement is executed and issued by the Department and final plans (hard copy and electronic) sealed by an engineer licensed in the State of North Carolina incorporating an approved VEP have been provided to the Resident Engineer and the State Value Management Engineer, the Contractor shall remain obligated to perform the work in accordance with the terms of the existing contract.

**RESOURCE CONSERVATION AND ENV. SUSTAINABLE PRACTICES:**

(5-21-13) (Rev. 5-19-15)

104-13

SP1 G118

In accordance with North Carolina Executive Order 156, NCGS 130A-309.14(3), and NCGS 136-28.8, it is the objective of the Department to aid in the reduction of materials that become a part of our solid waste stream, to divert materials from landfills, to find ways to recycle and reuse materials, to consider and minimize, where economically feasible, the environmental impacts associated with agency land use and acquisition, construction, maintenance and facility management for the benefit of the Citizens of North Carolina.

To achieve the mission of reducing environmental impacts across the state, the Department is committed to supporting the efforts to initiate, develop and use products and construction methods that incorporate the use of recycled, solid waste products and environmentally sustainable practices in accordance with Article 104-13 of the *Standard Specifications*.

Report the quantities of reused or recycled materials either incorporated in the project or diverted from landfills and any practice that minimizes the environmental impact on the project annually on the Project Construction Reuse and Recycling Reporting Form. The Project Construction Reuse and Recycling Reporting Form and a location tool for local recycling facilities are available at:

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

Submit the Project Construction Reuse and Recycling Reporting Form by August 1 annually to [valuemanagementunit@ncdot.gov](mailto:valuemanagementunit@ncdot.gov). For questions regarding the form or reporting, please contact the State Value Management Engineer at 919-707-4810.

**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.

**MAINTENANCE OF THE PROJECT:**

(11-20-07) (Rev. 1-17-12)

104-10

SP1 G125

Revise the *2012 Standard Specifications* as follows:

**Page 1-35, Article 104-10 Maintenance of the Project, line 25,** add the following after the first sentence of the first paragraph:

All guardrail/guiderail within the project limits shall be included in this maintenance.

**Page 1-35, Article 104-10 Maintenance of the Project, line 30,** add the following as the last sentence of the first paragraph:

The Contractor shall perform weekly inspections of guardrail and guiderail and shall report damages to the Engineer on the same day of the weekly inspection. *Where damaged guardrail or guiderail is repaired or replaced as a result of maintaining the project in accordance with this article, such repair or replacement shall be performed within 7 consecutive calendar days of such inspection report.*

**Page 1-35, Article 104-10 Maintenance of the Project, lines 42-44,** replace the last sentence of the last paragraph with the following:

The Contractor will not be directly compensated for any maintenance operations necessary, except for maintenance of guardrail/guiderail, as this work will be considered incidental to the work covered by the various contract items. The provisions of Article 104-7, Extra Work, and Article 104-8, Compensation and Record Keeping will apply to authorized maintenance of guardrail/guiderail. Performance of weekly inspections of guardrail/guiderail, and the damage reports required as described above, will be considered to be an incidental part of the work being paid for by the various contract items.

**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".

**SUBLETTING OF CONTRACT:**

(11-18-2014)

108-6

SP1 G186

Revise the *2012 Standard Specifications* as follows:

**Page 1-66, Article 108-6 Subletting of Contract, line 37**, add the following as the second sentence of the first paragraph:

All requests to sublet work shall be submitted within 30 days of the date of availability or prior to expiration of 20% of the contract time, whichever date is later, unless otherwise approved by the Engineer.

**Page 1-67, Article 108-6 Subletting of Contract, line 7,** add the following as the second sentence of the fourth paragraph:

Purchasing materials for subcontractors is not included in the percentage of work required to be performed by the Contractor. If the Contractor sublets items of work but elects to purchase material for the subcontractor, the value of the material purchased will be included in the total dollar amount considered to have been sublet.

**PROJECT SPECIAL PROVISIONS****ROADWAY****ASPHALT PAVEMENTS - SUPERPAVE:**

(6-19-12) (Rev. 4-21-15)

605, 609, 610, 650

SP6 R01

Revise the *2012 Standard Specifications* as follows:

**Page 6-3, Article 605-7 APPLICATION RATES AND TEMPERATURES**, replace this article, including Table 601-1, with the following:

Apply tack coat uniformly across the existing surface at target application rates shown in Table 605-1.

<b>TABLE 605-1 APPLICATION RATES FOR TACK COAT</b>	
<b>Existing Surface</b>	<b>Target Rate (gal/sy)</b>
	<b>Emulsified Asphalt</b>
New Asphalt	0.04 ± 0.01
Oxidized or Milled Asphalt	0.06 ± 0.01
Concrete	0.08 ± 0.01

Apply tack coat at a temperature within the ranges shown in Table 605-2. Tack coat shall not be overheated during storage, transport or at application.

<b>TABLE 605-2 APPLICATION TEMPERATURE FOR TACK COAT</b>	
<b>Asphalt Material</b>	<b>Temperature Range</b>
Asphalt Binder, Grade PG 64-22	350 - 400°F
Emulsified Asphalt, Grade RS-1H	130 - 160°F
Emulsified Asphalt, Grade CRS-1	130 - 160°F
Emulsified Asphalt, Grade CRS-1H	130 - 160°F
Emulsified Asphalt, Grade HFMS-1	130 - 160°F
Emulsified Asphalt, Grade CRS-2	130 - 160°F

**Page 6-7, Article 609-3 FIELD VERIFICATION OF MIXTURE AND JOB MIX FORMULA ADJUSTMENTS**, lines 35-37, delete the second sentence of the second paragraph.

**Page 6-18, Article 610-1 DESCRIPTION**, lines 40-41, delete the last sentence of the last paragraph.

**Page 6-19, Subarticle 610-3(A) Mix Design-General**, line 5, add the following as the first paragraph:

Warm mix asphalt (WMA) is allowed for use at the Contractor's option in accordance with the NCDOT Approved Products List for WMA Technologies available at:

**<https://connect.ncdot.gov/resources/Materials/MaterialsResources/Warm%20Mix%20Asphalt%20Approved%20List.pdf>**

**Page 6-21, Subarticle 610-3(C) Job Mix Formula (JMF)**, replace Table 610-1 with the following:

<b>TABLE 610-1 DESIGN MIXING TEMPERATURE AT THE ASPHALT PLANT<sup>A</sup></b>		
<b>Binder Grade</b>	<b>HMA JMF Temperature</b>	<b>WMA JMF Temperature Range</b>
PG 64-22	300°F	225 - 275°F
PG 70-22	315°F	240 - 290°F
PG 76-22	335°F	260 - 310°F

**A.** The mix temperature, when checked in the truck at the roadway, shall be within plus 15° and minus 25° of the temperature specified on the JMF.

**Page 6-21, Subarticle 610-3(C) Job Mix Formula (JMF)**, lines 4-6, delete first sentence of the second paragraph. Line 7, in the second sentence of the second paragraph, replace “275°F” with “275°F or greater.”

**Page 6-22, Article 610-4 WEATHER, TEMPERATURE AND SEASONAL LIMITATIONS FOR PRODUCING AND PLACING ASPHALT MIXTURES**, lines 15-17, replace the second sentence of the first paragraph with the following:

Do not place asphalt material when the air or surface temperatures, measured at the location of the paving operation away from artificial heat, do not meet Table 610-5.

**Page 6-23, Article 610-4 WEATHER, TEMPERATURE AND SEASONAL LIMITATIONS FOR PRODUCING AND PLACING ASPHALT MIXTURES**, replace Table 610-5 with the following:

<b>Asphalt Concrete Mix Type</b>	<b>Minimum Surface and Air Temperature</b>
B25.0B, C	35°F
I19.0B, C, D	35°F
SF9.5A, S9.5B	40°F <sup>A</sup>
S9.5C, S12.5C	45°F <sup>A</sup>
S9.5D, S12.5D	50°F

- A. For the final layer of surface mixes containing recycled asphalt shingles (RAS), the minimum surface and air temperature shall be 50°F.

**Page 6-26, Article 610-7 HAULING OF ASPHALT MIXTURE**, lines 22-23, in the fourth sentence of the first paragraph replace “so as to overlap the top of the truck bed and” with “to”.

**Page 6-41, Subarticle 650-3(B) Mix Design Criteria**, replace Table 650-1 with the following:

<i>Sieve Size (mm)</i>	<i>Type FC-1</i>	<i>Type FC-1 Modified</i>	<i>Type FC-2 Modified</i>
19.0	-	-	100
12.5	100	100	<b>80 - 100</b>
9.50	75 - 100	75 - 100	<b>55 - 80</b>
4.75	25 - 45	25 - 45	<b>15 - 30</b>
2.36	5 - 15	5 - 15	<b>5 - 15</b>
0.075	1.0 - 3.0	1.0 - 3.0	<b>2.0 - 4.0</b>

**ASPHALT BINDER CONTENT OF ASPHALT PLANT MIXES:**

(11-21-00) (Rev. 7-17-12)

609

SP6 R15

The approximate asphalt binder content of the asphalt concrete plant mixtures used on this project will be as follows:

Asphalt Concrete Base Course	Type B 25.0__	4.4%
Asphalt Concrete Intermediate Course	Type I 19.0__	4.8%
Asphalt Concrete Surface Course	Type S 4.75A	6.8%
Asphalt Concrete Surface Course	Type SA-1	6.8%
Asphalt Concrete Surface Course	Type SF 9.5A	6.7%
Asphalt Concrete Surface Course	Type S 9.5__	6.0%
Asphalt Concrete Surface Course	Type S 12.5__	5.6%

The actual asphalt binder content will be established during construction by the Engineer within the limits established in the *2012 Standard Specifications*.



**ASPHALT PLANT MIXTURES:**

(7-1-95)

609

SP6 R20

Place asphalt concrete base course material in trench sections with asphalt pavement spreaders made for the purpose or with other equipment approved by the Engineer.

**PRICE ADJUSTMENT - ASPHALT BINDER FOR PLANT MIX:**

(11-21-00)

620

SP6 R25

Price adjustments for asphalt binder for plant mix will be made in accordance with Section 620 of the *2012 Standard Specifications*.

The base price index for asphalt binder for plant mix is \$ **511.15** per ton.

This base price index represents an average of F.O.B. selling prices of asphalt binder at supplier's terminals on **April 1, 2015**.

**FINAL SURFACE TESTING NOT REQUIRED:**

(5-18-04) (Rev. 5-15-12)

610

SP6 R45

Final surface testing is not required on this project.

**IMPACT ATTENUATOR UNITS, TYPE 350:**

(4-20-04) (Rev. 1-17-12)

SP8 R75

**Description**

Furnish and install impact attenuator units and any components necessary to connect the impact attenuator units in accordance with the manufacturer's requirement, the details in the plans and at locations shown in the plans.

**Materials**

The Contractor may at his option, furnish any one of the **NON-GATING** impact attenuator units or approved equal:

The impact attenuator unit (QUADGUARD) as manufactured by:

Energy Absorption Systems, Inc.  
One East Wacker Drive  
Chicago, Illinois 60601-2076  
Telephone: 312-467-6750

The impact attenuator unit (TRACC) as manufactured by:

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

The Contractor may at his option, furnish any one of the **GATING** impact attenuator units or approved equal:

The impact attenuator unit (BRAKEMASTER) as manufactured by:

Energy Absorption Systems, Inc.  
One East Wacker Drive  
Chicago, Illinois 60601-2076  
Telephone: 312-467-6750

The impact attenuator unit (CAT) as manufactured by:

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

Prior to installation the Contractor shall submit to the Engineer:

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

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

### **Construction Methods**

If the median width is 40 feet or less, the Contractor shall supply one of the NON-GATING Impact Attenuator Units listed in the Materials Section herein.

If the median width is greater than 40 feet, the Contractor may use any of the GATING or NON-GATING Impact Attenuator Units listed in the Materials Section herein.

### **Measurement and Payment**

*Impact Attenuator Unit, Type 350* will be measured and paid at the contract unit price per each. Such prices and payment will be full compensation for all work covered by this provision including, but not limited to, furnishing, installing and all incidentals necessary to complete the work.

Payment will be made under:

**Pay Item**

Impact Attenuator Units, Type 350

**Pay Unit**

Each

**FOUNDATIONS AND ANCHOR ROD ASSEMBLIES FOR METAL POLES:**

(1-17-12) (Rev. 5-19-15)

9, 14, 17

SP9 R05

**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*.

**Materials**

Refer to the *2012 Standard Specifications*.

**Item**

Conduit

Grout, Type 2

Polymer Slurry

Portland Cement Concrete

Reinforcing Steel

Rollers and Chairs

Temporary Casings

**Section**

1091-3

1003

411-2(B)

1000

1070

411-2(C)

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. Bent, damaged or defective 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:

[connect.ncdot.gov/resources/Geological/Pages/Products.aspx](http://connect.ncdot.gov/resources/Geological/Pages/Products.aspx)

Provide anchor rod assemblies in accordance with the contract consisting of the following:

- (A) Straight anchor rods,
- (B) Heavy hex top and leveling nuts and flat washers on exposed ends of rods, and
- (C) Nuts and either flat plates or washers on the other ends of anchor rods embedded in foundations.

Do not use lock washers. Use steel anchor rods, nuts and washers that meet ASTM F1554 for Grade 55 rods and Grade A nuts. Use steel plates and washers embedded in concrete with a thickness of at least 1/4". Galvanize anchor rods and exposed nuts and washers in accordance with Article 1076-4 of the *2012 Standard Specifications*. It is not necessary to galvanize nuts, plates and washers embedded in concrete.

### **Construction Methods**

Install the required size and number of conduits in foundations in accordance with the plans 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 turn that meets the following nut rotation requirements:

<b>NUT ROTATION REQUIREMENTS (Turn-of-Nut Pretensioning Method)</b>	
<b>Anchor Rod Diameter, inch</b>	<b>Requirement</b>
$\leq 1 \frac{1}{2}$	1/3 turn (2 flats)
$> 1 \frac{1}{2}$	1/6 turn (1 flat)

Follow a star pattern cycling through each top nut at least twice.

- (11) Ensure nuts, washers and base plate are in firm contact with each other for each anchor rod. Cables, mast arms and trusses may now be attached to metal poles and upright trusses.
- (12) Between 4 and 14 days after pretensioning top nuts, use a torque wrench calibrated within the last 12 months to check nuts in the presence of the Engineer. Completely erect mast arm poles and cantilever signs and attach any hardware before checking top nuts for these structures. Check that top nuts meet the following torque requirements:



<b>TORQUE REQUIREMENTS</b>	
<b>Anchor Rod Diameter, inch</b>	<b>Requirement, ft-lb</b>
7/8	180
1	270
1 1/8	380
1 1/4	420
$\geq 1\ 1/2$	600

If necessary, retighten top nuts in the presence of the Engineer with a calibrated torque wrench to within  $\pm 10$  ft-lb of the required torque. Do not overtighten top nuts.

- (13) Do not grout under base plate.

### **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.

**MATERIALS:**

(2-21-12) (Rev. 5-19-15)

1000, 1002, 1005, 1018, 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:

If any change is made to the mix design, submit a new mix design (with the exception of an approved pozzolan source change).

If any major change is made to the mix design, also submit new test results showing the mix design conforms to the criteria. Define a major change to the mix design as:

- (1) A source change in coarse aggregate, fine aggregate or cement.
- (2) A pozzolan class or type change (e.g. Class F fly ash to Class C fly ash).
- (3) A quantitative change in coarse aggregate (applies to an increase or decrease greater than 5%), fine aggregate (applies to an increase or decrease greater than 5%), water (applies to an increase only), cement (applies to a decrease only), or pozzolan (applies to an increase or decrease greater than 5%).

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:

TABLE 1000-1 REQUIREMENTS FOR CONCRETE											
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	1.5 machine-placed 2.5 hand-placed	4	508	-	545	-
Sand Light-weight	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	-	Flow-able	-	-	40	100
Flowable Fill non-excavatable	125	as needed	as needed	as needed	as needed	-	Flow-able	-	-	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	Section
Type IL Blended Cement	1024-1

Page 10-19, Article 1002-3, SHOTCRETE FOR TEMPORARY SUPPORT OF EXCAVATIONS, line 30, add the following at the end of Section 1002:

**(H) Handling and Storing Test Panels**

Notify the Area Materials Engineer when preconstruction or production test panels are made within 24 hours of shooting the panels. Field cure and protect test panels from

damage in accordance with ASTM C1140 until the Department transports panels to the Materials and Tests Regional Laboratory for coring.

**Page 10-1, Subarticle 1000-3(A), Composition and Design, lines 25-27,** replace the second paragraph with the following:

Fly ash may be substituted for cement in the mix design up to 30% at a rate of 1.0 lb of fly ash to each pound of cement replaced.

**Page 10-2, Subarticle 1000-3(A), Composition and Design, lines 12-21,** delete the third paragraph through the sixth paragraph beginning with “If any change is made to the mix design, submit...” through “...(applies to a decrease only).”

**Page 10-6, Subarticle 1000-4(I), Use of Fly Ash, lines 36-2,** replace the first paragraph with the following:

Fly ash may be substituted for cement in the mix design up to 30% at a rate of 1.0 lb of fly ash to each pound of cement replaced. Use Table 1000-1 to determine the maximum allowable water-cementitious material (cement + fly ash) ratio for the classes of concrete listed.

**Page 10-7, Table 1000-3, MAXIMUM WATER-CEMENTITIOUS MATERIAL RATIO,** delete the table.

**Page 10-7, Article 1000-5, HIGH EARLY STRENGTH PORTLAND CEMENT CONCRETE, lines 30-31,** delete the second sentence of the third paragraph.

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

<b>TABLE 1005-1 AGGREGATE GRADATION - COARSE AGGREGATE</b>													
<b>Percentage of Total by Weight Passing</b>													
<b>Std. Size #</b>	<b>2"</b>	<b>1 1/2"</b>	<b>1"</b>	<b>3/4"</b>	<b>1/2"</b>	<b>3/8"</b>	<b>#4</b>	<b>#8</b>	<b>#10</b>	<b>#16</b>	<b>#40</b>	<b>#200</b>	<b>Remarks</b>
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 <sup>B</sup>	Aggregate Base Course, Aggregate Stabilization
ABC (M)	-	100	75-100	-	45-79	-	20-40	-	0-25	-	-	0-12 <sup>B</sup>	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 10-40, Tables 1018-1 and 1018-2, PIEDMONT, WESTERN AND COASTAL AREA CRITERIA FOR ACCEPTANCE OF BORROW MATERIAL**, under second column in both tables, replace second row with the following:

Acceptable, but not to be used in the top 3 ft of embankment or backfill

**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 10-46, Table 1024-1, POZZOLANS FOR USE IN PORTLAND CEMENT CONCRETE**, replace with the following:

<b>TABLE 1024-1 POZZOLANS FOR USE IN PORTLAND CEMENT CONCRETE</b>	
<b>Pozzolan</b>	<b>Rate</b>
Class F Fly Ash	20% - 30% by weight of required cement content with 1.0 lb Class F fly ash per lb of cement replaced
Ground Granulated Blast Furnace Slag	35%-50% by weight of required cement content with 1.0 lb slag per lb of cement replaced
Microsilica	4%-8% by weight of required cement content with 1.0 lb microsilica per lb of cement replaced

**Page 10-47, Subarticle 1024-3(B), Approved Sources, lines 16-18**, replace the second sentence of the second paragraph with the following:

Tests shall be performed by AASHTO's designated National Transportation Product Evaluation Program (NTPEP) laboratory for concrete admixture testing.

**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 10-73, Article 1056-4, GEOTEXTILES, line 33,** add the following after the first sentence in the second paragraph:

Geotextiles will be identified by the product name printed directly on the geotextile. When geotextiles are not marked with a product name or marked with only a manufacturing plant identification code, geotextiles will be identified by product labels attached to the geotextile wrapping. When identification is based on labels instead of markings, unwrap geotextiles just before use in the presence of the Engineer to confirm that the product labels on both ends of the outside of the geotextile outer wrapping match the labels affixed to both ends of the inside of the geotextile roll core. Partial geotextile roles without the product name printed on the geotextile or product labels affixed to the geotextile roll core may not be used.

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

TABLE 1056-1 GEOTEXTILE REQUIREMENTS						
Property	Requirement					Test Method
	Type 1	Type 2	Type 3 <sup>A</sup>	Type 4	Type 5 <sup>B</sup>	
<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 <sup>D</sup> , Class 3	Table 1 <sup>D</sup> , Class 1	100 lb <sup>C</sup>	Table 1 <sup>D</sup> , Class 3	-	ASTM D4632
Tear Strength (MD & CD)			-			ASTM D4533
Puncture Strength			-			ASTM D6241
Ultimate Tensile Strength (MD & CD)	-	-	-	-	2,400 lb/ft <sup>C</sup> (unless required otherwise in the contract)	ASTM D4595
Permittivity	Table 2 <sup>D</sup> , 15% to 50% <i>in Situ</i> Soil Passing No. 200 <sup>E</sup>		Table 7 <sup>D</sup>	Table 5 <sup>D</sup>	0.20 sec <sup>-1,C</sup>	ASTM D4491
Apparent Opening Size					0.60 mm <sup>F</sup>	ASTM D4751
UV Stability (Retained Strength)					70% <sup>C, G</sup>	ASTM D4355

- A. Minimum roll width of 36" required.
- B. Minimum roll width of 13 ft required.
- C. MARV per Article 1056-3.
- D. AASHTO M 288.
- E. US Sieve No. per AASHTO M 92.
- F. Maximum average roll value.
- G. After 500 hours of exposure.

Page 10-74, Article 1056-5, GEOCOMPOSITES, lines 7-8, replace the first sentence with the following:

Provide geocomposite drain strips with a width of at least 12" and Type 1 geotextiles attached to drainage cores that meet Table 1056-2.



**Page 10-115, Subarticle 1074-7(B), Gray Iron Castings, lines 10-11,** replace 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:

<b>TABLE 1078-1 REQUIREMENTS FOR CONCRETE</b>		
<b>Property</b>	<b>28 Day Design Compressive Strength 6,000 psi or less</b>	<b>28 Day Design Compressive Strength greater than 6,000 psi</b>
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 with the following:

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 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 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, Table 1092-3 MINIMUM COEFFICIENT OF RETROREFLECTION FOR NC GRADE A, replace with the following:

<b>Observation Angle, degrees</b>	<b>Entrance Angle, degrees</b>	<b>White</b>	<b>Yellow</b>	<b>Green</b>	<b>Red</b>	<b>Blue</b>	<b>Fluorescent Yellow Green</b>	<b>Fluorescent Yellow</b>
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

**GROUT PRODUCTION AND DELIVERY:**

(3-17-15)

1003

SP10 R20

Revise the *2012 Standard Specifications* as follows:

Replace Section 1003 with the following:

**SECTION 1003  
GROUT PRODUCTION AND DELIVERY**

**1003-1 DESCRIPTION**

This section addresses cement grout to be used for structures, foundations, retaining walls, concrete barriers, embankments, pavements and other applications in accordance with the contract. Produce non-metallic grout composed of Portland cement and water and at the Contractor's option or as required, aggregate and pozzolans. Include chemical admixtures as required or needed. Provide sand cement or neat cement grout as required. Define "sand cement grout" as grout with only fine aggregate and "neat cement grout" as grout without aggregate.

The types of grout with their typical uses are as shown below:

**Type 1** – A cement grout with only a 3-day strength requirement and a fluid consistency that is typically used for filling subsurface voids.

**Type 2** – A nonshrink grout with strength, height change and flow conforming to ASTM C1107 that is typically used for foundations, ground anchors and soil nails.

**Type 3** – A nonshrink grout with high early strength and freeze-thaw durability requirements that is typically used in pile blockouts, grout pockets, shear keys, dowel holes and recesses for concrete barriers and structures.

**Type 4** – A neat cement grout with low strength, a fluid consistency and high fly ash content that is typically used for slab jacking.

**Type 5** – A low slump, low mobility sand cement grout with minimal strength that is typically used for compaction grouting.

### **1003-2 MATERIALS**

Refer to Division 10.

<b>Item</b>	<b>Section</b>
Chemical Admixtures	1024-3
Fine Aggregate	1014-1
Fly Ash	1024-5
Ground Granulated Blast Furnace Slag	1024-6
Portland Cement	1024-1
Silica Fume	1024-7
Water	1024-4

Do not use grout that contains soluble chlorides or more than 1% soluble sulfate. At the Contractor's option, use an approved packaged grout instead of the materials above except for water. Use packaged grouts that are on the NCDOT Approved Products List.

Use admixtures for grout that are on the NCDOT Approved Products List or other admixtures in accordance with Subarticle 1024-3(E) except do not use concrete additives or unclassified or other admixtures in Type 4 or 5 grout. Use Class F fly ash for Type 4 grout and Type II Portland cement for Type 5 grout.

Use well graded rounded aggregate with a gradation, liquid limit (LL) and plasticity index (PI) that meet Table 1003-1 for Type 5 grout. Fly ash may be substituted for a portion of the fines in the aggregate. Do not use any other pozzolans in Type 5 grout.

**TABLE 1003-1  
AGGREGATE REQUIREMENTS FOR TYPE 5 GROUT**

<b>Gradation</b>		<b>Maximum Liquid Limit</b>	<b>Maximum Plasticity Index</b>
<b>Sieve Designation per AASHTO M 92</b>	<b>Percentage Passing (% by weight)</b>		
3/8"	100	N/A	N/A
No. 4	70 – 95		
No. 8	50 – 90		
No. 16	30 – 80		
No. 30	25 – 70		
No. 50	20 – 50		
No. 100	15 – 40		
No. 200	10 – 30	25	10

### **1003-3 COMPOSITION AND DESIGN**

When using an approved packaged grout, a grout mix design submittal is not required. Otherwise, submit proposed grout mix designs for each grout mix to be used in the work. Mixes for all grout shall be designed by a Certified Concrete Mix Design Technician or an Engineer licensed by the State of North Carolina. Mix proportions shall be determined by a testing laboratory approved by the Department. Base grout mix designs on laboratory trial batches that meet Table 1003-2 and this section. With permission, the Contractor may use a quantity of chemical admixture within the range shown on the current list of approved admixtures maintained by the Materials and Tests Unit.

Submit grout mix designs in terms of saturated surface dry weights on Materials and Tests Form 312U at least 35 days before proposed use. Adjust batch proportions to compensate for surface moisture contained in the aggregates at the time of batching. Changes in the saturated surface dry mix proportions will not be permitted unless revised grout mix designs have been submitted to the Engineer and approved.

Accompany Materials and Tests Form 312U with a listing of laboratory test results of compressive strength, density and flow or slump and if applicable, aggregate gradation, durability and height change. List the compressive strength of at least three 2" cubes at the age of 3 and 28 days.

The Engineer will review the grout mix design for compliance with the contract and notify the Contractor as to its acceptability. Do not use a grout mix until written notice has been received. Acceptance of the grout mix design or use of approved packaged grouts does not relieve the Contractor of his responsibility to furnish a product that meets the contract. Upon written request from the Contractor, a grout mix design accepted and used satisfactorily on any Department project may be accepted for use on other projects.



Perform laboratory tests in accordance with the following test procedures:

<b>Property</b>	<b>Test Method</b>
Aggregate Gradation <sup>A</sup>	AASHTO T 27
Compressive Strength	AASHTO T 106
Density (Unit Weight)	AASHTO T 121, AASHTO T 133 <sup>B</sup> , ANSI/API RP <sup>C</sup> 13B-1 <sup>B</sup> (Section 4, Mud Balance)
Durability	AASHTO T 161 <sup>D</sup>
Flow	ASTM C939 (Flow Cone)
Height Change	ASTM C1090 <sup>E</sup>
Slump	AASHTO T 119

**A.** Applicable to grout with aggregate.

**B.** Applicable to Neat Cement Grout.

**C.** American National Standards Institute/American Petroleum Institute Recommended Practice.

**D.** Procedure A (Rapid Freezing and Thawing in Water) required.

**E.** Moist room storage required.

#### **1003-4 GROUT REQUIREMENTS**

Provide grout types in accordance with the contract. Use grouts with properties that meet Table 1003-2. The compressive strength of the grout will be considered the average compressive strength test results of three 2" cubes at each age. Make cubes that meet AASHTO T 106 from the grout delivered for the work or mixed on-site. Make cubes at such frequencies as the Engineer may determine and cure them in accordance with AASHTO T 106.

Type of Grout	Minimum Compressive Strength at		Height Change at 28 days	Flow <sup>A</sup> /Slump <sup>B</sup>	Minimum Durability Factor
	3 days	28 days			
1	3,000 psi	–	–	10 – 30 sec	–
2	Table 1 <sup>C</sup>			Fluid Consistency <sup>C</sup>	–
3	5,000 psi	–	0 – 0.2%	Per Accepted Grout Mix Design/ Approved Packaged Grout	80
4 <sup>D</sup>	600 psi	1,500 psi	–	10 – 26 sec	–
5	–	500 psi	–	1 – 3"	–

A. Applicable to Type 1 through 4 grouts.

B. Applicable to Type 5 grout.

C. ASTM C1107.

D. Use Type 4 grout with proportions by volume of 1 part cement and 3 parts fly ash.

### 1003-5 TEMPERATURE REQUIREMENTS

When using an approved packaged grout, follow the manufacturer's instructions for grout and air temperature at the time of placement. Otherwise, the grout temperature at the time of placement shall be not less than 50°F nor more than 90°F. Do not place grout when the air temperature measured at the location of the grouting operation in the shade away from artificial heat is below 40°F.

### 1003-6 ELAPSED TIME FOR PLACING GROUT

Agitate grout continuously before placement. Regulate the delivery so the maximum interval between the placing of batches at the work site does not exceed 20 minutes. Place grout before exceeding the times in Table 1003-3. Measure the elapsed time as the time between adding the mixing water to the grout mix and placing the grout.

Air or Grout Temperature, Whichever is Higher	Maximum Elapsed Time	
	No Retarding Admixture Used	Retarding Admixture Used
90°F or above	30 minutes	1 hr. 15 minutes
80°F through 89°F	45 minutes	1 hr. 30 minutes
79°F or below	60 minutes	1 hr. 45 minutes

**1003-7 MIXING AND DELIVERY**

Use grout free of any lumps and undispersed cement. When using an approved packaged grout, mix grout in accordance with the manufacturer's instructions. Otherwise, comply with Articles 1000-8 through 1000-12 to the extent applicable for grout instead of concrete.

**TRUCK MOUNTED CHANGEABLE MESSAGE SIGNS:**

(8-21-12)

1101.02

SP11 R10

Revise the *2012 Roadway Standard Drawings* as follows:

**Drawing No. 1101.02, Sheet 12, TEMPORARY LANE CLOSURES**, replace General Note #11 with the following:

11- TRUCK MOUNTED CHANGEABLE MESSAGE SIGNS (TMCMS) USED ON SHADOW VEHICLES FOR "IN LANE" ACTIVITIES SHALL BE A MINIMUM OF 43" X 73". THE DISPLAY PANEL SHALL HAVE FULL MATRIX CAPABILITY WITH THE CAPABILITY TO PROVIDE 2 MESSAGE LINES WITH 7 CHARACTERS PER LINE WITH A MINIMUM CHARACTER HEIGHT OF 18". FOR ADDITIONAL MESSAGING, CONTACT THE WORK ZONE TRAFFIC CONTROL SECTION.

12- TMCMS USED FOR ADVANCED WARNING ON VEHICLES LOCATED ON THE SHOULDER MAY BE SMALLER THAN 43" X 73". THE DISPLAY PANEL SHALL HAVE THE CAPABILITY TO PROVIDE 2 MESSAGE LINES WITH 7 CHARACTERS PER LINE WITH A MINIMUM CHARACTER HEIGHT OF 18". FOR ADDITIONAL MESSAGING, CONTACT THE WORK ZONE TRAFFIC CONTROL SECTION.

**Drawing No. 1101.02, Sheet 13, TEMPORARY LANE CLOSURES**, replace General Note #12 with the following:

12- TRUCK MOUNTED CHANGEABLE MESSAGE SIGNS (TMCMS) USED ON SHADOW VEHICLES FOR "IN LANE" ACTIVITIES SHALL BE A MINIMUM OF 43" X 73". THE DISPLAY PANEL SHALL HAVE FULL MATRIX CAPABILITY WITH THE CAPABILITY TO PROVIDE 2 MESSAGE LINES WITH 7 CHARACTERS PER LINE WITH A MINIMUM CHARACTER HEIGHT OF 18". FOR ADDITIONAL MESSAGING, CONTACT THE WORK ZONE TRAFFIC CONTROL SECTION.

13- TMCMS USED FOR ADVANCED WARNING ON VEHICLES LOCATED ON THE SHOULDER MAY BE SMALLER THAN 43" X 73". THE DISPLAY PANEL SHALL HAVE THE CAPABILITY TO PROVIDE 2 MESSAGE LINES WITH 7 CHARACTERS PER LINE WITH A MINIMUM CHARACTER HEIGHT OF 18". FOR ADDITIONAL MESSAGING, CONTACT THE WORK ZONE TRAFFIC CONTROL SECTION.

**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. 04-21-15)

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 7**

**Page 7-1, Article 700-3, CONCRETE HAULING EQUIPMENT**, line 33, replace “competition” with “completion”.

**Division 8**

**Page 8-23, line 10, Article 838-2 Materials**, replace “Portland Cement Concrete, Class B” with “Portland Cement Concrete, Class A”.

**Division 10**

**Page 10-166, Article 1081-3 Hot Bitumen**, replace “Table 1081-16” with “Table 1081-2”, replace “Table 1081-17” with “Table 1081-3”, and replace “Table 1081-18” with “Table 1081-4”.

**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

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Goals for Female

Participation in Each Trade

(Statewide) 6.9%

**STANDARD SPECIAL PROVISION****REQUIRED CONTRACT PROVISIONS FEDERAL - AID CONSTRUCTION CONTRACTS**

FHWA - 1273 Electronic Version - May 1, 2012

Z-8

- I. General
- II. Nondiscrimination
- III. Nonsegregated Facilities
- IV. Davis-Bacon and Related Act Provisions
- V. Contract Work Hours and Safety Standards Act Provisions
- VI. Subletting or Assigning the Contract
- VII. Safety: Accident Prevention
- VIII. False Statements Concerning Highway Projects
- IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
- X. Compliance with Governmentwide Suspension and Debarment Requirements
- XI. Certification Regarding Use of Contract Funds for Lobbying

**ATTACHMENTS**

- A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

**I. GENERAL**

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).  
The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.  
Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.  
Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).
2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.
3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.
4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

**II. NONDISCRIMINATION**

The provisions of this section related to 23 CFR Part 230 are applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding \$10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. **Equal Employment Opportunity:** Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are

incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

- a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.
  - b. The contractor will accept as its operating policy the following statement:  
"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."
2. **EEO Officer:** The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.
  3. **Dissemination of Policy:** All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:
    - a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.
    - b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.
    - c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.
    - d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.
    - e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.
  4. **Recruitment:** When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.
    - a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.
    - b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.
    - c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.
  5. **Personnel Actions:** Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:
    - a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.
    - b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.
    - c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.
    - d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.
  6. **Training and Promotion:**
    - a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.
    - b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).
    - c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.
    - d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

7. **Unions:** If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:
  - a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.
  - b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.
  - c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.
  - d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.
8. **Reasonable Accommodation for Applicants / Employees with Disabilities:** The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.
9. **Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:** The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.
  - a. The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.
  - b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.
10. **Assurance Required by 49 CFR 26.13(b):**
  - a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.
  - b. The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.
11. **Records and Reports:** The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.
  - a. The records kept by the contractor shall document the following:
    - (1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;
    - (2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and
    - (3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;
  - b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

### III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

### IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding \$2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 "Contract provisions and related matters" with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

#### 1. Minimum wages

- a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the

Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

- b. (1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:
    - (i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
    - (ii) The classification is utilized in the area by the construction industry; and
    - (iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.
  - (2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.
  - (3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.
  - (4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.
  - c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.
  - d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.
2. **Withholding.** The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.
3. **Payrolls and basic records**
- a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.
  - b. (1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the

payrolls shall only need to include an individually identifying number for each employee ( e.g. , the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency.

- (2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:
- (i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;
  - (ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;
  - (iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.
- (3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.
- (4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.
- c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.
- 4. Apprentices and trainees**
- a. Apprentices (programs of the USDOL). Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.
- The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.
- Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.
- In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.
- b. Trainees (programs of the USDOL). Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.
- The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.
- Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.



- In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.
- c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.
  - d. Apprentices and Trainees (programs of the U.S. DOT). Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.
5. **Compliance with Copeland Act requirements.** The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.
  6. **Subcontracts.** The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.
  7. **Contract termination:** debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.
  8. **Compliance with Davis-Bacon and Related Act requirements.** All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.
  9. **Disputes concerning labor standards.** Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.
  10. **Certification of eligibility.**
    - a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
    - b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
    - c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

#### V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

The following clauses apply to any Federal-aid construction contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

1. **Overtime requirements.** No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
2. **Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.
3. **Withholding for unpaid wages and liquidated damages.** The FHWA or the contacting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.
4. **Subcontracts.** The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

#### VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).
  - a. The term "perform work with its own organization" refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:
    - (1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;

- (2) the prime contractor remains responsible for the quality of the work of the leased employees;
  - (3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and
  - (4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.
- b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.
2. The contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.
  3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.
  4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.
  5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

#### **VII. SAFETY: ACCIDENT PREVENTION**

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.
2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).
3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.3704).

#### **VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS**

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

#### **IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT**

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.
2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

**X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION**

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost \$25,000 or more – as defined in 2 CFR Parts 180 and 1200.

**1. Instructions for Certification – First Tier Participants:**

- a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.
- b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.
- c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default.
- d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
- e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).
- f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.
- g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.
- h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.
- i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
- j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

\* \* \* \* \*

**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. 4-21-15)

Z-10

**Description**

The North Carolina Department of Transportation will administer a custom version of the Federal On-the-Job Training (OJT) Program, commonly referred to as the Alternate OJT Program. All contractors (existing and newcomers) will be automatically placed in the Alternate Program. Standard OJT requirements typically associated with individual projects will no longer be applied at the project level. Instead, these requirements will be applicable on an annual basis for each contractor administered by the OJT Program Manager.

On the Job Training shall meet the requirements of 23 CFR 230.107 (b), 23 USC – Section 140, this provision and the On-the-Job Training Program Manual.

The Alternate OJT Program will allow a contractor to train employees on Federal, State and privately funded projects located in North Carolina. However, priority shall be given to training employees on NCDOT Federal-Aid funded projects.

**Minorities and Women**

Developing, training and upgrading of minorities and women toward journeyman level status is a primary objective of this special training provision. Accordingly, the Contractor shall make every effort to enroll minority and women as trainees to the extent that such persons are available within a reasonable area of recruitment. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training, whether a member of a minority group or not.

**Assigning Training Goals**

The Department, through the OJT Program Manager, will assign training goals for a calendar year based on the contractors' past three years' activity and the contractors' anticipated upcoming year's activity with the Department. At the beginning of each year, all contractors eligible will be contacted by the Department to determine the number of trainees that will be assigned for the upcoming calendar year. At that time the Contractor shall enter into an agreement with the Department to provide a self-imposed on-the-job training program for the calendar year. This agreement will include a specific number of annual training goals agreed to by both parties. The number of training assignments may range from 1 to 15 per contractor per calendar year. The Contractor shall sign an agreement to fulfill their annual goal for the year.\

**Training Classifications**

The Contractor shall provide on-the-job training aimed at developing full journeyman level workers in the construction craft/operator positions. Preference shall be given to providing training in the following skilled work classifications:

Equipment Operators	Office Engineers
Truck Drivers	Estimators
Carpenters	Iron / Reinforcing Steel Workers
Concrete Finishers	Mechanics
Pipe Layers	Welders

The Department has established common training classifications and their respective training requirements that may be used by the contractors. However, the classifications established are not all-inclusive. Where the training is oriented toward construction applications, training will be allowed in lower-level management positions such as office engineers and estimators. Contractors shall submit new classifications for specific job functions that their employees are performing. The Department will review and recommend for acceptance to FHWA the new classifications proposed by contractors, if applicable. New classifications shall meet the following requirements:

Proposed training classifications are reasonable and realistic based on the job skill classification needs, and

The number of training hours specified in the training classification is consistent with common practices and provides enough time for the trainee to obtain journeyman level status.

The Contractor may allow trainees to be trained by a subcontractor provided that the Contractor retains primary responsibility for meeting the training and this provision is made applicable to the subcontract. However, only the Contractor will receive credit towards the annual goal for the trainee.

Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training. The number of trainees shall be distributed among the work classifications on the basis of the contractor's needs and the availability of journeymen in the various classifications within a reasonable area of recruitment.

No employee shall be employed as a trainee in any classification in which they have successfully completed a training course leading to journeyman level status or in which they have been employed as a journeyman.

**Records and Reports**

The Contractor shall maintain enrollment, monthly and completion reports documenting company compliance under these contract documents. These documents and any other information as requested shall be submitted to the OJT Program Manager.

Upon completion and graduation of the program, the Contractor shall provide each trainee with a certification Certificate showing the type and length of training satisfactorily completed.

**Trainee Interviews**

All trainees enrolled in the program will receive an initial and Trainee/Post graduate interview conducted by the OJT program staff.

**Trainee Wages**

Contractors shall compensate trainees on a graduating pay scale based upon a percentage of the prevailing minimum journeyman wages (Davis-Bacon Act). Minimum pay shall be as follows:

60 percent	of the journeyman wage for the first half of the training period
75 percent	of the journeyman wage for the third quarter of the training period
90 percent	of the journeyman wage for the last quarter of the training period

In no instance shall a trainee be paid less than the local minimum wage. The Contractor shall adhere to the minimum hourly wage rate that will satisfy both the NC Department of Labor (NCDOL) and the Department.

**Achieving or Failing to Meet Training Goals**

The Contractor will be credited for each trainee employed by him on the contract work who is currently enrolled or becomes enrolled in an approved program and who receives training for at least 50 percent of the specific program requirement. Trainees will be allowed to be transferred between projects if required by the Contractor's scheduled workload to meet training goals.

If a contractor fails to attain their training assignments for the calendar year, they may be taken off the NCDOT's Bidders List.

**Measurement and Payment**

No compensation will be made for providing required training in accordance with these contract documents.

**STANDARD SPECIAL PROVISION**  
**MINIMUM WAGES**  
**GENERAL DECISION NC150101 01/23/2015 NC101**

Z-101

Date: January 23, 2015

General Decision Number: NC150101 01/23/2015 NC101

Superseded General Decision Numbers: NC20140101

State: North Carolina

Construction Type: HIGHWAY

**COUNTIES:**

Alamance	Forsyth	Randolph
Anson	Gaston	Rockingham
Cabarrus	Guilford	Stokes
Chatham	Mecklenburg	Union
Davie	Orange	Yadkin
Durham	Person	

HIGHWAY CONSTRUCTION PROJECTS (excluding tunnels, building structures in rest area projects & railroad construction; bascule, suspension & spandrel arch bridges designed for commercial navigation, bridges involving marine construction; and other major bridges).

Note: Executive Order (EO) 13658 establishes an hourly minimum wage of \$10.10 for 2015 that applies to all contracts subject to the Davis-Bacon Act for which the solicitation is issued on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.10 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

Modification Number

0

1

Publication Date

01/02/2015

01/23/2015

SUNC2014-003 11/14/2014

	Rates	Fringes
BLASTER	18.64	
CARPENTER	13.68	.05
CEMENT MASON/CONCRETE FINISHER	13.93	
ELECTRICIAN		
Electrician	18.79	2.72
Telecommunications Technician	15.19	1.25
IRONWORKER	13.30	
LABORER		
Asphalt Raker and Spreader	12.78	



	Rates	Fringes
Asphalt Screed/Jackman	14.50	
Carpenter Tender	12.51	.27
Cement Mason/Concrete Finisher Tender	11.04	
Common or General	10.40	.01
Guardrail/Fence Installer	13.22	
Pipelayer	12.43	
Traffic Signal/Lighting Installer	15.65	.24
<b>PAINTER</b>		
Bridge	23.77	
<b>POWER EQUIPMENT OPERATORS</b>		
Asphalt Broom Tractor	10.00	
Bulldozer Fine	16.13	
Bulldozer Rough	14.36	
Concrete Grinder/Groover	17.92	
Crane Boom Trucks	18.19	
Crane Other	19.83	
Crane Rough/All-Terrain	19.10	
Drill Operator Rock	14.28	
Drill Operator Structure	20.89	
Excavator Fine	16.95	
Excavator Rough	13.63	
Grader/Blade Fine	19.84	
Grader/Blade Rough	15.47	
Loader 2 Cubic Yards or Less	13.31	
Loader Greater Than 2 Cubic Yards	16.19	
Material Transfer Vehicle (Shuttle Buggy)	15.44	
Mechanic	17.51	
Milling Machine	15.22	
Off-Road Hauler/Water Tanker	11.83	
Oiler/Greaser	14.16	
Pavement Marking Equipment	12.05	
Paver Asphalt	15.97	
Paver Concrete	18.20	
Roller Asphalt Breakdown	12.79	
Roller Asphalt Finish	13.76	
Roller Other	12.08	
Scraper Finish	12.65	
Scraper Rough	11.50	
Slip Form Machine	19.60	
Tack Truck/Distributor Operator	14.82	
<b>TRUCK DRIVER</b>		
GVWR of 26,000 Lbs or Greater	11.45	
GVWR of 26,000 Lbs or Less	13.57	.03

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 a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

#### Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

#### Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

#### Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations  
 Wage and Hour Division  
 U. S. Department of Labor  
 200 Constitution Avenue, N.W.  
 Washington, D.C. 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator  
 U.S. Department of Labor  
 200 Constitution Avenue, N.W.  
 Washington, D.C. 20210

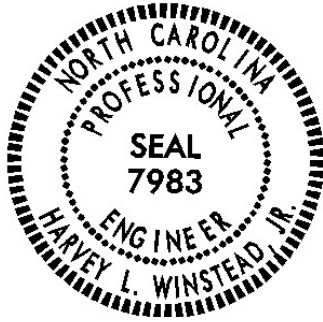
The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
 U.S. Department of Labor  
 200 Constitution Avenue, N.W.  
 Washington, D.C. 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION



**R-2248EA**

**INTELLIGENT TRANSPORTATION SYSTEMS  
CCTV AND DMS INSTALLATIONS**

**PROJECT SPECIAL PROVISIONS**

Prepared By:

DocuSigned by:  
*Harvey L. Winstead, Jr.*  
F62917C5CE07429...  
02-04-2015



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1 **1. GENERAL REQUIREMENTS**2 **1.1. DESCRIPTION**3 **(A) General**

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

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

10 Conform to the NCDOT and NC Statewide IT Policies and Standards as described  
11 at <https://www.scio.nc.gov/mission/itPoliciesStandards.aspx>. The architecture of the IT  
12 modules must be approved by NCDOT IT and the NC Office of Information Technology  
13 architecture groups.

14 **(B) Scope**

15 The scope of this project includes the installation of new fiber-optic communications cable,  
16 seven (7) new IP (Internet Protocol) based, closed circuit television (CCTV) cameras,  
17 modifications at two (2) existing IP based CCTV cameras, and two (2) new pedestal mount  
18 dynamic message signs (DMS). New fiber-optic cables will be installed in new and existing  
19 underground conduit. New or modified electrical service will be installed at each new CCTV  
20 and DMS as designated in the plans. The Contractor shall coordinate with the appropriate  
21 electric utility company in the area to establish new service.

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

25 Integrate the new fiber-optic cables with existing communications infrastructure so that the  
26 new CCTV, existing CCTV and new DMS devices are accessible and controlled by the  
27 existing computer and network hardware and software at the NCDOT Metrolina Regional  
28 Transportation Management Center (MRTMC) located at 2327 Tipton Drive in Charlotte.

29 **Modify existing local area network (LAN) settings required by the rerouting of existing**  
30 **fiber circuits installed under prior projects I-3803BA and R-2123CG through both Hubs**  
31 **#4 and #5, as shown in the plans, for network reconfiguration to maintain device**  
32 **operations in the event of a communications interruption.**

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

34 **1.2. MATERIALS**35 **(A) Qualified Products**

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

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

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

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

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

9 **(B) Information Technology Compliance**

10 Conform to the State of North Carolina Information Technology (IT) policy and standards as  
11 described at <http://www.scio.nc.gov/mission/itPoliciesStandards.aspx>. The architecture of the  
12 IT modules must be approved by the NC- DOT IT and NC Office of Information Technology  
13 architecture groups.

14 **1.3. PLAN OF RECORD DOCUMENTATION**

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

17 **1.4. REQUIREMENTS FOR CABLES CROSSING NORFOLK SOUTHERN RAILROADS**

18 Copies of all executed railroad agreements and related correspondence may be obtained from  
19 the Resident Engineer.

20 **(A) Railroad Crossings**

21 Do not commence cable routings over or under railroad-owned facilities until notification and  
22 coordination with Engineer and the appropriate railroad company has occurred. As shown on  
23 the Plans, one affected railroad facility on this project is owned by the Norfolk Southern  
24 Railway Company herein called the Railroad Company. Install fiber optic communications  
25 cable as shown on the Plans.

26 **(B) Requirements for Insurance**

27 The Contractor will be required to provide coverage conforming to the requirements of the  
28 Federal-Aid Policy Guide outlined under 23 CFR 646A for all work to be performed on the  
29 Railroad rights(s) of way under the terms of the contract by carrying insurance of the following  
30 kinds:

31 **Contractor's General Liability and Railroad Protective Liability Insurance**

32 i. Furnish a certificate of general liability insurance and railroad protective liability  
33 insurance evidencing a combined single limit of a minimum of \$1,000,000.00 per  
34 occurrence of general liability insurance and \$1,000,000.00 per occurrence of railroad  
35 protective liability insurance naming Norfolk Southern Railway Company as the  
36 certificate holder and as an additional insured on both the general and railroad  
37 protective liability insurance policy.

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

5 iii. Certificates shall make reference to the project, milepost and county. Certificate  
6 description and project designation to include the following information: Installation of  
7 fiber optic communications cable above tracks of the Norfolk Southern Railway  
8 Company, Mecklenburg County (include Railroad Milepost) identified as NCDOT  
9 Project R-2248EA.

10 Use the address below for the Certificates of Insurance holder:

11 Norfolk Southern Corporation  
12 Attn. Risk Manager  
13 Three Commercial Place  
14 Norfolk, VA 23510

15 iv. All policies and certificates shall contain a clause requiring that thirty (30) days written  
16 notice be given the Department of Transportation and the Railroad Company prior to  
17 cancellation or change. The notices shall make reference to the project, milepost and  
18 county.

19 NOTICE TO:

20 Norfolk Southern Corporation  
21 Attn. Risk Manager  
22 Three Commercial Place  
23 Norfolk, VA 23510

24 COPY NOTICE TO:

25 Department of Transportation  
26 Utilities Coordination Unit  
27 c/o State Railroad Agent  
28 1556 Mail Service Center  
29 Raleigh, NC 27699-1556

30 v. Carry all insurance herein specified until the final inspection and acceptance of the  
31 project, or that portion of the project within railroad right of way, by the Department of  
32 Transportation or, in the case of subcontractors, until the Contractor furnishes a letter to  
33 the Engineer stating that the subcontractor has completed his subcontracted work within  
34 railroad right of way to the satisfaction of the Contractor and the Contractor will  
35 accomplish any additional work necessary on railroad right of way with his own forces.  
36 It is understood that the amounts specified are minimum amounts and that the  
37 Contractor may carry insurance in larger amounts if he so desires. As to “aggregate  
38 limits”, if the insurer establishes loss reserves equal to or in excess of the aggregate  
39 limit specified in any of the required insurance policies, immediately notify the  
40 Department of Transportation and cease all operations until the aggregate limit is  
41 reinstated. If the insurer establishes loss reserves equal to or in excess of one/half of

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1 the aggregate limit, arrange to restore the aggregate limit to at least the minimum  
2 amount stated in these requirements. Any insurance policies and certificates taken out  
3 and furnished due to these requirements shall be approved by the Department of  
4 Transportation and the Railroad Company as to form and amount prior to beginning  
5 work on railroad right of way.

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

8 vi. Furnish evidence of insurance as required above to the Engineer.

9 **(C) Delays Caused By Operations of Others**

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

15 **(D) Cooperation with Others**

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

18 **(E) Authority of Railroad Engineer**

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

22 **(F) Interference with Railroad Operations**

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

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

35 **(G) Storage of Materials**

36 Materials and equipment shall not be stored where they will interfere with railroad operations,  
37 nor on the rights of way of the Railroad Company without first having obtained permission  
38 from the Railroad Engineer, and such permission will be with the understanding that the  
39 Railroad Company will not be liable or damage to such material and equipment from any cause

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1 and that the Railroad Engineer may move or require the Contractor to move, at the  
2 Contractor's expense, such material and equipment.

3 **(H) Flagging Protection or Watchman Service**

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

7 **(I) Completion and Acceptance of Work**

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

14 **1.5. WARRANTIES**

15 Comply with all requirements of Article 1098-1(D) of the Standard Specifications for providing  
16 manufacturer's warranties on Contractor-furnished equipment.



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1 **3. LAW ENFORCEMENT**

2 **3.1. DESCRIPTION**

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

5 **3.2. CONSTRUCTION METHODS**

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

9 **3.3. MEASUREMENT AND PAYMENT**

10 There will be no direct payment for uniformed Law Enforcement Offices and marked Law  
11 Enforcement vehicles as they are included in the Traffic Control Lump Sum pay item.



1 **4. UNDERGROUND CONDUIT**

2 **4.1. DESCRIPTION**

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

6 **4.2. MATERIALS**

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

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

11 Furnish conduits in the following colors according to contents and quantity:

Conduit Contents	Number of Conduits	Conduit Colors
Electrical Power	1	Red
	2	Red and Black w/ Red Stripes
Communications	1	Orange
	2	Orange and Black
	4	Orange, Black, White and Blue

12  
13 Furnish underground HDPE conduits as shown in the Plans. All vertical conduits (entrance to  
14 electrical service and equipment disconnect and pole mounted cabinet) must be rigid galvanized  
15 steel.

16 **4.3. CONSTRUCTION METHODS**

17 Install underground conduit in compliance with all requirements of Section 1715-3 of the *Standard*  
18 *Specifications*.

19 **4.4. MEASUREMENT AND PAYMENT**

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

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

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

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

8 Payment will be made under:

9	<b>Pay Item</b>	<b>Pay Unit</b>
10	Tracer Wire .....	Linear Foot
11	Unpaved Trenching (1) (2").....	Linear Foot
12	Directional Drill (1) (2") .....	Linear Foot

1

## 5. JUNCTION BOXES

### 5.1. DESCRIPTION

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

### 5.2. MATERIALS

6 Material, equipment, and hardware furnished under this section shall be pre-approved on the  
7 Department's QPL, with the exception of "Junction Box (Special Oversized Heavy-Duty)."

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

10 Provide special oversized heavy-duty junction boxes and covers with minimum inside dimensions of  
11 36" x 36" x 24" (length x width x depth).

### 5.3. CONSTRUCTION METHODS

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

15 Install oversized heavy-duty junction boxes for storage of fiber-optic communications cables. Install  
16 special oversized heavy-duty junction boxes for underground splice enclosures and storage of fiber-  
17 optic cable.

18 Inspect all existing junction boxes within the project limits prior to replacing any existing junction  
19 boxes with Special Oversized Heavy-Duty junction boxes and prior to beginning the installation of  
20 fiber-optic cable. Report any identified existing junction box damage to the Engineer, who will  
21 determine if the damage is sufficient for the junction box(es) to be replaced.

22 Do not damage existing junction boxes that are removed and replaced with Special Oversized  
23 Heavy-Duty junction boxes. Replace any junction boxes damaged during removal with new  
24 junction boxes prior to delivery to the MRTMC.

25 Deliver all removed, undamaged junction boxes to the NCDOT Division 10, MRTMC at 2327  
26 Tipton Drive, Charlotte, NC. Contact Mr. Will Simons at 704-347-6605 in advance to arrange a  
27 delivery date and time.

28 Provide real world coordinates for all junction boxes and equipment cabinets installed or used under  
29 this project **and for all existing junction boxes within the project limits**. Provide the coordinates  
30 in feet units using the North Carolina State Plane coordinate system (1983 North American Datum  
31 also known as NAD '83). Furnish coordinates that do not deviate more than 1.7 ft in the horizontal  
32 plane and 3.3 ft in the vertical plane. Global positioning system (GPS) equipment able to obtain the  
33 coordinate data within these tolerances may be used. Submit cut sheets on the GPS unit proposed to  
34 collect the data for approval by the Engineer.

35 Provide both a digital copy and hard copy of all information regarding the location (including, but  
36 not limited to, manufacturer, model number, and NCDOT inventory number) in the Microsoft®  
37 spreadsheet provided by the Department, shown by example in Figure 1716-1 of the *Standard*  
38 *Specifications*.

1 **5.4. MEASUREMENT AND PAYMENT**

2 *Junction Box* (\_\_\_\_\_) will be measured and paid as the actual number of junction boxes of each size  
3 and type furnished, installed, and accepted.

4 Measurement and payment will also be made for the replacement of existing damaged junction  
5 boxes where such damage was reported to the Engineer in advance of work by the Contractor and  
6 where approved for replacement by the Engineer.

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

9 No measurement will be made to capture and report the GPS coordinates for all new equipment  
10 cabinets installed on the project and for all new and existing junction boxes (including replaced  
11 junction boxes) within the project limits, as this is considered incidental to furnishing and installing  
12 equipment cabinets and junction boxes.

13 No measurement will be made to remove and deliver an existing junction box where the existing  
14 junction box is replaced with a Special Oversized Heavy-Duty junction box as this is considered  
15 incidental to installation of the Special Oversized Heavy-Duty junction box.

16 No measurement will be made of new junction boxes furnished to replace junction boxes that were  
17 damaged during removal.

18 Payment will be made under:

19 <b>Pay Item</b>	<b>Pay Unit</b>
20 Junction Box (Special Oversized Heavy-Duty).....	Each
21 Junction Box (Standard Size).....	Each
22 Junction Box (Oversized Heavy-Duty).....	Each

1

**6. WOOD POLES**

2 **6.1. DESCRIPTION**

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

5 **6.2. MATERIALS**

6 **(A) General**

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

9 Refer to Articles 1082-3 (Treated Timber and Lumber), 1082-4 (Preservative Treatment),  
10 1091-2 (Wire), and 1091-6 (Grounding Electrodes) of the *Standard Specifications*.

11 **(B) Wood Pole**

12 Furnish 40' Class 4 or better wood poles for attaching messenger cable and communications  
13 cable or for mounting electrical service equipment as shown in the Plans.

14 **6.3. CONSTRUCTION METHODS**

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

17 **6.4. MEASUREMENT AND PAYMENT**

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

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

22 Payment will be made under:

23 <b>Pay Item</b>	<b>Pay Unit</b>
24 Wood Pole.....	Each

1 **7. RISER ASSEMBLIES**

2 **7.1. DESCRIPTION**

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

5 **7.2. MATERIALS**

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

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

10 **7.3. CONSTRUCTION METHODS**

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

13 **7.4. MEASUREMENT AND PAYMENT**

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

17 No measurement will be made for vertical conduit segments (i.e., short risers) extending from an  
18 entrance in the bottom of a pole-mounted equipment cabinet to ground level below the cabinet to tie  
19 directly onto an underground conduit as such vertical conduits will be considered incidental to the  
20 pole-mounted equipment cabinet.

21 Payment will be made under:

22 <b>Pay Item</b>	<b>Pay Unit</b>
23 1¼" Riser with Weatherhead .....	Each

1 **8. FIBER-OPTIC CABLE**

2 **8.1. DESCRIPTION**

3 Furnish and install single mode fiber-optic (SMFO) communications cable, communications cable  
4 identification markers, and all necessary hardware.

5 **8.2. MATERIALS**

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

8 Refer to Articles 1098-10(A) (SMFO Communications Cable), and 1098-10(C) (Communications  
9 Cable Identification Markers), of the *Standard Specifications*.

10 Provide communications cable identification markers with **704-342-6814** as the contact telephone  
11 number.

12 **8.3. CONSTRUCTION METHODS**

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

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

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

20 **8.4. MEASUREMENT AND PAYMENT**

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

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

28  
29 Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
31 Communications Cable (12-Fiber) .....	Linear Foot
32 Communications Cable (144-Fiber) .....	Linear Foot

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1 **9. DELINEATOR MARKERS**

2 **9.1. DESCRIPTION**

3 Furnish and install delineator markers with all necessary hardware.

4 **9.2. MATERIALS**

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

7 Provide delineator markers with **704-342-6814** as the contact telephone number.

8 **9.3. CONSTRUCTION METHODS**

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

11 Install delineator markers at new and existing junction boxes as shown in the Plans. If necessary,  
12 use electronic locating equipment to locate existing junction boxes shown of the Plans.

13 **9.4. MEASUREMENT AND PAYMENT**

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

15 No measurement will be made for the use of electronic locating equipment to locate existing  
16 junction boxes shown on the Plans as this is considered incidental to furnishing and installing  
17 delineator markers.

18 Payment will be made under:

19 <b>Pay Item</b>	<b>Pay Unit</b>
20 Delineator Marker .....	Each





1 **10.4. MEASUREMENT AND PAYMENT**

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

5 *Interconnect center (\_\_\_\_-fiber)* will be measured and paid as the actual number of fiber-optic  
6 interconnect centers of the type specified furnished, installed, and accepted.

7 *Modify interconnect center* will be measured and paid as the actual number of interconnect centers  
8 modified and accepted.

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

13 Payment will be made under:

14 <b>Pay Item</b>	<b>Pay Unit</b>
15 Splice Enclosure.....	Each
16 Interconnect Center (12-Fiber) .....	Each
17 Interconnect Center (144-Fiber) .....	Each
18 Modify Interconnect Center .....	Each

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**11. ELECTRICAL SERVICE**

**11.1. 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.

**11.2. MATERIALS**

**(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 eight (8) spaces in the disconnect. Furnish a single pole 15A circuit breaker at each CCTV location. Furnish a double pole 50A circuit breaker at each DMS location. 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 2/0 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°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 2/0 AWG and smaller Copper/Aluminum wire,
- With or without horn bypass,
- Made of galvanized steel,
- Listed as meeting UL Standard US-414,
- Overhead or underground service entrance specified.

Furnish 1.5" watertight hub for threaded rigid conduit with meter base.

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

- Type of design.....Silicon Oxide Varistor
- Voltage.....120/240 Single Phase, 3 wire

- 1           ▪ Maximum current.....100,000 amps
- 2           ▪ Maximum energy .....3,000 joules per pole
- 3           ▪ Maximum number of surges .....Unlimited
- 4           ▪ Response time one milliamp test .....5 nanoseconds
- 5           ▪ Response time to clamp 10,000 amps.....10 nanoseconds
- 6           ▪ Response time to clamp 50,000 amps.....25 nanoseconds
- 7           ▪ Leak current at double the rated voltage.....None
- 8           ▪ Ground wire .....Separate

9   **(B) Modify Existing Electrical Service Equipment**

10       At locations shown in the Plans, modify the existing electrical service by installing an  
 11       additional 15A, single pole circuit breaker for the CCTV camera in an existing service  
 12       disconnect enclosure. Furnish circuit breakers with a minimum of 10,000 RMS symmetrical  
 13       amperes short circuit current rating. Ensure circuit breakers are listed as meeting UL-489.  
 14       Install conduit between the existing service disconnect enclosure and an adjacent junction box  
 15       as shown in the plans.

16   **(C) 10KVA Single Phase General Purpose Transformer**

17       As shown on the Plans, furnish and install a double-wound, dry type general purpose  
 18       transformer to isolate the line side voltages from the load side voltages as shown in the Plans.  
 19       Provide the transformer with the following specifications:

- 20           ▪ Primary Volts: 120/240 with 83/41 Amps Max. 60Hz.
- 21           ▪ Secondary Volts: 120/240 with 83/41 Amps Max. 60Hz.
- 22           ▪ 10 kVA power rating.
- 23           ▪ Electrostatic shielding between primary and secondary windings.
- 24           ▪ Epoxy-silica encapsulated core and coil.
- 25           ▪ Copper windings and copper lead wire terminations.
- 26           ▪ Multiple front and bottom knockout for conduit entry/exit.
- 27           ▪ Ground studs for conduit bonding.

28       Provide the transformer in a NEMA 3R enclosure suitable for mounting to a metal pole.

29   **(D) Equipment Cabinet Disconnect**

30       Provide new equipment cabinet disconnects at the locations shown in the Plans. Furnish double  
 31       pole 50A circuit breakers at DMS locations. Furnish single pole 15A circuit breaker at CCTV  
 32       locations. Furnish panels that have a minimum of four (4) spaces in the disconnect. Furnish  
 33       circuit breakers with a minimum of 10,000 RMS symmetrical amperes short circuit current  
 34       rating in a lockable NEMA 3R enclosure. Ensure circuit breakers are listed as meeting UL-  
 35       489. Fabricate enclosure from galvanized steel and electrostatically apply dry powder paint  
 36       finish, light gray in color, to yield a minimum thickness of 2.4 mils. All exterior surfaces must

1 be powder coated steel. Provide ground bus and neutral bus with a minimum of four terminals  
2 and a minimum wire capacity range of number 8 through number 1/0 AWG.

3 **(E) 3-Wire Copper Service Entrance Conductors**

4 Furnish 3-wire, 3 AWG stranded copper service entrance conductors with THWN rating.  
5 Provide conductors with black, red, and white insulation that are intended for power circuits at  
6 600 Volts or less and comply with the following:

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

9 **(F) 4-Wire Copper Feeder Conductors**

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

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

16 See the Plans for wire sizes and quantities.

17 **(G) 3-Wire Copper Feeder Conductors**

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

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

24 See the Plans for wire sizes and quantities.

25 **(H) Grounding System**

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

29 **11.3. CONSTRUCTION METHODS**

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

33 **(A) Meter Base/Disconnect Combination Panel**

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

1 above ground and either PVC or HDPE for below ground depending on the installation method  
2 required by the plans.

3 **(B) Modify Existing Electrical Service Equipment**

4 Coordinate with the Engineer and the utility company to de-energize the existing service  
5 temporarily prior to starting the modification. Additionally, at locations where the existing  
6 service is for a traffic signal, coordinate service interruptions with the City of Charlotte  
7 Department of Transportation.

8 Measure the existing grounding system for ground resistance. If the ground resistance is  
9 greater than 20 ohms, abandon the existing grounding system and install a new grounding  
10 system as described in this section. Ensure the existing grounding electrode conductor is  
11 removed or disconnected from the system.

12 Install a new conduit system between the existing service disconnect and the new cabinet or  
13 equipment cabinet disconnect as shown in the Plans. All above ground conduits, conduit  
14 bodies and fittings must be rigid galvanized steel. Underground conduits and fittings can be  
15 PVC or HDPE. Transition from rigid galvanized steel to PVC using rigid galvanized steel  
16 sweeping elbows or in junction boxes. Install stranded copper feeder conductors from the  
17 service disconnect to the new cabinet or equipment cabinet disconnect sized as shown in the  
18 Plans.

19 **(C) 10KVA Single Phase General Purpose Transformer**

20 As shown on the Plans, furnish and install a single phase general purpose transformer in a  
21 NEMA 3R enclosure. Route the conductors from the transformer secondary to the DMS  
22 equipment cabinet or equipment cabinet disconnect in rigid galvanized conduit. Bond the  
23 equipment cabinet disconnect in accordance with the NEC. Provide all mounting hardware  
24 and other parts and labor necessary to successfully install the transformer.

25 **(D) Equipment Cabinet Disconnect**

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

33 **(E) 3-Wire Copper Service Entrance Conductors**

34 At locations shown in the Plans, furnish and install 3-wire THWN stranded copper service  
35 entrance conductors in 1.25 inch rigid galvanized risers as shown in the plans. Install a  
36 waterproof hub on top of the electrical service disconnect for riser entrance/exit. Size the  
37 conductors as specified in the Plans. Comply with the *Standard Specifications* and Standard  
38 Drawings and all applicable electrical codes.

1 **(F) 4-Wire Copper Feeder Conductors**

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

6 **(G) 3-Wire Copper Feeder Conductors**

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

11 **(H) Grounding System**

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

16 Submit to the Engineer a completed Inductive Loop & Grounding Test Form available on the  
17 Department's website at:

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

19 **11.4. MEASUREMENT AND PAYMENT**

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

26 *Modify existing electrical service equipment* will be measured and paid as the actual number of  
27 complete and functional modified existing electrical service equipment furnished, installed and  
28 accepted. New electrical service disconnect, breakers, lightning arresters, new conduit between the  
29 meter base and new service disconnect, new stranded copper conductors between the meter base and  
30 new service disconnect, above ground rigid galvanized steel conduit from the new service disconnect  
31 to below ground, and any remaining hardware and conduit bodies to modify the existing service are  
32 considered incidental to modifying existing electrical service equipment.

33 *10KVA Transformer* will be measured and paid in actual number of complete and functional 10KVA  
34 transformers furnished, installed and accepted. Enclosures, mounting hardware, pre-formed pad, and  
35 any remaining hardware, fittings, and conduit bodies to connect the isolation transformer will be  
36 considered incidental to the 10KVA transformer and will be considered incidental to the 10KVA  
37 transformer.

38 *Equipment cabinet disconnect* will be measured and paid as the actual number of complete and  
39 functional equipment cabinet disconnects furnished, installed and accepted. Breakers, exposed  
40 vertical conduit runs to the cabinet and any remaining hardware and conduit to connect the

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1 equipment cabinet disconnect to the cabinet will be considered incidental to the equipment cabinet  
 2 subpanel.

3 *3-Wire copper service entrance conductors* will be measured and paid as the actual linear feet of  
 4 3-wire, #3 gauge stranded copper service entrance conductors with THWN rating furnished, installed  
 5 and accepted. Payment is for all three conductors. Measurement will be for the actual linear footage  
 6 of combined conductors after all terminations are complete. No separate payment will be made for  
 7 each individual conductor.

8 *4-Wire copper feeder conductors* will be measured and paid as the actual linear feet of 4-wire  
 9 THWN stranded copper feeder conductors furnished, installed and accepted. Payment is for all four  
 10 conductors. Measurement will be for the actual linear footage of combined conductors after all  
 11 terminations are complete. No separate payment will be made for each individual conductor. No  
 12 separate payment will be made for different wire sizes. No payment will be made for excess wire in  
 13 the cabinets.

14 *3-Wire copper feeder conductors* will be measured and paid as the actual linear feet of 3-wire  
 15 THWN stranded copper feeder conductors furnished, installed and accepted. Payment is for all three  
 16 conductors. Measurement will be for the actual linear footage of combined conductors after all  
 17 terminations are complete. No separate payment will be made for each individual conductor. No  
 18 separate payment will be made for different wire sizes. No payment will be made for excess wire  
 19 in the cabinets.

20 *5/8" X 10' grounding electrode* (ground rod) will be measured and paid as the actual number of 5/8"  
 21 copper clad steel ground rods furnished, installed and accepted. No separate payment will be made  
 22 for exothermic welding kit as they will be considered incidental to the installation of the ground rod.

23 *#4 solid bare grounding conductor* will be measured and paid as the actual linear feet of #4 AWG  
 24 solid bare copper grounding conductor furnished, installed and accepted. Measurement will be  
 25 along the approximate centerline from the base of the electrical service disconnect to the last  
 26 grounding electrode.

27 Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Meter Base/Disconnect Combination Panel (Pole Mount).....	Each
Meter Base/Disconnect Combination Panel (Pedestal Mount).....	Each
Modify Existing Electrical Service Equipment .....	Each
10KVA Single Phase Transformer .....	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





- 1 • Shutter: .....Electronic shutter with manual
- 2 control from 1/2 of a second to
- 3 1/30,000th of a second,
- 4 • Overexposure protection: .....The camera must have built-in
- 5 circuitry or a protection device to
- 6 prevent any damage to the camera
- 7 when pointed at strong light sources,
- 8 including the sun,
- 9 • Sensitivity: .....0.6 lux at 90% scene reflectance
- 10 • Input/Output Connection: .....Single 10BASE-T/100BASE-T
- 11 compatible outdoor-rated Cat5e
- 12 cable for video, control, and Power
- 13 over Ethernet; IP66-rated RJ45
- 14 connector,
- 15 • Power: .....High Power over Ethernet (High
- 16 PoE), 74W max

**(2) Zoom Lens**

18 Furnish each camera with a motorized zoom lens that is integrated in a high performance  
19 dome system, or approved equivalent, with automatic iris control and manual override.  
20 Furnish lenses that meet the following optical specifications:

- 21 • Aperture .....f/1.6 – f/2.9,
- 22 • Focal length:.....4.45 mm (wide) and 89 mm (tele.),
- 23 minimum,
- 24 • Horizontal viewing angle:.....55.4° (wide) and 2.9° (tele),
- 25 minimum,
- 26 • Zoom .....30X optical, 12X digital, minimum
- 27 • Preset positioning:.....64 Presets, minimum.

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

**(C) Camera Housing**

34 Furnish new dome style enclosure for the CCTV assemblies. Equip each housing with a  
35 mounting assembly for attachment to the CCTV lowering system. The enclosures must be  
36 equipped with a sunshield and a strip heater, and be fabricated from corrosion resistant  
37 aluminum and finished in a neutral color of weather resistant enamel. The enclosure must  
38



1 **(F) Ethernet Cable**

2 Provide, at a minimum, Category 5 Enhanced (5e) Ethernet cable that complies with  
3 ANSI/TIA-568-B-5 standards for four-pair shielded twisted copper for Ethernet  
4 communications. The cable shall meet all of the mechanical requirements of ANSI/ECEA S-  
5 80-576. The Ethernet cable must be rated for medium-power, network-powered broadband  
6 communications circuits and must be Type BMU network-powered broadband  
7 communications medium-power cable.

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

12 **(G) Surge Suppression**

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

14 **12.3. CONSTRUCTION METHODS**

15 **(A) General**

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

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

20 **(B) Electrical and Mechanical Requirements**

21 Install Power over Ethernet (PoE) injector in CCTV equipment cabinet, and run an outdoor-  
22 rated Cat5e Ethernet cable up the interior of the steel pole to the CCTV assembly. Take all  
23 precautions necessary to ensure the Ethernet cable is not damaged during storage and  
24 installation. Do not step on the cable nor run over the cable with vehicles or equipment. Do  
25 not pull the cable over or around obstructions or along the ground. Install the cables according  
26 to the latest version of the manufacturer's cable installation procedures and the industry-  
27 accepted installation standards, codes, and practices, or as directed by the Engineer.

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

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

33 Furnish all tools, equipment, materials, supplies, and hardware necessary to install a fully  
34 operational CCTV camera system as depicted in the plans.

35 **12.4. MEASUREMENT AND PAYMENT**

36 *CCTV camera assembly* will be measured and paid as the actual number of CCTV assemblies  
37 furnished, installed, integrated, and accepted. No separate measurement will be made for Ethernet  
38 cables, connectors, CCTV camera attachment assemblies, conduit, condulets, risers, grounding

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1 equipment, surge protectors, CCTV control software, Power over Ethernet (PoE) injectors, or any  
2 other equipment or labor required to install the CCTV assembly.

3 *Furnish CCTV camera assembly* will be measured and paid as the actual number of CCTV  
4 assemblies furnished and accepted. No separate measurement will be made for Ethernet cables,  
5 connectors, CCTV camera attachment assemblies, surge protectors, Power over Ethernet (PoE)  
6 injectors, or any other equipment that is an integral part of the CCTV camera assembly.

7 Payment will be made under:

8	<b>Pay Item</b>	<b>Pay Unit</b>
9	CCTV Camera Assembly .....	Each
10	Furnish CCTV Camera Assembly .....	Each

1 **13. CCTV FIELD EQUIPMENT CABINET**

2 **13.1. DESCRIPTION**

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

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

9 The cabinet cage must conform to section 6.3 of the CALTRANS TSCES.

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

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

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

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

21 **13.2. MATERIALS**

22 **(A) Shelf Drawer**

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

29 **(B) Cabinet Light**

30 Furnish two (2) fluorescent lighting fixtures in each cabinet (one front, one back) mounted  
31 horizontally inside the top portion of the cabinet. Install 16 watt T-4 cool white lamps in the  
32 fluorescent fixtures. Provide a protective diffuser to cover exposed bulbs. The fixtures must  
33 be operated by normal power factor UL-listed ballast. Ensure that the fixtures illuminate all  
34 terminals, labels, and devices in the cabinet. Conveniently locate the fixtures so as not to  
35 interfere with a technician's ability to perform work on any devices or terminals in the cabinet.  
36 The lights must be mounted so as to not interfere with the upper door stay. Provide a front and  
37 rear door switch to provide power to each fixture when the respective door is open. Wire the  
38 fluorescent fixtures to the 15 amp ECB (equipment circuit breaker).

1 **(C) Surge Protection for System Equipment**

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

4 **(1) Main AC Power Input**

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

- 11 • Maximum AC line voltage: 140 VAC,
- 12 • Twenty pulses of peak current, each of which must rise in 8 microseconds and  
13 fall in 20 microseconds to ½ the peak: 20000 Amperes,
- 14 • The protector must be provided with the following terminals:
  - 15 – Main Line (AC Line first stage terminal),
  - 16 – Main Neutral (AC Neutral input terminal),
  - 17 – Equipment Line Out (AC line second state output terminal, 19 amps),
  - 18 – Equipment Neutral Out (Neutral terminal to protected equipment),
  - 19 – GND (Earth connection),
- 20 • The Main AC line in and the Equipment Line out terminals must be separated  
21 by a 200 Microhenry (minimum) inductor rated to handle 10 AMP AC  
22 Service,
- 23 • The first stage clamp must be between Main Line and Ground terminals,
- 24 • The second stage clamp must be between Equipment Line Out and Equipment  
25 Neutral,
- 26 • The protector for the first and second stage clamp must have an MOV or  
27 similar solid state device rated at 20 KA and must be of a completely solid  
28 state design (i.e., no gas discharge tubes allowed),
- 29 • The Main Neutral and Equipment Neutral Out must be connected together  
30 internally and must have an MOV similar solid state device or gas discharge  
31 tube rated at 20 KA between Main Neutral and Ground terminals,
- 32 • Peak Clamp Voltage: 350 volts at 20 KA. (Voltage measured between  
33 Equipment Line Out and Equipment Neutral Out terminals. Current applied  
34 between Main Line and Ground Terminals with Ground and Main Neutral  
35 terminals externally tied together),
- 36 • Voltage must never exceed 350 volts,
- 37 • The Protector must be epoxy-encapsulated in a flame-retardant material,

- 1 • Continuous service current: 10 Amps at 120 VAC RMS,
- 2 • The Equipment Line Out must provide power to cabinet CCTV and
- 3 communications equipment and to the 24V power supply.

4 **(2) Ground Bus**

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

9 **(3) Uninterruptible Power Supply (UPS)**

10 Within each CCTV field equipment cabinet to be powered by the Duke Energy system,  
11 furnish and install one rack mounted UPS that meets the following minimum  
12 specifications:

13 **Output**

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

22 **Input**

- 23 • Nominal Input Voltage .....120V,
- 24 • Input Frequency .....50/60 Hz +/- 3 Hz (auto sensing),
- 25 • Input Connections .....NEMA 5-15P,
- 26 • Cord Length .....6 feet,
- 27 • Input voltage range for
- 28 main operations .....82 - 144V,
- 29 • Input voltage adjustable range for
- 30 main operation .....75 -154 V,

31 **Battery Type**

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

- 33 • Typical recharge time .....2 hours,



1 **Communications & Management**

- 2 • Interface Port(s) .....DB-9 RS-232, USB,
- 3 • Control panel.....LED status display with
- 4 load and battery bar-graphs,

5 **Surge Protection and Filtering**

- 6 • Surge energy rating .....480 Joules,

7 **Environmental**

- 8 • Operating Environment.....32 - 104° F,
- 9 • Operating Relative Humidity .....0 - 95%,
- 10 • Storage Temperature .....5 - 113° F,
- 11 • Storage Relative Humidity .....0 - 95%,

12 **Conformance**

- 13 • Regulatory Approvals .....FCC Part 15 Class A,UL 1778.

14 **13.3. CONSTRUCTION METHODS**

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

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

21 Install a level concrete technician pad measuring a minimum 4 inches thick, 24 inches wide and 36  
22 inches long at the front door of the CCTV equipment cabinet as shown on the Typical Details sheet  
23 within the plans.

24 **13.4. MEASUREMENT AND PAYMENT**

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

27 No separate payment will be made for the UPS, cabling, connectors, cabinet attachment assemblies,  
28 conduit, condulets, risers, grounding equipment, surge protectors, concrete technician pad or any  
29 other equipment or labor required to install the field equipment cabinet and integrate the cabinets  
30 with the CCTV equipment.

31 Payment will be made under:

32 <b>Pay Item</b>	<b>Pay Unit</b>
33 CCTV Field Equipment Cabinet.....	Each

1                                   **14. CCTV METAL POLES AND LOWERING SYSTEM**

2   **14.1. DESCRIPTION**

3   **(A) CCTV Metal Poles**

4       Furnish and install CCTV metal poles, grounding systems, and all necessary hardware. The  
5       work covered by this special provision includes requirements for the design, fabrication, and  
6       installation of custom designed CCTV metal poles with camera lowering systems for IP  
7       (Internet Protocol) cameras and associated foundations.

8       Provide designs of completed assemblies with hardware that equals or exceeds *AASHTO*  
9       *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic*  
10       *Signals* 5th Edition, 2009, including the latest interim specifications. Provide assemblies with  
11       a round or near-round (18 sides or more) cross-section, or a multi sided cross section with no  
12       less than six sides. The sides may be straight, convex, or concave.

13   **(B) CCTV Camera Lowering System**

14       Provide a CCTV camera lowering system for a digital, IP based camera as an integral part of  
15       the CCTV metal pole. The lowering system will consist of a support arm, camera connection  
16       box, and all necessary cabling and wiring for installation.

17   **(C) Portable CCTV Camera Lowering System**

18       Provide a portable CCTV lowering device to operate the lowering system.

19   **(D) Drilled Pier Foundations**

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

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

24       If the Contractor chooses to design a non-standard foundation for a standard pole and the soil  
25       test results indicate a standard foundation is feasible for the site, the Contractor will be paid the  
26       cost of the standard foundation (drilled pier and wing wall, if applicable). Any additional costs  
27       associated with a non-standard site-specific foundation including additional materials, labor  
28       and equipment will be considered incidental to the cost of the standard foundation. All costs  
29       for the non-standard foundation design will also be considered incidental to the cost of the  
30       standard foundation.

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

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

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

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

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

6 **(1) Soil Test**

7 (a) General

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

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

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

16 (b) Soil Test Procedure

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

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

- 25 - A total of 100 blows have been applied in any 2 consecutive 6-in. intervals,
- 26 - A total of 50 blows have been applied with < 3-in. penetration.

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

33 If the CCTV pole location is located between intersections, provide a coordinate  
34 location and offset, or milepost number and offset. Pole numbers should be made  
35 available to the geotechnical drilling Contractor. Include pole numbers in the boring  
36 label if they are available. If they are not available, ensure the boring labels can be  
37 cross-referenced to corresponding pole numbers or pole locations. For each boring,  
38 submit a legible (hand written or typed) boring log signed and sealed by a licensed  
39 Geologist or Professional Engineer registered in North Carolina. Include on each

1 boring the SPT blow counts and N-values at each depth, depth of the boring, and a  
2 general description of the soil types encountered.

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

6 **(2) Standard Foundation Determination:**

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

$$8 \quad N_{AVG} = \frac{(N@1' + N@2.5' + \dots + N@Deepest \text{ Boring Depth})}{9 \quad \text{Total Number of N-values}}$$

$$10 \quad Y = (N@1')^2 + (N@2.5')^2 + \dots + (N@Deepest \text{ Boring Depth})^2$$

$$11 \quad Z = (N@1' + N@2.5' + \dots + N@Deepest \text{ Boring Depth})$$

$$12 \quad N_{STD \text{ DEV}} = \left( \frac{(Total \text{ Number of N-values} \times Y) - Z^2}{13 \quad (Total \text{ Number of N-values}) \times (Total \text{ Number of N-values} - 1)} \right)^{0.5}$$

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

$$15 \quad N_{AVG} - (N_{STD \text{ DEV}} \times 0.45)$$

16 *Or*

$$17 \quad \text{Average of First Four N-Values} = \frac{(N@1' + N@2.5' + N@5' + N@7.5')}{18 \quad 4}$$

19 *Note: If less than 4 N-values are obtained because of criteria listed in Section 2 above,*  
20 *use average of N-values collected for second condition. Do not include the N-value*  
21 *at the deepest boring depth for above calculations if the boring is discontinued at or*  
22 *before the required boring depth because of criteria listed in Section 2 above. Use*  
23 *N-value of zero for weight of hammer or weight of rod. If N-value is greater than*  
24 *50, reduce N-value to 50 for calculations.*

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

28 If one of the following occurs, the Standard Foundations Chart shown on the plans may  
29 not be used and a non-standard foundation may be required. In such case, contact the  
30 Engineer.

- 31 • The Design N-value is less than 4,
- 32 • The drilled pier length, "L", determined from the Standard Foundations Chart,  
33 is greater than the depth of the corresponding boring.

34 In the case where a standard foundation cannot be used, the Department will be  
35 responsible for the additional cost of the non-standard foundation.

36 Foundation designs are based on level ground around the traffic signal pole. If the slope  
37 around the edge of the drilled pier is steeper than 8:1 (H:V) or the proposed foundation  
38

1 will be less than 10 feet from the top of an embankment slope, the Contractor is  
2 responsible for providing slope information to the foundation designer and to the  
3 Engineer so it can be considered in the design.

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

5 [https://connect.ncdot.gov/resources/Geological/Geotech%20Forms/2012 METAL%20P](https://connect.ncdot.gov/resources/Geological/Geotech%20Forms/2012_METAL%20P)  
6 [OLES%20-%20Standard%20Foundation%20Selection.pdf](https://connect.ncdot.gov/resources/Geological/Geotech%20Forms/2012_METAL%20P)

7 If assistance is needed, contact the Engineer.

8 **(3) Non-Standard Foundation Design:**

9 Design non-standard foundations based upon site-specific soil test information collected  
10 in accordance with sub-section (1) Soil Test above. Design drilled piers for side  
11 resistance only in accordance with Section 4.6 of the *AASHTO Standard Specifications*  
12 *for Highway Bridges*. Use the computer software LPILE version 5.0 or later  
13 manufactured by Ensoft, Inc. to analyze drilled piers. Use the computer software gINT  
14 version 8.0 or later manufactured by Bentley Systems, Inc. with the current NCDOT  
15 gINT library and data template to produce SPT boring logs. Provide a drilled pier  
16 foundation for each pole with a length and diameter that result in a horizontal lateral  
17 movement of less than 1 inch at the top of the pier and a horizontal rotational movement  
18 of less than 1 inch at the edge of the pier. Submit any non-standard foundation designs  
19 including drawings, calculations, and soil boring logs to the Engineer for review and  
20 approval before construction. Foundations installed without prior approval may be  
21 rejected.

22 **14.2. MATERIALS**

23 **(A) CCTV Metal Poles**

24 Furnish CCTV poles that are 50 feet tall as indicated in the plans.

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

31 Ensure that allowable pole deflection does not exceed that allowed per *AASHTO Standard*  
32 *Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals*, 5th  
33 Edition, 2009, including the latest interim specifications. Ensure that maximum deflection at  
34 the top of the pole does not exceed 2.5 percent of the pole height at the maximum wind speed  
35 as prescribed for the project area.

36 Use the submerged arc process or other NCDOT previously approved process suitable for  
37 poles to continuously weld pole shafts along their entire length. The longitudinal seam weld  
38 will be finished flush to the outside contour of the base metal. Ensure shafts have no  
39 circumferential welds except at the lower end joining the shaft to the pole base. In the event  
40 that a circumferential weld is necessary, prior approval is required from the Engineer and

- 1 NCDOT Materials and Test Unit. Provide welding that conforms to Article 1072-20 of the  
2 *Standard Specifications*, except that no field welding on any part of the pole will be permitted  
3 unless approved by a qualified engineer.
- 4 Refer to Metal Pole Standard Drawing Sheets M2 through M5 for fabrication details. Fabricate  
5 anchor bases from plate steel meeting, as a minimum, the requirements of ASTM A 36M or  
6 cast steel meeting the requirements of ASTM A 27M Grade 485-250, AASHTO M270 Gr 36  
7 or an approved equivalent. Conform to the applicable bolt pattern and orientation as shown on  
8 Metal Pole Standard Drawing Sheet M2.
- 9 Ensure all hardware is galvanized steel or stainless steel. The Contractor is responsible for  
10 ensuring that the designer/fabricator specifies connecting hardware and/or materials that do not  
11 create a dissimilar metal corrosive reaction.
- 12 Unless otherwise required by the design, ensure each anchor rod is 2" diameter and 60" length.  
13 Provide 10" minimum thread projection at the top of the rod, and 8" minimum at the bottom of  
14 the rod. Use anchor rod assembly and drilled pier foundation materials that meet the  
15 Foundations and Anchor Rod Assemblies for Metal Poles provision.
- 16 For each structural bolt and other steel hardware, hot dip galvanizing shall conform to the  
17 requirements of AASHTO M 232 (ASTM A 153). Ensure end caps for poles are constructed of  
18 cast aluminum conforming to Aluminum Alloy 356.0F.
- 19 Provide a circular anchor bolt lock plate that will be secured to the anchor bolts at the  
20 embedded end with 2 washers and 2 nuts. Provide a base plate template that matches the bolt  
21 circle diameter of the anchor bolt lock plate. Construct plates and templates from ¼" minimum  
22 thick steel with a minimum width of 4". Galvanizing is not required.
- 23 Provide 4 heavy hex nuts and 4 flat washers for each anchor bolt. For nuts, use AASHTO  
24 M291 grade 2H, DH, or DH3 or equivalent material. For flat washers, use AASHTO M293 or  
25 equivalent material.
- 26 Provide a 2 inch hole equipped with an associated coupling and conduit fittings/bodies  
27 approximately 18 inches above the base of the pole accommodate passage of CCTV cables  
28 from the CCTV cabinet to the inside of the pole. Refer to Metal Pole Standard Drawing Sheet  
29 M3 for fabrication details.
- 30 **Provide a hand hole access with a watertight cover at a 42" height above the base of the**  
31 **pole** and of the type and size required by the manufacture of the internal CCTV Camera  
32 Lowering System to ensure smooth and efficient operation of the camera lowering system.
- 33 Have poles permanently stamped above the base hand hole with the identification tag details as  
34 shown on Metal Pole Standard Drawing Sheet M2.
- 35 For each pole, provide a 1/2 inch minimum thread diameter, coarse thread stud and nut for  
36 grounding which will accommodate #4 AWG ground wire. Ensure that the lug is electrically  
37 bonded to the pole and is conveniently located inside the pole at the hand hole.
- 38 Provide a removable pole cap with stainless steel attachment screws for the top of each pole.  
39 Ensure that the cap is cast aluminum conforming to Aluminum Association Alloy 356.0F.  
40 Furnish cap attached to the pole with a sturdy chain or cable approved by the Engineer. Ensure

1 that the chain or cable is long enough to permit the cap to hang clear of the pole-top opening  
2 when the cap is removed.

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

- 10       ▪ Repair of Galvanizing.....Article 1076-6

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

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

14 Comply with article 1098-1B "General Requirements" of the *Standard Specifications* for  
15 submittal requirements. Furnish shop drawings for approval. Provide the copies of detailed  
16 shop drawings for each type of structure as summarized below. Ensure that shop drawings  
17 include material specifications for each component and identify welds by type and size on the  
18 drawing details, not in table format. Do not release structures for fabrication until shop  
19 drawings have been approved by NCDOT. Provide an itemized bill of materials for all  
20 structural components and associated connecting hardware on the drawings.

21 Comply with article 1098-1A "General Requirements" of the *Standard Specifications* for  
22 Qualified Products List (QPL) submittals. All shop drawings must include project location  
23 description, CCTV inventory number(s), and a project number or work order number on the  
24 drawings.

25 Summary of information required for metal pole review submittal:

Item	Hardcopy Submittal	Electronic Submittal	Comments / Special Instructions
Sealed, Approved ITS Plan/Loading Diagram	1	1	All structure design information needs to reflect the latest approved ITS plans.
Custom Pole Shop Drawings	4 sets	1 set	Submit drawings on 11" x 17" format media. Show NCDOT project number and CCTV camera number in or above the title block.
Standard Pole Shop Drawings (from the QPL)	4 sets	1 set	Submit drawings on 11" x 17" format media. Show NCDOT project number and CCTV camera number in or above the title block.
Structure Calculations	1 set	1 set	Submit calculations on 8 ½" x 11" format media. Show NCDOT project number and CCTV camera number in the upper right corner of each page.

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Standard Pole Foundation Drawings	1 set	1 set	Submit drawings on 11" x 17" format media. Submit a completed Standard Foundation Selection form for each pole using foundation table on Metal Pole Drawing M-8.
Custom Foundation Drawings	4 sets	1 set	Submit drawings on 11" x 17" format media. Show NCDOT project number and CCTV camera number in or above the title block.
Foundation Calculations	1	1	Submit calculations on 8 1/2" x 11" format media. Show NCDOT project number and CCTV camera number in the upper right corner of each page.
Soil Boring Logs and Report	1	1	Report should include a location plan and a soil classification report including soil capacity, water level, hammer efficiency, soil bearing pressure, soil density, etc. for each pole.

1  
2 **NOTE** – All shop drawings and custom foundation design drawings must be sealed by a  
3 professional Engineer licensed in the state of North Carolina. All geotechnical information  
4 must be sealed by either a Professional Engineer or geologist licensed in the state of North  
5 Carolina. Include a title block and revision block on the shop drawings and foundation designs  
6 showing the NCDOT inventory number.

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

#### 11 (B) **CCTV Camera Lowering System**

12 Provide a CCTV camera lowering system as an integral part of the CCTV metal pole. The  
13 lowering system will consist of a support arm, camera connection box, and all necessary  
14 cabling and wiring for installation of a digital, IP (Internet Protocol) based camera.

15 Ensure that the lowering device provides the electrical connections between the control cabinet  
16 and the equipment installed on the lowering device without reducing the function or  
17 effectiveness of the equipment installed on the lowering device or degrading the overall system  
18 in any way.

19 Locate the stainless steel lowering cable inside conduit within the pole to avoid cable twisting  
20 and ensure that only the lowering cable is in motion inside the pole when the lowering device  
21 is operated. The cost to furnish and install this conduit is included in the cost of the pole with  
22 lowering device. Ensure that all other cables remain stable and secure during lowering and  
23 raising operations.

24 Provide the lowering device with a disconnect unit for electrically connecting the equipment  
25 installed on the lowering device's equipment connection box to the power, data, and video



1 cables (as applicable); a divided support arm, and a pole adapter for the assembly's attachment  
2 to the pole.

3 All of the lowering device's external components must be made of corrosion-resistant  
4 materials that are powder-coated, galvanized, or otherwise protected from the environment by  
5 industry-accepted coatings that withstand exposure to a corrosive environment.

6 Ensure that the disconnect unit has a minimum load capacity of 200 pounds with a 4:1 safety  
7 factor. Fixed and movable components of the disconnect unit must have a locking mechanism  
8 between them. Provide a minimum of two mechanical latches for the movable assembly and,  
9 when latched, ensure that all weight is removed from the lowering cable. Provide fixed unit  
10 with a heavy-duty cast tracking guide and a means to allow latching in the same position each  
11 time.

12 Provide a disconnect unit that securely holds the lowering device and the equipment installed  
13 on the lowering device. The interface and locking components must be stainless steel or  
14 aluminum.

15 The lowering cable shall be a minimum diameter of 0.125 inch and constructed of 7 strands, 19  
16 gauge, stainless steel aircraft cable with a minimum breaking strength of 1,740 pounds. The  
17 contractor shall ensure that the prefabricated components for the lift unit support system  
18 preclude the lifting cable from contacting the power or video cables.

19 Provide a connector block as specified by the manufacturer or with the lowering device. The  
20 connector block shall be equipped with modular, self-aligning and self-adjusting female and  
21 male socket contact halves. The lowering device must be equipped with enough contacts to  
22 permit operation of all required functions of the camera. The lowering device connections  
23 must carry the signals, voltages, and current required by the device(s) connected to them under  
24 full load conditions. Submit documentation to the Engineer showing pin assignment.

25 The female socket contacts and the male contact halves must be of heavy-duty construction  
26 and the connector blocks made of molded synthetic rubber, molded chlorosulfonated  
27 polyethylene, polymer body or approved equal. The connector pins shall be made of brass or  
28 gold-plated nickel, or gold-plated copper. The current-carrying male and female contacts shall  
29 have a minimum diameter of 0.09 inch.

30 Provide cored holes in the rubber to create moisture-tight seals when mated with the male  
31 connector. All wire leads from both the male and female contacts shall be permanently molded  
32 in a body of chlorosulfonated polyethylene, or an approved equal. All current-carrying wires  
33 and signal wires shall be minimum #18 AWG stranded copper cable.

34 All contacts shall be self-wiping with a shoulder at the base of each male contact so that it is  
35 recesses in the female block, thereby giving each contact a rain-tight seal when mated.

36 **(C) Portable CCTV Camera Lowering Device**

37 Provide a portable CCTV lowering device to operate the lowering system. Provide a metal-  
38 frame lowering tool with winch assembly and a cable with a combined weight less than 35  
39 pounds; a quick release cable connector, and an adjustable safety clutch. The lowering tool  
40 shall be powered using a half-inch chuck, variable-speed reversible industrial-duty electric drill

1 to match the manufacturer-recommended revolutions per minute, or be supplied with a drill  
2 motor for the lowering tool.

3 The lowering tool shall support itself and the load. The lowering tool shall be equipped with a  
4 positive braking mechanism to secure the cable reel during raising and lowering operations,  
5 and to prevent freewheeling.

6 The lowering tool shall be equipped with gearing that reduces the manual effort required to  
7 operate the lifting handle to raise and lower a capacity load. It shall be provided with an  
8 adapter for operating the lowering device with the portable half-inch chuck drill using a clutch  
9 mechanism.

10 All lowering equipment, lowering device, pulleys, cables, etc. must be made of durable,  
11 corrosion resistant materials, powder coated, galvanized, or otherwise protected from the  
12 environment by industry-accepted coatings to withstand exposure to corrosive environment.

### 13 **14.3. CONSTRUCTION METHODS**

#### 14 **(A) CCTV Metal Poles**

15 Install anchor rod assemblies in accordance with the *Foundations and Anchor Rod Assemblies*  
16 *for Metal Poles* provision (SP09-R005) located on the Department's 2012 Standard  
17 Specifications and Provisions website:

18 <https://connect.ncdot.gov/resources/Specifications/Pages/Specifications-and-Special-Provisions.aspx>

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

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

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

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

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

32 Perform repair of damaged galvanizing that complies with the *Standard Specifications*, Article  
33 1076-6 "Repair of Galvanizing."

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

36 Install a 1/4" thick plate for concrete foundation tag to include: concrete grade, depth, diameter,  
37 and reinforcement sizes of the installed foundation.

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

3 **(B) CCTV Camera Lowering System**

4 Weights and/or counterweights shall be provided to assure the alignment for the camera  
5 connection can be raised into position without binding and that it can be lowered properly,  
6 unless otherwise approved by the Engineer. Ensure that the divided support arm and receiver  
7 brackets self-align the contact unit with the pole centerline during installation and that the  
8 contact unit cannot twist when subjected to the wind speed requirement as specified by the  
9 *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and*  
10 *Traffic Signals*, 5th Edition, 2009, including the latest interim specifications. Supply internal  
11 conduit in the pole for the power and video cabling. The cost to furnish and install this conduit  
12 shall be included in the cost of the CCTV pole.

13 All pulleys installed for the lowering device and portable lowering tool must have sealed self-  
14 lubricated bearings, oil-tight bronze bearings, or sintered bronze bushings.

15 Provide 1.25-inch-diameter PVC conduit in the pole for the lowering cable. The contractor  
16 shall verify that a conduit mount adapter is furnished for the interface between the conduit and  
17 the internal back side of the lowering device. The cost to furnish and install this conduit shall  
18 be included in the cost of the CCTV pole.

19 **(C) Drilled Pier Foundations**

20 Construct drilled pier foundations in accordance with the *Foundations and Anchor Rod*  
21 *Assemblies for Metal Poles* provision.

22 **14.4. MEASUREMENT AND PAYMENT**

23 *CCTV metal poles* will be measured and paid as the actual number of CCTV metal poles furnished,  
24 installed and accepted.

25 *CCTV camera lowering system* will be measured and paid as the actual number of CCTV camera  
26 lowering systems furnished, installed and accepted.

27 *Portable CCTV camera lowering tool* will be measured and paid as the actual number of portable  
28 CCTV camera lowering tools furnished and accepted.

29 *Soil test* will be measured and paid as the actual number of Soil Tests with SPT borings drilled  
30 furnished and accepted.

31 *Drilled pier foundation* will be measured and paid as the actual volume of concrete poured in cubic  
32 yards of Drilled Pier Foundation furnished, installed and accepted.

33 No measurement will be made for CCTV Metal Pole designs and foundation designs, as these will  
34 be considered incidental to CCTV Metal Poles and Drilled Pier Foundations.

35 No measurement will be made for conduits inside the CCTV Pole for the lowering device cables,  
36 data cables, and power cables, as these will be considered incidental to CCTV Metal Poles.

37

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1 Payment will be made under:

2	<b>Pay Item</b>	<b>Pay Unit</b>
3	CCTV Metal Pole .....	Each
4	CCTV Camera Lowering System .....	Each
5	Portable CCTV Camera Lowering Tool .....	Each
6	Soil Test .....	Each
7	Drilled Pier Foundation.....	Cubic Yard

1 **15. DYNAMIC MESSAGE SIGN (DMS)**

2 **15.1. DESCRIPTION**

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

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

9 Add and configure the new DMS into the existing DMS database at the MRTMC using the Control  
10 Software and computer system. Furnish, install, test, integrate and make fully operational the new  
11 DMS at the location shown in the Plans.

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

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

- 14 ○ Walk-In Enclosure DMS,  
15 ○ Full Matrix, 27 pixel high and 90 pixels wide LED,  
16 ○ DMS mounting hardware,  
17 ○ DMS controllers, uninterruptible power supplies (UPS), cabinets and accessories with  
18 interconnect and power cabling and conduit,  
19 ○ Branch circuit conductors and related equipment,  
20 ○ All other equipment and incidentals required for furnishing, installing, and testing the DMS  
21 system and system components.

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

23 **15.2. MATERIALS**

24 **(A) Environmental Requirements**

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

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

29 **(B) Full Matrix LED Dynamic Message Sign (DMS)**

30 Construct the DMS to display at least three lines of text that, when installed, are clearly visible  
31 and legible to a person with 20/20 corrected vision from a distance of 900 feet in advance of  
32 the DMS at an eye height of 3.5 feet along the axis.

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

1 27 pixels high and 90 pixels wide, with an 18” border surrounding the display between the  
2 outer edge of the pixel matrix and the outer edge of the enclosure.

3 **(1) DMS Enclosure**

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

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

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

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

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

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

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

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

35 **(2) DMS Interior Environment Control**

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

40 (a) Internal Temperature Sensors

1 Provide the DMS with two internally mounted temperature sensors which are  
2 equipped with external thermocouples and which the field controller continuously  
3 monitors. Design the field controller to use this temperature information to  
4 determine when to activate and deactivate the environmental control systems  
5 described herein. Locate sensors on opposite ends of the upper 1/3 of the LED  
6 display matrix with their external thermocouples attached to and making contact  
7 with an LED pixel circuit board. Design the thermocouple and LED board to be  
8 easily detachable, in the event that one of the units requires removal and  
9 replacement. Provide sensors capable of measuring temperatures from -40° F to  
10 +185° F. Design the field controller to automatically shut down the LED display  
11 whenever one or both sensors indicates that LED board temperature has exceeded  
12 +140° F, and to automatically restart the LED display whenever the temperature  
13 falls below +130° F. Design both shutdown and re-start temperature thresholds to  
14 be user-programmable. Design the field controller to report sensor temperatures  
15 and DMS shutdown/re-start events to the DMS Control Software.

16 (b) Housing Cooling System

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

39 (c) LED Display Cooling System

40 Provide the DMS with an LED display cooling system which directs air across the  
41 LED display modules whenever LED board temperature exceeds a user-  
42 programmable threshold. Direct fan-forced air vertically across the backside of the  
43 entire LED display matrix using multiple ball-bearing fans. Program the field

1 controller to activate the LED cooling fan system whenever LED board temperature  
2 exceeds +90° F and to deactivate the system whenever LED board temperature falls  
3 to +85° F. Locate cooling fans so as not to hinder removal of LED display modules  
4 and driver boards.

5 (d) Front Face Panel Defog/Defrost System

6 Provide the DMS with a defog/defrost system which circulates warm, fan-forced air  
7 across the inside of the polycarbonate front face whenever LED board temperature  
8 falls below a user-programmable threshold. Provide multiple steel ball-bearing fans  
9 that provide uniform airflow across the face panel. Program the field controller to  
10 activate the defog/defrost system whenever LED board temperature falls below  
11 +40° F and to deactivate the defog/defrost system whenever LED board  
12 temperature exceeds +106° F. Mount a 100-watt pencil-style heating element in  
13 front of each defog/defrost fan to warm the air directed across the DMS face.  
14 Design heating elements to be on only when the defog/defrost fans are on.

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

18 (3) **Front Panel**

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

22 Furnish polycarbonate panels with the following characteristics:

- 23 • Tensile Strength, Ultimate: .....10,000 PSI,
- 24 • Tensile Strength, Yield: .....9,300 PSI,
- 25 • Tensile Strain at Break:.....125%,
- 26 • Tensile Modulus: .....330,000 PSI,
- 27 • Flexural Modulus:.....330,000 PSI,
- 28 • Impact Strength, Izod (1/8", notched): ....17 ft-lbs/inch of notch,
- 29 • Rockwell Hardness: .....M75, R118,
- 30 • Heat Deflection Temperature
- 31 Under Load: .....264 PSI at 270°F
- 32 and 66 PSI at 288°F,
- 33 • Coefficient of Thermal Expansion:.....3.9X10-5 in/in/°F,
- 34 • Specific Heat: .....0.30 BTU/lb/°F,
- 35 • Initial Light Transmittance: .....85% minimum,



- 1                   • Change in Light Transmittance,
- 2                   3 years exposure in a Southern
- 3                   latitude: .....3%,
- 4                   • Change in Yellowness Index,
- 5                   3 years exposure in a Southern
- 6                   latitude: .....less than 5%.

7 For substitutes, submit one 12” x 12” sample of the proposed material together with a  
 8 description of the material attributes to the Engineer for review and approval. Install a  
 9 .09” aluminum mask on the front of the panel (facing the motorists) that contains a  
 10 circular opening for each LED pixel. Prime and coat the front side of the aluminum  
 11 mask, which faces the viewing motorists, with automotive-grade flat black acrylic enamel  
 12 paint or an approved equivalent. Guarantee all painted surfaces provide a minimum  
 13 outdoor service life of 20 years.

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

20 **(4) Display Modules**

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

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

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

- 32                   • All upper and lower case letters,
- 33                   • All punctuation marks,
- 34                   • All numerals 0 to 9,
- 35                   • Special user-created characters.

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

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

1           **(5) Discrete LEDs**

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

6           Provide LEDs that are untinted, non-diffused, high output solid state lamps utilizing  
7           indium gallium aluminum phosphide (InGaAlP) technology. No substitutions will be  
8           allowed. Provide T1 ¾, 0.2 inch size LEDs that emit a true amber color at a wavelength  
9           of  $590 \pm 5$  nm.

10          Provide LEDs with a MTBF (Mean Time Before Failure) of at least 100,000 hours of  
11          permanent use at an operating point of 140° F or below at a specific forward current of  
12          20mA. Discrete LED failure is defined as the point at which the LED's luminous  
13          intensity has degraded to 50% or less of its original level.

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

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

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

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

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

30           **(6) LED Power Supplies**

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

39          Provide power supplies to operate within a minimum input voltage range of +90 to +135  
40          volts AC and within a temperature range of -22° F to 140° F. Power supply output at

1 140° F must not deteriorate to less than 65% of its specified output at 70° F. Provide  
2 power supplies that are overload protected by means of circuit breakers, that have an  
3 efficiency rating of at least 75%, a power factor rating of at least .95, and are UL listed.  
4 Provide all power supplies from the same manufacturer and with the same model number.  
5 Design the power driver circuitry to minimize power consumption.

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

9 **(7) LED Pixels**

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

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

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

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

23 **(8) Character Display**

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

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

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

33 **(9) Display Capabilities**

34 Design the DMS with at least the following message displays:

- 35 • Static display,
- 36 • Flashing display with Dynamic flash rates,
- 37 • At least two alternating Static and / or Flashing sequences (multi page  
38 messages).

1           **(10) DMS Mini Controller**

2           Furnish and install a mini controller inside the DMS that is interconnected with the main  
3           controller using a fiber-optic cable, CAT-5 cable, or an approved alternate. The mini  
4           controller will enable a technician to perform all functions available from the main  
5           controller. Provide the mini controller with an LCD/keypad interface. Size the LCD  
6           display screen to allow preview of an entire one-page message on one screen. Provide a  
7           4 X 4 keypad.

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

11          **(C) DMS Enclosure Structure Mounting**

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

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

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

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

24          Design the DMS structure to conform to the applicable requirements of the *Standard*  
25          *Specifications for Structural Supports for Highway Signs, Luminaires*, and the section titled  
26          “DMS Assemblies” of these Project Special Provisions.

27          **(D) DMS / DMS Controller Interconnect**

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

33          **(E) DMS Controller and DMS Cabinet**

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

39          Provide the DMS controller as a software oriented microprocessor and with resident software  
40          stored in non volatile memory. The Control Software, controller and communications must

1 comply with the NTCIP Standards identified in these Project Special Provisions. Provide  
2 sufficient non-volatile memory to allow storage of at least 500 multi page messages and a test  
3 pattern program.

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

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

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

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

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

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

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

35 Provide a torsionally rigid door with a continuous stainless steel hinge on the side that permits  
36 complete access to the cabinet interior. Provide a gasket as a permanent and weather resistant

- 1 seal at the cabinet door and at the edges of the fan / exhaust openings. Use a non-absorbent  
2 gasket material that will maintain its resiliency after long term exposure to the outdoor  
3 environment. Construct the doors so that they fit firmly and evenly against the gasket material  
4 when closed. Provide the cabinet door with louvered vents and air filters near the bottom as  
5 described in the paragraph above.
- 6 The cabinet shall contain a full-height standard EIA 19-inch rack. The rack shall be secured  
7 within the cabinet by mounts at the top and bottom.
- 8 The rack shall contain a minimum of one (1) pullout drawer. The drawer shall be suitable for  
9 storing manuals and small tools, such as screwdrivers. The drawer shall be able to latch in the  
10 out position to function as a laptop/utility shelf.
- 11 Provide a convenient location on the inside of the door to store the cabinet wiring diagrams and  
12 other related cabinet drawings. Provide a Corbin #2 main door lock made of non ferrous or  
13 stainless steel material. Key all locks on the project alike, and provide 10 keys to the Engineer.  
14 In addition, design the handle to permit pad-locking.
- 15 Provide the interior of the cabinet with ample space for housing the controller and all  
16 associated equipment and wiring; use no more than 75% of the useable space in the cabinet.  
17 Provide ample space in the bottom of the cabinet for the entrance and exit of all power,  
18 communications, and grounding conductors and conduit.
- 19 Arrange the equipment so as to permit easy installation of the cabling through the conduit so  
20 that they will not interfere with the operation, inspection, or maintenance of the unit. Provide  
21 adjustable metal shelves, brackets, or other support for the controller unit and auxiliary  
22 equipment. Leave a 3 inch minimum clearance from the bottom of the cabinet to all  
23 equipment, terminals, and bus bars.
- 24 Provide power supply monitoring circuitry to detect power failure and to automatically report  
25 the occurrence to the Control Software.
- 26 Install two 15 watt fluorescent light strips with shields, one in the top of the cabinet and the  
27 other under the bottom shelf. Design both lights to automatically turn on when the cabinet  
28 door is opened and turn off when the door closes.
- 29 Mount and wire a 120V (+10%) GFCI duplex receptacle of the 3 wire grounding type in the  
30 cabinet in a location that presents no electrical hazard when used by service personnel for the  
31 operation of power tools and work lights.
- 32 No cabinet resident equipment may utilize the GFCI receptacle. Furnish one spare non-GFCI  
33 receptacle for future equipment.
- 34 Mount a bug-proof and weatherproof thermostatically controlled fan and safety shield in the  
35 top of the cabinet. Size the fan to provide at least for two air exchanges per minute. Fuse the  
36 fan at 125% of the capacity of the motor. The magnetic field of the fan motor must not affect  
37 the performance of the control equipment. Use a fan thermostat that is manually adjustable to  
38 turn on between 80° F and 160° F with a differential of not more than 10° F between automatic  
39 turn on and turn off. Mount it in an easily accessible location, but not within 6 inches of the  
40 fan.

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

4 **(1) Wiring**

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

8 Neatly arrange and secure the wiring inside the cabinet. Where cable wires are clamped  
9 to the walls of the control cabinet, provide clamps made of nylon, metal, plastic with  
10 rubber or neoprene protectors, or similar. Lace and jacket all harnesses, or tie them with  
11 nylon tie wraps spaced at 6 inches maximum to prevent separation of the individual  
12 conductors.

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

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

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

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

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

34 Label all equipment and equipment controls clearly.

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

1           **(2) Power Supply and Circuit Protection**

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

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

11          **(3) Circuit Breakers**

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

16          **(4) Surge Suppressor**

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

20          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

21                   \*Capable of handling the continuous current to the equipment

22          **(5) Radio Interference Suppressor**

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



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1 Provide RIS that are hermetically sealed in a substantial metal case which is filled with a  
 2 suitable insulating compound and have nickel plated 10/24 brass stud terminals of  
 3 sufficient external length to provide space to connect #8 AWG wires. Mount them so  
 4 that the studs cannot be turned in the case. Properly insulate ungrounded terminals from  
 5 each other, and maintain a surface linkage distance of not less than ¼” between any  
 6 exposed current conductor and any other metallic parts. The terminals must have an  
 7 insulation factor of 100 200 M , depend  
 8 designed for 120 VAC + 10%, 60Hz, and which meet the standards of UL and the Radio  
 9 Manufacturers Association.

10 **(6) Communications Surge Protector**

11 Equip the cabinet with properly labeled hybrid data line surge protectors that meet the  
 12 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

13 **(7) Lightning Arrester**

14 Protect the system with an UL approved lightning arrester installed at the main service  
 15 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

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Response time to clamp 50,000 amps	25 nanoseconds
Leak current at double the rated voltage	None
Ground Wire	Separate

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**(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 Ratio	@50% Load Up to 4.8:1 @75% Load Up to 3.2:1 @100% Load Up to 2.4:1
Output THD	3% Max. (Linear) 5% Max. (Non-Linear)
Output Overload	110% for 10 min; 200% for 0.05 sec.
Output Dynamic Response	+/- 4% for 100% Step Load Change 0.5 ms Recovery Time.
Output Efficiency @ 100% Load	90% (Normal Mode)
Operating Temperature	-40° F to +165 ° F
Humidity	0% to 95% Non-condensing
Remote Monitoring Interface	RS-232
Protection	Input/Output Short Circuit Input/Output Overload Excessive Battery Discharge

Specifications	UL1778, FCC Class A, IEE 587
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1  
2 Provide the UPS unit capable of supplying 30 minutes of continuous backup power to the  
3 equipment connected to it when the equipment is operating at full load.

4 **(9) Controller Communications Interface**

5 Provide the controller with the following interface ports:

- 6 • An EIA/TIA-232E port for remote communication using NTCIP,
- 7 • An 10/100 Ethernet port for remote communication using NTCIP,
- 8 • An EIA/TIA-232E port for onsite access using a laptop,
- 9 • An EIA/TIA-232E auxiliary port for communication with a field device such  
10 as a UPS,
- 11 • Fiber-optic ports for communication with the sign,
- 12 • RJ45 ports for communication with the sign using CAT-5 cable,
- 13 • RJ45 ports for communication with mini-controller located inside the sign  
14 enclosure.

15 **(10) Controller Local User Interface**

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

- 18 • On / Off Switch: controls power to the controller,
- 19 • Control Mode Switch: for setting the controller operation mode to either  
20 remote or local mode,
- 21 • LCD Display and Keypad: Allow user to navigate through the controller menu  
22 for configuration (display, communications parameter, etc.) running  
23 diagnostics, viewing peripherals status, message creation, message preview,  
24 message activation, and etc. Furnish a LCD display with a minimum size of  
25 240x64 dots with LED back light.

26 **(11) Controller Address**

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

31 **(12) Controller Functions**

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

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

5 **(13) DMS Controller Memory**

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

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

15 **(F) Photo-Electric Sensors**

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

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

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

25 **(G) Equipment List**

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

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

34 **(H) Physical Description**

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

1 **(I) Parts List**

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

9 **(J) Character Set Submittal**

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

13 **(K) Wiring Diagrams**

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

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

20 **(L) Routine of Operation**

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

27 **(M) Maintenance Procedures**

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

32 **(N) Repair Procedures**

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

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

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

6 **(O) Field Trial**

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

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

15 **15.3. CONSTRUCTION METHODS**

16 **(A) Description**

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

20 Provide electrical equipment described in this specification that conforms to the standards of  
21 NEMA, UL, or Electronic Industries Association (EIA), wherever applicable. Provide  
22 connections between controllers and electric utilities that conform to NEC standards. Express  
23 wire sizes according to the American Wire Gauge (AWG).

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

29 **(B) Layout**

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

35 **(C) Construction Submittal**

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

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

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

7 **(D) Conduit**

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

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

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

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

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

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

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

28 **(E) Wiring Methods**

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

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

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

37 **(F) Equipment and Cabinet Mounting**

38 Mount equipment securely at the locations shown in the Plans, in conformance with the  
39 dimensions shown. Install fasteners as recommended by the manufacturer and space them

1 evenly. Use all mounting holes and attachment points for attaching DMS enclosures and  
2 controller cabinets to the structures.

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

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

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

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

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

15 Install a level concrete technician pad measuring a minimum 4 inches thick, 24 inches wide  
16 and 36 inches long at the front door of the DMS equipment cabinet as shown on the Typical  
17 Details sheet within the plans.

18 **(G) Work Site Clean-Up**

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

22 **15.4. MEASUREMENT AND PAYMENT**

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

31 Payment will be made under:

32 <b>Pay Item</b>	<b>Pay Unit</b>
33 Dynamic Message Sign.....	Each



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**16. NTCIP REQUIREMENTS**

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

4 **16.1. REFERENCES**

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

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

9 **Table 1: NTCIP Standards**

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

1    **(A) General Requirements**

2       **(1) Subnet Level**

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

- 8           • Hayes AT - Command Set,
- 9           • MNP5,
- 10          • MNP10, and
- 11          • V.42bis.

12          Ensure each serial port on each NTCIP Component supports NTCIP 2103 over a null-  
13          modem connection with data rates of 19.2 kbps, 14.4 kbps, 9600 bps, 4800 bps, 2400 bps,  
14          1200 bps, 600 bps, and 300 bps.

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

17          Ensure NTCIP components support NTCIP 2102 and NTCIP 2104.

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

23       **(2) Transport Level**

24          Ensure each NTCIP Component complies with NTCIP 2201 and 2202.

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

29       **(3) Application Level**

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

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

1       **(4) Information Level**

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

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

9       **Table 2: Modified Object Ranges for Mandatory Objects**

Object	Reference	Project Requirement
ModuleTableEntry	NTCIP 1201 Clause 2.2.3	Contains at least one row with moduleType equal to 3 (software). The moduleMake specifies the name of the manufacturer, the moduleModel specifies the manufacturer's name of the component and the modelVersion indicates the model version number of the component.
MaxGroupAddresses	NTCIP 1201 Clause 2.7.1	At least 1
CommunityNamesMax	NTCIP 1201 Clause 2.8.2	At least 3
DmsNumPermanentMsg	NTCIP 1203 Clause 2.6.1.1.1.1	At least 1*
DmsMaxChangeableMsg	NTCIP 1203 Clause 2.6.1.1.1.3	At least 21
DmsFreeChangeableMemory	NTCIP 1203 Clause 2.6.1.1.1.4	At least 20 when no messages are stored.
DmsMessageMultiString	NTCIP 1203 Clause 2.6.1.1.1.8.3	The DMS supports any valid MULTI string containing any subset of those MULTI tags listed in Table 4
DmsControlMode	NTCIP 1203 Clause 2.7.1.1.1.1	Support at least the following modes: - Local - External Central - Central Override

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

3 **Table 3: Content of Permanent Messages**

Permanent Message Number	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).

4 **Table 4: Required MULTI Tags**

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

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

3 **(5) Test Heading**

4 (a) Time Management

5 As defined in NTCIP 1201

6 (b) Timebase Event Schedule

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

9 **Table 5: Modified Object Ranges for the Timebase Event Schedule Conformance**  
10 **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

11  
12 (c) Report  
13 As defined in NTCIP 1201. The following list indicates the modified object  
14 requirements for this conformance group.

15 **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

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- 1 (d) PMPP
- 2 (e) Font Configuration
- 3 As defined in NTCIP 1203. The following list indicates the modified object
- 4 requirements for this conformance group.

5 **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**

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7 \*Upon delivery, the first font is a standard 18” font. The second font is a double-

8 stroke 18” font. The third font is a 28” font. The fourth font is empty.

9 \*\*Upon delivery, the first three font sets are configured in accordance with the

10 ASCII character set for the following characters:

- 11 – “A” thru “Z”- All upper case letters,
- 12 – “0” thru “9”- All decimal digits,
- 13 – Space (i.e., ASCII code 0x20),
- 14 – Punctuation marks shown in brackets [ , , ! ? - ‘ ’ “ ” / ( ) ],
- 15 – Special characters shown in brackets [# & \* +<>].

16 (f) DMS Configuration

17 As defined in NTCIP 1203.

18 (g) MULTI Configuration

19 As defined in NTCIP 1203. The following list indicates the modified object

20 requirements for this conformance group.

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2**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

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- (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.

1 (k) Illumination/Brightness Control

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

4 **Table 9: Modified Object Ranges for the Illumination/Brightness Control**  
5 **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

6

7 (l) Auxiliary I/O8 (m) Scheduling

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

11 **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

12

13 (n) Sign Status

14 As defined in NTCIP 1203.

15 (o) Status Error

16 As defined in NTCIP 1203.

17 (p) Pixel Error Status

18 As defined in NTCIP 1203.

19 (q) Fan Error Status

20 As defined in NTCIP 1203.

21 (r) Power Status

22 As defined in NTCIP 1203.



1 (s) Temperature Status

2 As defined in NTCIP 1203.

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

4  
5 **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.

6  
7 **(6) Documentation**

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

- 10
- 11 • The relevant version of each official standard MIB Module referenced by the device functionality,
  - 12 • If the device does not support the full range of any given object within a  
13 Standard MIB Module, a manufacturer specific version of the official  
14 Standard MIB Module with the supported range indicated in ASN.1 format in  
15 the SYNTAX and/or DESCRIPTION fields of the associated OBJECT TYPE  
16 macro. Name this file identical to the standard MIB Module, except that it will  
17 have the extension ".man",
  - 18 • A MIB Module in ASN.1 format containing any and all manufacturer-specific  
19 objects supported by the device with accurate and meaningful DESCRIPTION  
20 fields and supported ranges indicated in the SYNTAX field of the OBJECT-  
21 TYPE macros,
  - 22 • A MIB containing any other objects supported by the device.

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

4 **(B) NTCIP Acceptance Testing**

5 Test the NTCIP requirements outlined above by a third party testing firm. Submit to the  
6 Engineer for approval a portfolio of the selected firm. Include the name, address, and a history  
7 of the selected firm in performing NTCIP testing along with references. Also provide a contact  
8 person's name and phone number. Submit detailed NTCIP testing plans and procedures,  
9 including a list of hardware and software, to the Engineer for review and approval 10 days in  
10 advance of a scheduled testing date. Develop test documents based on the NTCIP  
11 requirements of these Project Special Provisions. The acceptance test will use the NTCIP  
12 Exerciser, and/or other authorized testing tools and will follow the guidelines established in the  
13 ENTERPRISE Test Procedures. Conduct the test in North Carolina on the installed system in  
14 the presence of the Engineer. Document and certify the results of the test by the firm  
15 conducting the test and submit the Engineer for review and approval. In case of failures,  
16 remedy the problem and have the firm retest in North Carolina. Continue process until all  
17 failures are resolved. The Department reserves the right to enhance these tests as deemed  
18 appropriate to ensure device compliance.

19 **16.2. MEASUREMENT AND PAYMENT**

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

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

1 **17. DMS PEDESTAL STRUCTURE**

2 **17.1. DESCRIPTION**

3 This section includes all design, fabrication, furnishing, and erection of the DMS pedestal structures,  
4 platforms, walkways, ladders for access to the DMS inspection doors, and attachment of the DMS  
5 enclosures to the structures in accordance with the requirements of these Project Special Provisions  
6 and the Plans. Fabricate the supporting DMS assemblies from tubular steel. Furnish pedestal type  
7 DMS assemblies as shown in the Plans.

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

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

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

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

18 **17.2. MATERIALS**

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

20	<b>Item</b>	<b>Section</b>
21	Structural Steel	Section 1072
22	Overhead Sign Structures	Section 1096
23	Signing Materials	Section 1092
24	Organic-Zinc Repair Paint	Article 1080 9
25	Reinforcing Steel	Sub-article 1070
26	Direct Tension Indicators	Sections 440 and 1072

27 **17.3. CONSTRUCTION METHODS**

28 **(A) General**

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

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

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

1 Erect DMS in accordance with the requirements indicated on the Plans and in these Project  
2 Special Provisions. Field drill two holes per connection in the Z bars for attaching the DMS to  
3 the structure. Use two bolts at each connection. Provide two (2) U-bolts at each U-bolt  
4 connection such as 1) each truss chord to sign hanger, or 2) each truss chord to platform  
5 support. Provide two (2) U-bolts at each U-bolts connection where ends of truss chords are  
6 supported. Minimum diameter of all U-bolts is to be ½ inch.

7 Use two coats of a zinc-rich paint to touch up minor scars on all galvanized materials. See  
8 *Standard Specifications*, Section 1076-6.

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

#### 10 **Shop Drawing**

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

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

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

25 Allow a minimum of 40 working days for shop drawing approval after the Engineer receives  
26 them. If revised drawings are necessary, allow appropriate additional time for review and  
27 approval of final shop drawings.

28 Approval of shop drawings by the Engineer will not relieve the Contractor of his responsibility  
29 for the correctness of drawings, or for the fit of all shop and field connections and anchors.

#### 30 **(B) Design and Fabrication**

##### 31 **(1) Dynamic Message Sign Assembly**

- 32 • Design must be in accordance with the *Standard Specifications for Structural*  
33 *Supports for Highway Signs, Luminaires and Traffic Signals*, 5th Edition,  
34 2009, and the latest Interim Specifications,
- 35 • The wind pressure map that is developed from the 3-second gust speeds, as  
36 provided in Article 3.8, shall be used,
- 37 • The natural wind gust speed in North Carolina shall be assumed to be 5 meters  
38 per second or 11.6 mph for inland areas, and 7 meters per second or 15.7 mph  
39 for coastal areas. The coastal area shall be defined as any area within 2 miles

1 from the waterfront facing the ocean or sound and all area where the design  
2 basic wind speed is above 120 mph, as shown in Figure 3-2,

- 3 • The fatigue importance category used in the design, for each type of structure,  
4 as provided for in Article 11.6, Fatigue Importance Factors, shall be Category  
5 II unless otherwise shown on the contract plans,
- 6 • Wind drag coefficient for Dynamic Message Sign enclosures shall be 1.7.

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

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

12 Case 1 For a single upright post of span type overhead sign structure, the  
13 effective column length factor, “K”, shall be taken as 2.0,

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

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

- 20 • For twin post truss-type upright post, the unbraced length shall be from the  
21 chord to post connection to the top of base plate,
- 22 • For twin post truss-type upright post that is subject to axial compression,  
23 bending moment, shear, and torsion the post shall satisfy Standard  
24 *Specifications for Structural Supports for Highway Signs, Luminaries and*  
25 *Traffic Signals* Equations 5-17, 5-18 and 5-19. To reduce the effects of  
26 secondary bending, in lieu of Equation 5-18, the following equation may be  
27 used:

$$28 \quad \frac{f_a}{F_a} + \frac{f_b}{\left(1 - \frac{0.6f_a}{F_e}\right)F_b} + \left(\frac{f_v}{F_v}\right)^2 \leq 1.0$$

29 Where:

30  $f_a$  = Computed axial compression stress at base of post

- 31 • The base plate thickness for all uprights and poles shall be a minimum of 2”  
32 but not less than that determined by the following criteria and design,

33 Case 1 Circular or rectangular solid base plates with the upright pole welded to  
34 the top surface of base plate with full penetration butt weld, and where

1 no stiffeners are provided. A base plate with a small center hole, which  
 2 is less than 1/5 of the upright diameter, and located concentrically with  
 3 the upright pole, may be considered as a solid base plate.

4 The magnitude of bending moment in the base plate, induced by the  
 5 anchoring force of each anchor bolt shall be calculated using equation  
 6  $M = (P \times D1) / 2$ ,

7 Case 2 Circular or rectangular base plate with the upright pole socketed into and  
 8 attached to the base plate with two lines of fillet weld, and where no  
 9 stiffeners are provided, or any base plate with a center hole that is larger  
 10 in diameter than 1/5 of the upright diameter.

11 The magnitude of bending moment induced by the anchoring force of  
 12 each anchor bolt shall be calculated using equation  $M = P \times D2$ ,

- 13 - M, bending moment at the critical section of the base plate  
 14 induced by one anchor bolt,
- 15 - P, anchoring force of each anchor bolt,
- 16 - D1, horizontal distance between the center of the anchor bolt  
 17 and the outer face of the upright, or the difference between  
 18 the radius of the bolt circle and the outside radius of the  
 19 upright,
- 20 - D2, horizontal distance between the face of the upright and the  
 21 face of the anchor bolt nut,

- 22 • The critical section shall be located at the face of the anchor bolt and  
 23 perpendicular to the radius of the bolt circle. The overlapped part of two  
 24 adjacent critical sections shall be considered ineffective,
- 25 • The thickness of base plate of Case 1 shall not be less than that calculated  
 26 based on formula for Case 2,
- 27 • Uprights, foundations, and trusses shall be designed in accordance with the  
 28 DMS Foundation Special Provision for the effects of torsion. Torsion shall be  
 29 considered from dead load eccentricity of these attachments, as well as for  
 30 attachments such as walkway platforms, supporting brackets, etc., that add to  
 31 the torsion in the assembly. Truss vertical and horizontal truss diagonals in  
 32 particular and any other assembly members shall be appropriately sized for  
 33 these loads,
- 34 • Uprights, foundations, and trusses shall be designed for the proposed sign  
 35 wind area and future wind areas. The design shall consider the effect of  
 36 torsion induced by the eccentric force location of the center of wind force  
 37 above (or below) the center of the supporting truss. Truss vertical and  
 38 horizontal truss diagonals in particular and any other assembly members shall  
 39 be appropriately sized for these loads.

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

3 Horizontal components of the supporting structures for overhead DMS must be of a truss  
4 design to support the DMS. Truss centerline must coincide with centerline of the DMS  
5 design area shown on the structure line drawing. Provide permanent camber in addition  
6 to dead load camber in accordance with the *Standard Specifications for Structural*  
7 *Supports for Highway Signs, Luminaires, and Traffic Signals*. Indicate on the shop  
8 drawings the amount of camber provided and the method employed in the fabrication of  
9 the support to obtain the camber.

10 For all U-bolt connections of hanger beams to overhead assembly truss chords, provide  
11 all U-bolts with a flat washer, a lock washer and double nuts at each end of the U-bolts.  
12 All double nuts that are on any U-bolt shall be the same thickness and weight. When  
13 assembled, the double nuts shall be brought tight against each other by the use of two  
14 wrenches.

15 Fabricate attachment assemblies for the mounting DMS in a manner that allows easy  
16 removal of the sign.

17 **(2) DMS Maintenance Platform (Walkway)**

18 Provide a maintenance platform (walkway), a minimum of three feet wide with open skid  
19 resistant surface and safety railing on the DMS assemblies for access to the DMS  
20 inspection door. Provide platforms with fixed safety railings along both sides from the  
21 beginning of the platform to the inspection door.

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

- 24 • The top of the platform grading surface is vertically aligned with the bottom  
25 of the DMS door,
- 26 • The DMS door will open 90-degrees from its closed position without any  
27 obstruction from the platform or safety handrails,
- 28 • The platform is rigidly and directly connected to the walkway brackets and  
29 there is no uneven surface between sections,
- 30 • Install a 4" x 4" safety angle parallel to and along both sides of the platform  
31 and extend it the entire length of the platform. Design the safety angle to  
32 withstand loading equivalent to the platform,
- 33 • Ensure the platform design allows full access to the DMS enclosure inspection  
34 door with no interference or obstructions.

35 **(3) DMS Access Ladder**

36 Provide a fixed ladder, of the same material as the pedestal structures, leading to and  
37 ending at the access platform. Equip the ladder with a security cover (ladder guard) and  
38 lock to prohibit access by unauthorized persons. Furnish the lock to operate with a  
39 Corbin #2 key, and furnish two keys per lock. Design the rungs on 12-inch center to  
40 center typical spacing. Start the first ladder rung no more than 18 inches above the

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1 landing pad. Attach the security cover approximately 6 feet above the finished ground.  
 2 Design the ladder and security cover as a permanent part of the DMS assembly and  
 3 include complete design details in the DMS assembly shop drawings. Fabricate the  
 4 ladder and cover to meet all OSHA requirements and applicable state and local codes,  
 5 including but not limited to providing a ladder cage.

6 Furnish and install a level concrete pad a minimum of 4 inches deep, 24 inches wide, and  
 7 36 inches long to service as a landing pad for accessing the ladder. Design the landing  
 8 pad to be directly below the bottom rung. Access to the ladder shall not be obstructed by  
 9 the DMS foundation. Provide pre-formed or cast-in place concrete pads.

## 10 17.4. MEASUREMENT AND PAYMENT

11 *DMS Pedestal Structure* will be measured and paid as the actual number of dynamic message sign  
 12 pedestal structure assemblies furnished, installed, and accepted. Payment includes all design,  
 13 fabrication, construction, transportation, and attachment of the complete dynamic message sign  
 14 assemblies, supporting structure, hardware, access platform, direct tension indicators, preparing and  
 15 furnishing shop drawings, additional documentation, incidentals, and all other equipment and  
 16 features necessary to furnish the system described above.

17 *DMS Access Ladder* will be measured and paid as the actual number of DMS access ladders  
 18 furnished, installed and accepted. Payment includes design, fabrication, transportation, attachment  
 19 to the DMS assembly as described above, lock with two keys each, and concrete pad.

20 Payment will be made under:

21 <b>Pay Item</b>	<b>Pay Unit</b>
22 DMS Pedestal Structure .....	Each
23 DMS Access Ladder .....	Each



1           **18. FOUNDATIONS AND ANCHOR ROD ASSEMBLIES FOR METAL POLES**

2           **18.1. DESCRIPTION**

3 Foundations for metal poles include foundations for signals, cameras, overhead and dynamic  
4 message signs (DMS) and high mount and low level light standards supported by metal poles or  
5 upright trusses. Foundations consist of footings with pedestals and drilled piers with or without  
6 grade beams or wings. Anchor rod assemblies consist of anchor rods (also called anchor bolts) with  
7 nuts and washers on the exposed ends of rods and nuts and a plate or washers on the other ends of  
8 rods embedded in the foundation.

9 Construct concrete foundations with the required resistances and dimensions and install anchor rod  
10 assemblies in accordance with the contract and accepted submittals. Construct drilled piers  
11 consisting of cast-in-place reinforced concrete cylindrical sections in excavated holes. Provide  
12 temporary casings or polymer slurry as needed to stabilize drilled pier excavations. Use a  
13 prequalified Drilled Pier Contractor to construct drilled piers for metal poles. Define “excavation”  
14 and “hole” as a drilled pier excavation and “pier” as a drilled pier.

15 This provision does not apply to materials and anchor rod assemblies for standard foundations for  
16 low level light standards. See Section 1405 of the *Standard Specifications* and Standard Drawing  
17 No. 1405.01 of the 2012 Roadway Standard Drawings for materials and anchor rod assemblies for  
18 standard foundations. For construction of standard foundations for low level light standards,  
19 standard foundations are considered footings in this provision.

20 This provision does not apply to foundations for signal pedestals; see Section 1743 of the *Standard*  
21 *Specifications* and Standard Drawing No. 1743.01 of the 2012 Roadway Standard Drawings.

22           **18.2. MATERIALS**

23 Refer to the 2012 *Standard Specifications*.

24	<b>Item</b>	<b>Section</b>
25	Conduit	1091-3
26	Grout, Nonshrink	1003
27	Polymer Slurry	411-2(B)
28	Portland Cement Concrete	1000
29	Reinforcing Steel	1070
30	Rollers and Chairs	411-2(C)
31	Temporary Casings	411-2(A)

32 Provide Type 3 material certifications in accordance with Article 106-3 of the *Standard*  
33 *Specifications* for conduit, rollers, chairs and anchor rod assemblies. Store steel materials on  
34 blocking at least 12" above the ground and protect it at all times from damage; and when placing in  
35 the work make sure it is free from dirt, dust, loose mill scale, loose rust, paint, oil or other foreign  
36 materials. Load, transport, unload and store foundation and anchor rod assembly materials so  
37 materials are kept clean and free of damage. Damaged or deformed materials will be rejected.

1 Use conduit type in accordance with the contract. Use Class A concrete for footings and pedestals,  
2 Class Drilled Pier concrete for drilled piers and Class AA concrete for grade beams and wings  
3 including portions of drilled piers above bottom of wings elevations. Corrugated temporary casings  
4 may be accepted at the discretion of the Engineer. A list of approved polymer slurry products is  
5 available from:

6 [www.ncdot.org/doh/preconstruct/highway/geotech/leftmenu/Polymer.html](http://www.ncdot.org/doh/preconstruct/highway/geotech/leftmenu/Polymer.html)

7 Provide anchor rod assemblies in accordance with the contract consisting of the following:

- 8 ○ Straight anchor rods,
- 9 ○ Heavy hex top and leveling nuts and flat washers on exposed ends of rods, and
- 10 ○ Nuts and either flat plates or washers on the other ends of anchor rods embedded in  
11 foundations.

12 Do not use lock washers. Use steel anchor rods, nuts and washers that meet ASTM F1554 for Grade  
13 55 rods and Grade A nuts. Use steel plates and washers embedded in concrete with a nominal  
14 thickness of at least 1/4". Galvanize anchor rods and exposed nuts and washers in accordance with  
15 Article 1076-4 of the *Standard Specifications*. It is not necessary to galvanize nuts, plates and  
16 washers embedded in concrete.

### 17 **18.3. CONSTRUCTION METHODS**

18 Install the required size and number of conduits in foundations in accordance with the plans and  
19 accepted submittals. Construct top of piers, footings, pedestals, grade beams and wings flat, level  
20 and within 1" of elevations shown in the plans or approved by the Engineer. Provide an Ordinary  
21 Surface finish in accordance with Subarticle 825-6(B) of the *Standard Specifications* for portions of  
22 foundations exposed above finished grade. Do not remove anchor bolt templates or pedestal or  
23 grade beam forms or erect metal poles or upright trusses onto foundations until concrete attains a  
24 compressive strength of at least 3,000 psi.

#### 25 **(A) Drilled Piers**

26 Before starting drilled pier construction, hold a predrill meeting to discuss the installation,  
27 monitoring and inspection of the drilled piers. Schedule this meeting after the Drilled Pier  
28 Contractor has mobilized to the site. The Resident or Division Traffic Engineer, Contractor  
29 and Drilled Pier Contractor Superintendent will attend this predrill meeting.

30 Do not excavate holes, install piles or allow equipment wheel loads or vibrations within 20 ft  
31 of completed piers until 16 hours after Drilled Pier concrete reaches initial set.

32 Check for correct drilled pier alignment and location before beginning drilling. Check  
33 plumbness of holes frequently during drilling.

34 Construct drilled piers with the minimum required diameters shown in the plans. Install piers  
35 with tip elevations no higher than shown in the plans or approved by the Engineer.

36 Excavate holes with equipment of the sizes required to construct drilled piers. Depending on  
37 the subsurface conditions encountered, drilling through rock and boulders may be required. Do  
38 not use blasting for drilled pier excavations.

- 1 Contain and dispose of drilling spoils and waste concrete as directed and in accordance with  
2 Section 802 of the *Standard Specifications*. Drilling spoils consist of all materials and fluids  
3 removed from excavations.
- 4 If unstable, caving or sloughing materials are anticipated or encountered, stabilize holes with  
5 temporary casings and/or polymer slurry. Do not use telescoping temporary casings. If it  
6 becomes necessary to replace a temporary casing during drilling, backfill the excavation, insert  
7 a larger casing around the casing to be replaced or stabilize the excavation with polymer slurry  
8 before removing the temporary casing.
- 9 If temporary casings become stuck or the Contractor proposes leaving casings in place,  
10 temporary casings should be installed against undisturbed material. Unless otherwise  
11 approved, do not leave temporary casings in place for mast arm poles and cantilever signs.  
12 The Engineer will determine if casings may remain in place. If the Contractor proposes  
13 leaving temporary casings in place, do not begin drilling until a casing installation method is  
14 approved.
- 15 Use polymer slurry and additives to stabilize holes in accordance with the slurry  
16 manufacturer's recommendations. Provide mixing water and equipment suitable for polymer  
17 slurry. Maintain polymer slurry at all times so slurry meets Table 411-3 of the *Standard*  
18 *Specifications* except for sand content.
- 19 Define a "sample set" as slurry samples collected from mid-height and within 2 ft of the  
20 bottom of holes. Take sample sets from excavations to test polymer slurry immediately after  
21 filling holes with slurry, at least every 4 hours thereafter and immediately before placing  
22 concrete. Do not place Drilled Pier concrete until both slurry samples from an excavation meet  
23 the required polymer slurry properties. If any slurry test results do not meet the requirements,  
24 the Engineer may suspend drilling until both samples from a sample set meet the required  
25 slurry properties.
- 26 Remove soft and loose material from bottom of holes using augers to the satisfaction of the  
27 Engineer. Assemble rebar cages and place cages and Drilled Pier concrete in accordance with  
28 Subarticle 411-4(E) of the *Standard Specifications* except for the following:
- 29       ▪ Inspections for tip resistance and bottom cleanliness are not required,
  - 30       ▪ Temporary casings may remain in place if approved, and
  - 31       ▪ Concrete placement may be paused near the top of pier elevations for anchor rod  
32       assembly installation and conduit placement, or
  - 33       ▪ If applicable, concrete placement may be stopped at bottom of grade beam or wings  
34       elevations for grade beam or wing construction.
- 35 If wet placement of concrete is anticipated or encountered, do not place Drilled Pier concrete  
36 until a concrete placement procedure is approved. If applicable, temporary casings and fluids  
37 may be removed when concrete placement is paused or stopped in accordance with the  
38 exceptions above provided holes are stable. Remove contaminated concrete from exposed  
39 Drilled Pier concrete after removing casings and fluids. If holes are unstable, do not remove  
40 temporary casings until a procedure for placing anchor rod assemblies and conduit or  
41 constructing grade beams or wings is approved.

1 Use collars to extend drilled piers above finished grade. Remove collars after Drilled Pier  
2 concrete sets and round top edges of piers.

3 If drilled piers are questionable, pile integrity testing (PIT) and further investigation may be  
4 required in accordance with Article 411-5 of the *Standard Specifications*. A drilled pier will be  
5 considered defective in accordance with Subarticle 411-5(D) of the *Standard Specifications*  
6 and drilled pier acceptance is based in part on the criteria in Article 411-6 of the *Standard*  
7 *Specifications* except for the top of pier tolerances in Subarticle 411-6(C) of the *Standard*  
8 *Specifications*.

9 If a drilled pier is under further investigation, do not grout core holes, backfill around the pier  
10 or perform any work on the drilled pier until the Engineer accepts the pier. If the drilled pier is  
11 accepted, dewater and grout core holes and backfill around the pier with approved material to  
12 finished grade. If the Engineer determines a pier is unacceptable, remediation is required in  
13 accordance with Article 411-6 of the *Standard Specifications*. No extension of completion  
14 date or time will be allowed for remediation of unacceptable drilled piers or post repair testing.

15 Permanently embed a plate in or mark top of piers with the pier diameter and depth, size and  
16 number of vertical reinforcing bars and the minimum compressive strength of the concrete mix  
17 at 28 days.

18 **(B) Footings, Pedestals, Grade Beams and Wings**

19 Excavate as necessary for footings, grade beams and wings in accordance with the plans,  
20 accepted submittals and Section 410 of the *Standard Specifications*. If unstable, caving or  
21 sloughing materials are anticipated or encountered, shore foundation excavations as needed  
22 with an approved method. Notify the Engineer when foundation excavation is complete. Do  
23 not place concrete or reinforcing steel until excavation dimensions and foundation material are  
24 approved.

25 Construct cast-in-place reinforced concrete footings, pedestals, grade beams and wings with  
26 the dimensions shown in the plans and in accordance with Section 825 of the *Standard*  
27 *Specifications*. Use forms to construct portions of pedestals and grade beams protruding above  
28 finished grade. Provide a chamfer with a 3/4" horizontal width for pedestal and grade beam  
29 edges exposed above finished grade. Backfill and fill in accordance with Article 410-8 of the  
30 *Standard Specifications*. Proper compaction around footings and wings is critical for  
31 foundations to resist uplift and torsion forces. Place concrete against undisturbed soil and do  
32 not use forms for standard foundations for low level light standards.

33 **(C) Anchor Rod Assemblies**

34 Size anchor rods for design and the required projection above top of foundations. Determine  
35 required anchor rod projections from nut, washer and base plate thicknesses, the protrusion of  
36 3 to 5 anchor rod threads above top nuts after tightening and the distance of one nut thickness  
37 between top of foundations and bottom of leveling nuts.

38 Protect anchor rod threads from damage during storage and installation of anchor rod  
39 assemblies. Before placing anchor rods in foundations, turn nuts onto and off rods past  
40 leveling nut locations. Turn nuts with the effort of one workman using an ordinary wrench

- 1 without a cheater bar. Report any thread damage to the Engineer that requires extra effort to  
2 turn nuts.
- 3 Arrange anchor rods symmetrically about center of base plate locations as shown in the plans.  
4 Set anchor rod elevations based on required projections above top of foundations. Securely  
5 brace and hold rods in the correct position, orientation and alignment with a steel template. Do  
6 not weld to reinforcing steel, temporary casings or anchor rods.
- 7 Install top and leveling (bottom) nuts, washers and the base plate for each anchor rod assembly  
8 in accordance with the following procedure:
- 9 1. Turn leveling nuts onto anchor rods to a distance of one nut thickness between the top  
10 of foundation and bottom of leveling nuts. Place washers over anchor rods on top of  
11 leveling nuts.
  - 12 2. Determine if nuts are level using a flat rigid template on top of washers. If necessary,  
13 lower leveling nuts to level the template in all directions or if applicable, lower nuts to  
14 tilt the template so the metal pole or upright truss will lean as shown in the plans. If  
15 leveling nuts and washers are not in full contact with the template, replace washers  
16 with galvanized beveled washers.
  - 17 3. Verify the distance between the foundation and leveling nuts is no more than one nut  
18 thickness.
  - 19 4. Place base plate with metal pole or upright truss over anchor rods on top of washers.  
20 High mount luminaires may be attached before erecting metal poles but do not attach  
21 cables, mast arms or trusses to metal poles or upright trusses at this time.
  - 22 5. Place washers over anchor rods on top of base plate. Lubricate top nut bearing  
23 surfaces and exposed anchor rod threads above washers with beeswax, paraffin or  
24 other approved lubricant.
  - 25 6. Turn top nuts onto anchor rods. If nuts are not in full contact with washers or washers  
26 are not in full contact with the base plate, replace washers with galvanized beveled  
27 washers.
  - 28 7. Tighten top nuts to snug-tight with the full effort of one workman using a 12" wrench.  
29 Do not tighten any nut all at once. Turn top nuts in increments. Follow a star pattern  
30 cycling through each nut at least twice.
  - 31 8. Repeat (7) for leveling nuts.
  - 32 9. Replace washers above and below the base plate with galvanized beveled washers if  
33 the slope of any base plate face exceeds 1:20 (5%), any washer is not in firm contact  
34 with the base plate or any nut is not in firm contact with a washer. If any washers are  
35 replaced, repeat (7) and (8).
  - 36 10. With top and leveling nuts snug-tight, mark each top nut on a corner at the intersection  
37 of 2 flats and a corresponding reference mark on the base plate. Mark top nuts and  
38 base plate with ink or paint that is not water-soluble. Use the turn-of-nut method for  
39 pretensioning. Do not pretension any nut all at once. Turn top nuts in increments for a  
40 total of one flat (1/6 revolution) for anchor rod diameters greater than 1 1/2" and 2

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- 1 flats (1/3 revolution) for anchor rod diameters 1 1/2" or less. Follow a star pattern  
 2 cycling through each top nut at least twice.
- 3 11. Ensure nuts, washers and base plate are in firm contact with each other for each anchor  
 4 rod. Cables, mast arms and trusses may now be attached to metal poles and upright  
 5 trusses.
- 6 12. Between 4 and 14 days after pretensioning top nuts, use a torque wrench calibrated  
 7 within the last 12 months to check nuts in the presence of the Engineer. Completely  
 8 erect mast arm poles and cantilever signs and attach any hardware before checking top  
 9 nuts for these structures. Check that top nuts meet the following torque requirements:

10

<b>TORQUE REQUIREMENTS</b>	
<b>Anchor Rod Diameter, inch</b>	<b>Requirement, ft-lb</b>
7/8	180
1	270
1-1/8	380
1-1/4	420
$\geq 1-1/2$	600

- 11
- 12 If necessary, retighten top nuts in the presence of the Engineer with a calibrated torque  
 13 wrench to within  $\pm 10$  ft-lb of the required torque. Do not over tighten top nuts.

- 14 13. Do not grout under base plate.

15 **18.4. MEASUREMENT AND PAYMENT**

16 Foundations and anchor rod assemblies for metal poles and upright trusses will be measured and  
 17 paid for elsewhere in the contract.

18 No payment will be made for temporary casings that remain in drilled pier excavations. No payment  
 19 will be made for PIT. No payment will be made for further investigation of defective piers. Further  
 20 investigation of piers that are not defective will be paid as extra work in accordance with Article  
 21 104-7 of the *Standard Specifications*. No payment will be made for remediation of unacceptable  
 22 drilled piers or post repair testing.

1                                   **19. DYNAMIC MESSAGE SIGN FOUNDATIONS**

2    **19.1. DESCRIPTION**

3    Sign foundations include foundations for overhead and dynamic message signs (DMS) supported by  
4    metal poles or upright trusses. Sign foundations consist of footings with pedestals or drilled piers  
5    with or without grade beams or wings, conduit and anchor rod assemblies. Construct sign  
6    foundations in accordance with the contract and accepted submittals. Define “cantilever sign” as an  
7    overhead cantilever sign support in accordance with Figure 1-1 of the *AASHTO Standard*  
8    *Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals*, 5th  
9    Edition, 2009, including the latest interim specifications.

10   **19.2. MATERIALS**

11   Use sign foundation materials that meet the Foundations and Anchor Rod Assemblies for Metal  
12   Poles provision.

13   **(A) Assumed Subsurface Conditions**

14       Assume the following soil parameters and groundwater elevation for sign foundations unless  
15       these subsurface conditions are not applicable to sign locations:

- 16           ▪ Unit weight ( $\gamma$ ) = 120 lb/cf,
- 17           ▪ Friction angle ( $\phi$ ) = 30°F,
- 18           ▪ Cohesion ( $c$ ) = 0 lb/sf, and
- 19           ▪ Groundwater 7 ft below finished grade.

20       A subsurface investigation is required if the Engineer determines these assumed subsurface  
21       conditions do not apply to a sign location and the sign cannot be moved. Subsurface  
22       conditions requiring a subsurface investigation include but are not limited to weathered or hard  
23       rock, boulders, very soft or loose soil, muck or shallow groundwater. No extension of  
24       completion date or time will be allowed for subsurface investigations.

25   **(B) Subsurface Investigations**

26       Use a prequalified geotechnical consultant to perform one standard penetration test (SPT)  
27       boring in accordance with ASTM D1586 at each sign location requiring a subsurface  
28       investigation. Rough grade sign locations to within 2 ft of finished grade before beginning  
29       drilling. Drill borings to 2 drilled pier diameters below anticipated pier tip elevations or  
30       refusal, whichever is higher.

31       Use the computer software gINT version 8.0 or later manufactured by Bentley Systems, Inc.  
32       with the current NCDOT gINT library and data template to produce SPT boring logs. Provide  
33       boring logs sealed by a geologist or engineer licensed in the state of North Carolina.

34   **(C) Sign Foundation Designs**

35       Design sign foundations for the wind zone and clearances shown in the plans and the slope of  
36       finished grade at each sign location. Use the assumed soil parameters and groundwater  
37       elevation above for sign foundation designs unless a subsurface investigation is required. For

1 sign locations requiring a subsurface investigation, design sign foundations for the subsurface  
2 conditions at each sign location. Design footings, pedestals, drilled piers, grade beams and  
3 wings in accordance with the 5th Edition of the *AASHTO Standard Specifications for*  
4 *Structural Supports for Highway Signs, Luminaries and Traffic Signals*, 5th Edition, 2009,  
5 including the latest interim specifications. In some instances, conflicts with drainage structures  
6 may dictate sign foundation types.

7 Design footings in accordance with Section 4.4 of the *AASHTO Standard Specifications for*  
8 *Highway Bridges*. Do not use an allowable bearing pressure of more than 3,000 lb/sf for  
9 footings.

10 Design drilled piers for side resistance only in accordance with Section 4.6 of the *AASHTO*  
11 *Standard Specifications for Highway Bridges* except reduce ultimate side resistance by 25%  
12 for uplift. Use the computer software LPILE version 5.0 or later manufactured by Ensoft, Inc.  
13 to analyze drilled piers. Provide drilled pier designs with a horizontal deflection of less than 1"  
14 at top of piers. For cantilever signs with single drilled pier foundations supporting metal poles,  
15 use wings to resist torsion forces. Provide drilled pier designs with a factor of safety of at least  
16 2.0 for torsion.

17 For drilled pier sign foundations supporting upright trusses, use dual drilled piers connected  
18 with a grade beam having a moment of inertia approximately equal to that of either pier. The  
19 Broms' method is acceptable to analyze drilled piers with grade beams instead of LPILE. Use  
20 a safety factor of at least 3.5 for the Broms' design method in accordance with C13.6.1.1 of the  
21 *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and*  
22 *Traffic Signals*, 5th Edition, 2009, including the latest interim specifications.

23 Submit boring logs, if any, working drawings and design calculations for acceptance in  
24 accordance with Article 105-2 of the *Standard Specifications*. Submit working drawings  
25 showing plan views, required foundation dimensions and elevations and typical sections with  
26 reinforcement, conduit and anchor rod assembly details. Include all boring logs, design  
27 calculations and LPILE output for sign foundation design submittals. Have sign foundations  
28 designed, detailed and sealed by an engineer licensed in the state of North Carolina.

### 29 **19.3. CONSTRUCTION METHODS**

30 Construct footings, pedestals, drilled piers, grade beams and wings and install anchor rod assemblies  
31 for sign foundations in accordance with the *Foundations and Anchor Rod Assemblies for Metal*  
32 *Poles* provision.

### 33 **19.4. MEASUREMENT AND PAYMENT**

34 *DMS foundation* will be measured and paid in cubic yards of concrete for footings, pedestals, drilled  
35 piers, grade beams and wings shown on the accepted submittals. The contract unit price for *DMS*  
36 *foundation* will be full compensation for providing labor, tools, equipment and foundation materials,  
37 stabilizing or shoring excavations and supplying concrete, reinforcing steel, conduit, anchor rod  
38 assemblies and any incidentals necessary to construct sign foundations. Subsurface investigations  
39 required by the Engineer will be paid as extra work in accordance with Article 104-7 of the *Standard*  
40 *Specifications*.



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1 Payment will be made under:

2 **Pay Item**

**Pay Unit**

3 DMS Foundation..... Cubic Yards



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- 1 • RJ45 connectors,
- 2 • Category 5e, unshielded twisted pair cable,
- 3 • Segment Length: 100m,
- 4 • Auto-negotiation support (10/100Mbps),
- 5 • Auto MDIX crossover capability,
- 6 • Full Duplex operation (IEEE 802.3x),
- 7 • TVS (transient voltage suppression) between Line +/-, Line +/-ground, and
- 8 Line -ground to protect the circuitry.

9 Furnish Field Ethernet switches with the following networking requirements:

- 10 ▪ The switch shall support automatic address learning of up to 8192 MAC addresses.
- 11 ▪ The switch shall support the following advanced layer 2 functions:
  - 12 • IEEE 802.1Q VLAN, with support for up to 4096 VLANs,
  - 13 • IEEE 802.1p priority queuing,
  - 14 • IEEE 802.1w rapid spanning tree,
  - 15 • IEEE 802.1s multiple spanning tree,
  - 16 • IEEE802.1AD link aggregation,
  - 17 • IEEE 802.3x flow control,
  - 18 • IGMPv2 with 256 IGMP groups,
  - 19 • Port Rate Limiting,
  - 20 • Configuration via test file which can be modified through standard text editor,
  - 21 • Forwarding/filtering rate shall be 14,880 packets per second (PPS) for
  - 22 10Mps, 148,800 for 100Mps, 1,488,000 for 1000Mps, and
  - 23 • DHCP Option 82.

24 Furnish Field Ethernet switches with the following network management functionality  
25 requirements:

- 26 ▪ SNMPv2, SNMPv3,
- 27 ▪ RMON,
- 28 ▪ GVRP,
- 29 ▪ Port Mirroring,
- 30 ▪ 802.1x port security,
- 31 ▪ Radius Server,
- 32 ▪ TACACS+ Server,
- 33 ▪ SSL – Secure Socket Layer,

- 1           ▪ SSH – Secure Shell,
- 2           ▪ TFTP,
- 3           ▪ Network Time Protocol (NTP),
- 4           ▪ Simple Network Time Protocol (SNTP), and
- 5           ▪ Management via web or Telnet.

6 **(C) Hub Ethernet Switch**

7           Furnish hub Ethernet switches that are fully functionally compatible and interconnectable with  
8           the existing Cisco Catalyst 3750-X switch located in Hub Building #5.

9           Furnish hub Ethernet switches fabricated for use in environmentally controlled areas.

10          Furnish hub Ethernet Switches that come equipped with hardware to permit mounting in an  
11          EIA 19” equipment rack.

12          Furnish hub Ethernet Switches that are 1 RU (rack unit) in height.

13          Furnish hub Ethernet switches with the following minimum characteristics and features:

- 14           ▪ Furnish twenty-four (24) SFP transceiver modules rated to service the hub Ethernet  
15           to field Ethernet optical uplinks rated for optical attenuation required to service the  
16           link. Use SFP modules that are matched and compatible with the SFP module it is  
17           mated with. Furnish attenuators if required to service link without saturation  
18           receiving optics,
- 19           ▪ Furnish SFP modules rated for use with the existing optical cable integrated under  
20           this project,
- 21           ▪ Furnish SFP modules with LC connectors,
- 22           ▪ SFP modules shall be considered incidental to the hub Ethernet switch,
- 23           ▪ Management console port.

24          Furnish hub Ethernet switches with the following networking requirements:

- 25           ▪ The switch shall support automatic address learning of up to 8192 MAC addresses.
- 26           ▪ The switch shall support the following advanced layer 2 functions:
  - 27               • IEEE 802.1Q VLAN, with support for up to 4096 VLANs,
  - 28               • IEEE 802.1p priority queuing,
  - 29               • IEEE 802.1w rapid spanning tree,
  - 30               • IEEE 802.1s multiple spanning tree,
  - 31               • IEEE802.1AD link aggregation,
  - 32               • IEEE 802.3x flow control,
  - 33               • IGMPv2 with 256 IGMP groups,
  - 34               • Port Rate Limiting,

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- 1 • Configuration via test file which can be modified through standard text editor,
- 2 • Forwarding/filtering rate shall be 14,880 packets per second (PPS) for
- 3 10Mbps, 148,800 for 100Mbps, 1,488,000 for 1000Mbps, and
- 4 • DHCP Option 82.

5 Furnish hub Ethernet switches with the following network management functionality  
6 requirements:

- 7 ▪ SNMPv2, SNMPv3,
- 8 ▪ RMON,
- 9 ▪ GVRP,
- 10 ▪ Port Mirroring,
- 11 ▪ 802.1x port security,
- 12 ▪ Radius Server,
- 13 ▪ TACACS+ Server,
- 14 ▪ SSL – Secure Socket Layer,
- 15 ▪ SSH – Secure Shell,
- 16 ▪ TFTP,
- 17 ▪ Network Time Protocol (NTP),
- 18 ▪ Simple Network Time Protocol (SNTP), and
- 19 ▪ Management via web or Telnet.

20 **(D) Gigabit Transceiver Modules - ZX**

21 Furnish and install extended distance GLC-ZX-SMD 1000 BASE-ZX SFP transceiver modules  
22 for single mode fiber (SMF), 1550 nm wavelength, and dual LC/PC connectors. The gigabit  
23 transceiver modules shall support Digital Optical Monitoring (DOM) version 12.2(46)SE and  
24 Cisco IOS Release 12.2(25)FZ. Fully compatible equivalent gigabit transceivers may be  
25 furnished upon the approval of the Engineer.

26 **20.3. CONSTRUCTION METHODS**

27 **(A) General**

28 Furnish media access control (MAC) addresses for all equipment utilized as part of this project.  
29 Affix MAC Address label to each device utilized. Furnish IP addresses for all equipment  
30 utilized as part of this project. Affix final IP address each device utilized. Use labels that do  
31 not smear or fade.

32 In field equipment cabinets, fully integrate new Ethernet switches with the fiber-optic  
33 interconnect centers. Integrate all field equipment as call for.

34 Fully integrate LAN to accomplish local device failover and fault tolerance.

1 Fully integrate LAN equipment to provide virus protection, user authentication, and security  
2 functions to prevent unauthorized users and data from entering the LAN.

3 **(B) Requirements Definition Document**

4 Prior to commencing work, the Contractor shall develop a Requirements Definition Document  
5 (RDD) that will form the basis for the overall network architecture and design that at a  
6 minimum includes the following:

- 7       ▪ Complete description of the proposed implementation of the access, distribution  
8       and core layers for the network as described in the Plans and these Project Special  
9       Provisions,
- 10       ▪ Development of an IP Design Scheme with ranges assigned to each node to be  
11       integrated by the Contractor (address ranges, geographic distribution, standards for  
12       addresses within each cabinet),
- 13       ▪ Proposed IP subnet definition and addressing including any and all masks,
- 14       ▪ Proposed IP multicast configuration including multicast routing (i.e., PIM sparse or  
15       dense) and Rendezvous Point (RP) designation as necessary,
- 16       ▪ Proposed recommendations for failover and redundancy including network device  
17       power, supervisor cards, and network ports,
- 18       ▪ Proposed configuration and guidelines for L3 routing (OSPF, VRRP, EIGRP, RIP,  
19       etc.),
- 20       ▪ Proposed configuration and guidelines for Virtual LAN assignments including  
21       management VLANs, device VLANs and routing VLANs,
- 22       ▪ Proposed configuration and guidelines for L2 broadcast storm prevention, loop  
23       prevention and fault tolerance mechanisms. (Spanning Tree diagram with  
24       designated, blocking and forwarding ports indicated. Root bridge and backup root  
25       bridge must also be specified.) Incorporation of Multiple Spanning Tree Protocol,
- 26       ▪ Proposed configuration and guidelines to mitigate common security threats such as  
27       denial of service, man in the middle, MAC/IP spoofing and brute force dictionary  
28       attacks,
- 29       ▪ Proposed configuration and guidelines for 802.1p Class of Service (COS) queue  
30       assignments, and
- 31       ▪ Proposed configuration and guidelines for specific port assignments on each of the  
32       L2 and L3 devices.
- 33       ▪ **Proposed modifications to existing LAN settings required by the rerouting of  
34       existing fiber circuits installed under prior projects I-3803BA and R-2123CG  
35       through both Hubs #4 and #5, as shown in the plans, for network  
36       reconfiguration to maintain device operations in the event of a  
37       communications interruption.**

38 The RDD shall be prepared and signed by a qualified networking professional (minimum  
39 CCNA or a manufacturer-approved equivalent based on the approved hardware vendor) and

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1 will be approved by the Engineer. The Qualified network professional will be present during  
2 the installation and testing of the local area network as well as during system testing.

3 **(C) Field Ethernet Switch**

4 Install and integrate all field Ethernet switches at field locations as depicted in the diagrams  
5 and tables and called for in these Project Special Provisions. Integrate with equipment cabinet  
6 hardware and fiber-optic communications equipment.

7 Provide inline surge protection for all Ethernet connections in field cabinets.

8 **(D) Hub Ethernet Switch**

9 Install and integrate all hub Ethernet switches at hub building locations as depicted in the Plans  
10 and called for in these Project Special Provisions.

11 Install cross-connect cables for both data and power between the proposed hub Ethernet switch  
12 and the existing Cisco Catalyst 3750X switch so that the hub Ethernet switch's communication  
13 access to the MRTMC is achieved through the existing Cisco Catalyst 3750X switch.

14 Integrate the proposed hub Ethernet switch with existing switch(es) and proposed field  
15 Ethernet switches.

16 **(E) Gigabit Transceiver Modules – ZX**

17 Install the gigabit transceiver modules in the existing and proposed hub Ethernet switches in  
18 Hub #4 and Hub #5 as depicted in the Plans.

19 **20.4. MEASUREMENT AND PAYMENT**

20 *Field Ethernet switch* will be measured and paid as the actual number of field Ethernet switches  
21 furnished, installed, integrated, and accepted. All SFP modules, optics, cabling, attenuators,  
22 configuration, and testing or other labor or materials required to install and integrate the field  
23 Ethernet switch will be considered incidental and will not be paid for separately.

24 *Furnish field Ethernet switch* will be measured and paid as the actual number of field Ethernet  
25 switches furnished and accepted. All SFP modules, optics, cabling, attenuators, configuration,  
26 testing and other materials that are an integral part of the field Ethernet switch will be considered  
27 incidental and will not be paid for separately.

28 *Hub Ethernet switch* will be measured and paid as the actual number of hub Ethernet switches  
29 furnished, installed, integrated, and accepted. All cabling, attenuators, configuration, and testing or  
30 other labor or materials required to install and integrate the field Ethernet switch will be considered  
31 incidental and will not be paid for separately.

32 *Gigabit transceiver module – ZX* will be measured and paid as the actual number of gigabit  
33 transceiver modules – ZX furnished, installed, tested and accepted. No separate measurement will  
34 be made for fiber-optic jumpers as these are considered incidental to furnishing and installing the  
35 gigabit transceiver modules.

36 Payment for all LAN integration, RDD development, cabling, jumpers, adapters, sockets, LAN patch  
37 panels, and other hardware shall be considered incidental and no separate payment will be made.

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1 Payment will be made under:

2	<b>Pay Item</b>	<b>Pay Unit</b>
3	Field Ethernet Switch.....	Each
4	Furnish Field Ethernet Switch .....	Each
5	Hub Ethernet Switch.....	Each
6	Gigabit Transceiver Module – ZX.....	Each







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1	▪ Video Coaxial Cable	0-1,500 feet (using RG59/U cable)
2	▪ Compensation Range	Selectable ranges:
3	▪ (Inputs Only)	– None
4		– 500 feet (152.4 m)
5		– 1,000 feet (304.8 m)
6		– 1,500 feet (457.2 m)
7	▪ Differential Gain	Less than 1%
8	▪ Differential Phase	Less than 1/2°
9	▪ Maximum Output Level	1.0 Vp-p terminated
10	▪ Signal-to-Noise Ratio	-45 dB
11	▪ Tilt	Less than 1%
12	▪ Inputs	Ground isolated
13	▪ Character Size	7 x 9 TV Lines
14	▪ Brightness	Individually adjustable (digital)
15	▪ Position	Individually adjustable (digital)
16	Communication:	
17	▪ Type	RS-232, RS-422, RS-485
18	▪ Data Rate	Selectable; 1200, 2400, 4800 or 9600 baud
19	▪ Cable Requirements	24-gauge shielded twisted pair
20	RS-232	Maximum 50 feet (15.25 m)
21	RS-422	Maximum 4,000 feet (1,219 m)
22	RS-485	Maximum 4,000 feet (1,219 m)
23	General:	
24	▪ Construction	Aluminum
25	▪ Dimensions	5.25" H x 19.00" W x 12.90" D
26	▪ Mounting Fits	19-inch EIA Standard rack mount (3 RUs)
27	▪ Operating Temperature	32° to 120°F (0° to 49°C)
28	▪ Humidity	10% to 90%, non-condensing
29	▪ Memory Backup	Lithium battery
30	Certifications/Ratings:	
31	▪ FCC, Class B (CM9760-MDA)	
32	▪ Meets NEMA Type 1 standards	

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1 **21.3. CONSTRUCTION METHODS**2 **(A) Rack-Mounted Video Decoder Chassis**

3 Install the rack-mounted video decoder chassis into an existing 19” rack within the MRTMC  
4 equipment room in a space as directed by the Engineer. Integrate the central video decoder  
5 units with the rack cabinet power supply and UPS.

6 **(B) Central Video Decoder Unit**

7 Install the central video decoder units in the rack-mounted video decoder chassis at the  
8 MRTMC as shown in the Plans. Integrate the decoders with the existing core Ethernet switch.  
9 Integrate the central video decoder unit video outputs with the inputs on the master distribution  
10 amplifier at the MRTMC as directed by the Engineer.

11 **(C) Master Distribution Amplifier**

12 Install the master distribution amplifier within existing rack space in the MRTMC equipment  
13 room as directed by the Engineer. Integrate the master distribution amplifiers with the  
14 proposed rack-mounted video decoder chassis and the existing Pelco video matrix switch.

15 Furnish all necessary interconnecting video and data cables and hardware to properly integrate  
16 the master distribution amplifiers into the existing video system.

17 **21.4. MEASUREMENT AND PAYMENT**

18 *Rack-mounted video decoder chassis* will be measured and paid as the actual number of units,  
19 furnished, installed, integrated, and accepted. All cabling and patch cables, integration, and  
20 configuration required to install the rack-mounted video decoder chassis unit shall be incidental and  
21 not be paid for separately.

22 *Central video decoder unit* will be measured and paid as the actual number of units, furnished,  
23 installed, integrated, and accepted. All cabling and patch cables, integration, and configuration  
24 required to install the central video decoder unit shall be incidental and not be paid for separately.

25 *Master distribution amplifier* will be measured and paid as the actual number of units, furnished,  
26 installed, integrated, and accepted. All cabling and patch cables, integration, and configuration  
27 required to install the master distribution amplifier shall be incidental and not be paid for separately.

28 Payment will be made under:

29 <b>Pay Item</b>	<b>Pay Unit</b>
30 Rack-Mounted Video Decoder Chassis .....	Each
31 Central Video Decoder Unit .....	Each
32 Master Distribution Amplifier .....	Each



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1 Integrate the new CCTV units with NCDOT’s regional video sharing and distribution system to  
2 allow for remote users to view and control the new CCTV units that terminate on the NCDOT  
3 analog video matrix switch through the Ethernet network connection between the remote user and  
4 the NCDOT VideoPro server at the MRTMC.

5 **22.4. MEASUREMENT AND PAYMENT**

6 Integration and Configuration will be measured and paid as a lump sum price. This item shall  
7 include the installation, testing, and all materials, equipment, labor, tools, storage, shipping, and  
8 incidentals necessary to complete the integration and configuration of CCTV and DMS devices with  
9 the existing systems at the MRTMC.

10 All cabling, labeling, sockets, or other accessories required to configure, integrate, and interconnect  
11 computer equipment shall be considered incidental and shall not be paid for separately.

12 All central equipment installed for communications to new CCTV and DMS units will be measured  
13 and paid for under the applicable Section of these Project Special Provisions.

14 Payment will be made under:

15 <b>Pay Item</b>	<b>Pay Unit</b>
16 Integration and Configuration.....	Lump Sum

17



1 the Design Approval and Operational Tests. When all corrections and changes (if any) have  
2 been made, the Department may accept the prototype DMS and controller as the physical and  
3 functional standard for the system furnished under this contract. You may use the prototype  
4 units on this project if, after inspection and rework (if necessary), they meet all physical and  
5 functional specifications. In the case of standard product line equipment, if the Contractor can  
6 provide test results certified by an independent testing facility as evidence of prior completion  
7 of successful design approval tests, then the Engineer may choose to waive these tests.

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

11 **(B) CCTV System**

12 No design approval test is required.

13 **(C) Fiber-optic Communications**

14 No design approval test is required.

15 **(D) Central Hardware**

16 No design approval test is required.

17 **23.3. COMPATIBILITY TESTS**

18 **(A) DMS System**

19 No compatibility test is required.

20 **(B) CCTV System**

21 Compatibility Tests are applicable to CCTV cameras and video encoders/decoders that the  
22 Contractor wishes to furnish but are of a different manufacturer or model series than the  
23 existing units in the field or existing units installed at the MRTMC. If required, the  
24 Compatibility Test shall be completed and accepted by the Engineer prior to approval of the  
25 material submittal.

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

31 The Contractor shall provide, install, and integrate a full-functioning unit to be tested. The  
32 Department will provide access to existing equipment to facilitate these testing procedures.  
33 The Contractor is responsible for configuring proposed equipment at the MRTMC and proving  
34 compatibility. The Engineer will determine if the Compatibility Test was acceptable for each  
35 proposed device.

36 **(C) Fiber-optic Communications**

37 No compatibility test is required.



1 **(D) Central Hardware**

2 Compatibility Tests are applicable to field Ethernet switches that the Contractor wishes to  
3 furnish but are of a different manufacturer or model series than the existing units in the field or  
4 existing units installed at the MRTMC. If required, the Compatibility Test shall be completed  
5 and accepted by the Engineer prior to approval of the material submittal.

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

11 The Contractor shall provide, install, and integrate a fully-functioning unit to be tested. The  
12 Department will provide access to existing equipment to facilitate these testing procedures.  
13 The Contractor is responsible for configuring proposed equipment at the MRTMC and proving  
14 compatibility. The Engineer will determine if the Compatibility Test was acceptable for each  
15 proposed device.

16 **23.4. OPERATIONAL FIELD TEST (ON-SITE COMMISSIONING)**

17 **(A) DMS System**

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

21 **(1) Physical Examination**

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

25 Perform the following tests as a minimum:

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

32 **(2) Continuity Tests**

33 Check the wiring to assure it conforms to the requirements of these Project Special  
34 Provisions.

35 **(3) Functional Tests**

36 Perform the following functional tests:

- 37 • Start-up and operate the DMS locally using a laptop computer,

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- 1 • Use automatic (photo-electric sensor controlled) DMS Control Software to
- 2 switch between “dim”, “normal”, and “bright” light levels,
- 3 • Operate the DMS with all display elements flashing continuously for 10
- 4 minutes at the maximum flash rate,
- 5 • Exercise the DMS by displaying static messages, flashing messages, and
- 6 alternating static and flashing message sequences,
- 7 • Automatic poll the DMS by the Control Software at various intervals and
- 8 verify the data received by Control Software from DMS,
- 9 • Download and edit messages using Control Software,
- 10 • Execute status request on the DMS controller,
- 11 • Observe normal operations during uploading and downloading messages,
- 12 • Input and select messages from the sign controller’s local user interface,
- 13 • Test sequence activation at chosen intervals,
- 14 • Display and verify all stored messages,
- 15 • Verify resumption of standard operation upon interruption of electrical power,
- 16 • Demonstrate detected failures and response functions,
- 17 • Demonstrate proper operation of the Failure Log,
- 18 • Set controller clock using the Control Software,
- 19 • Execute system shutdown using the Control Software and local user interface,
- 20 and
- 21 • Verify detection of a power failure in the DMS enclosure and the report
- 22 feature of the failure to the Control Software,
- 23 • Display IP address and web settings,
  - 24 – Verify that the IP address is not publically accessible. Placing a display on a
  - 25 private network or VPN helps mitigate the lack of security,
  - 26 – Disable the telnet, Web Interface, Web LCD, and ICMP (PING) interfaces,
  - 27 – Change the default password,
- 28 • Set the controller to enable a controller log file.

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

**33 (B) CCTV System**

34 Perform the following local operational field tests at the camera assembly field site in  
 35 accordance with the test plans. A laptop computer shall provide camera control and

1 positioning. After installing the camera assembly, including the camera hardware, field  
2 Ethernet switch, power supply, and connecting cables:

- 3       ▪ Furnish all equipment, appliances, and labor necessary to test the installed cable and  
4       to perform the following tests before any connections are made,
- 5       ▪ Verify that physical construction has been completed,
- 6       ▪ Inspect the quality and tightness of ground and surge protector connections,
- 7       ▪ Check the power supply voltages and outputs,
- 8       ▪ Connect devices to the power sources,
- 9       ▪ Verify installation of specified cables and connections between the camera, PTZ,  
10      field Ethernet switch, and control cabinet,
- 11      ▪ Perform the CCTV assembly manufacturer's initial power-on test in accordance  
12      with the manufacturer's recommendation,
- 13      ▪ Set the VLAN, IP address, default gateway and subnet mask for the camera and  
14      field Ethernet switch,
- 15      ▪ Verify the presence and quality of the video image with a portable NTSC-approved  
16      monitor,
- 17      ▪ Exercise the pan, tilt, zoom, focus, iris opening, and manual iris control selections,  
18      and the operation, preset positioning, and power on/off functions,
- 19      ▪ Demonstrate the pan and tilt speeds and extent of movement to meet all applicable  
20      standards, specifications, and requirements,
- 21      ▪ Verify proper voltage of all power supplies,
- 22      ▪ Interconnect the communication interface device with the communication  
23      network's assigned fiber-optic trunk cable and verify that there is a transmission  
24      LED illuminated, and
- 25      ▪ Verify that the CCTV camera's built-in digital video Ethernet encoder is properly  
26      encoding its video signal.

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

31 **(C) Fiber-optic Communications**

32 Conduct optical time domain reflectometer (OTDR) tests on the cable on the reel and after the  
33 cable is installed and terminated. Provide written notification a minimum of ten days before  
34 beginning fiber-optic cable testing.

35 After splicing is completed, perform bi-directional OTDR tests on each fiber, including unused  
36 fibers, to ensure the following:

- 37       ▪ Fusion splice loss does not exceed 0.05 dB,

- 1           ▪ Terminations and connections have a loss of 0.5 dB or less, and  
2           ▪ Reflection loss is 40 dB or greater for each connector.
- 3       Install a 1,000-foot pre-tested launch cable between the OTDR and fiber-optic cable to be  
4       tested.
- 5       If exceeded, remake splices until the loss falls below 0.05 dB. The Department will record each  
6       attempt for purposes of acceptance.
- 7       Furnish durable labeled plots and electronic copies on a CD or DVD of test results for each  
8       fiber including engineering calculations demonstrating that OTDR test results meet or exceed  
9       the attenuation requirements and that optical properties of the cable have not been impaired.  
10       Include digital photographs that clearly show the workmanship for each splice. Label all test  
11       results (plots and discs) with the manufacturer and model number of the OTDR testing  
12       equipment.
- 13       Provide a tabular summary or spreadsheet detailing and comparing the loss budget and actual  
14       loss calculations per link. Provide test results for fiber-optic cable that demonstrates the loss  
15       budget where the fiber originates and the point where the fiber meets an electronic device.
- 16       If any fiber exceeds the maximum allowable attenuation or if the fiber-optic properties of the  
17       cable have been impaired, take approved corrective action including replacement of complete  
18       segments of fiber-optic cable if required. Corrective action will be at no additional cost to the  
19       Department.

20   **(D) Central Hardware**

- 21       The Contractor shall perform a Network System Test (NST) on the local area network. During  
22       the NST, the Contractor must demonstrate successful local operation of field equipment  
23       operating from the field Ethernet switches as well as successful control of the equipment from  
24       the MRTMC.
- 25       In the event of a failed NST, the Contractor, at his expense, must perform all necessary  
26       activities required to provide proper operation of the LAN, which can include full replacement  
27       of field equipment or cabling.
- 28       The Engineer or his representative will witness all NSTs. Documentation of all testing  
29       procedures and activities must be provided to the Engineer prior to full acceptance of the  
30       system ring.

31   **23.5. 30-DAY OBSERVATION PERIOD**

- 32       The 30-Day Observation Period shall not be considered part of work to be completed by the project  
33       completion date.
- 34       Upon successful completion of all project work, the component tests, the System Test, and the  
35       correction of all deficiencies, including minor construction items, the 30-day Observation Period  
36       may commence. This observation consists of a 30-day period of normal, day-to-day operations of  
37       the new field equipment in operation with the new central equipment without any failures. The  
38       purpose of this period is to ensure that all components of the system function in accordance with the  
39       Plans and these Project Special Provisions.

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1 Respond to system or component failures (or reported failures) that occur during the 30-day  
2 Observation Period within twenty-four (24) hours. Correct said failures within forty-eight (48)  
3 hours. Any failure that affects a major system component as defined below for more than forty-eight  
4 (48) hours will suspend the timing of the 30-day Observation Period beginning at the time when the  
5 failure occurred. After the cause of such failures has been corrected, timing of the 30-day  
6 Observation Period will resume. System or component failures that necessitate a redesign of any  
7 component or failure in any of the major system components exceeding a total of three (3)  
8 occurrences will terminate the 30-day Observation Period and cause the 30-day Observation Period  
9 to be restarted from day zero when the redesigned components have been installed and/or the  
10 failures corrected. The major system components are:

- 11 ○ DMS Field Controller and Display Module,
- 12 ○ CCTV Camera, PTZ, and built-in digital video Ethernet encoder,
- 13 ○ Fiber-optic Communications Cables and Splices, and
- 14 ○ Local Area Network including Ethernet switches

#### 15 **23.6. FINAL ACCEPTANCE**

16 Final system acceptance is defined as the time when all work and materials described in the Plans  
17 and these Project Special Provisions have been furnished and completely installed by the Contractor;  
18 all parts of the work have been approved and accepted by the Engineer; and the 30-day observation  
19 period has been successfully completed.

20 The project will be ready for final acceptance upon the satisfactory completion of all tests detailed in  
21 this Section of the Project Special provisions; the rectification of all punch-list discrepancies; and the  
22 submittal of all project documentation.

#### 23 **23.7. MEASUREMENT AND PAYMENT**

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

25 Payment for this work will be covered in the applicable sections of these Project Special Provisions  
26 at the contract unit price for other items furnished on this Project.

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
<b>ROADWAY ITEMS</b>						
0001	0000100000-N	800	MOBILIZATION	Lump Sum	L.S.	
0002	1489000000-E	610	ASPHALT CONC BASE COURSE, TYPE B25.0B	170 TON		
0003	1519000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5B	125 TON		
0004	1575000000-E	620	ASPHALT BINDER FOR PLANT MIX	15 TON		
0005	3000000000-N	SP	IMPACT ATTENUATOR UNIT, TYPE 350	2 EA		
0006	3030000000-E	862	STEEL BM GUARDRAIL	712.5 LF		
0007	3150000000-N	862	ADDITIONAL GUARDRAIL POSTS	4 EA		
0008	3365000000-E	863	REMOVE EXISTING GUIDERAIL	512 LF		
0009	3389500000-N	865	ADDITIONAL GUIDERAIL POSTS	4 EA		
0010	3389600000-N	865	CABLE GUIDERAIL ANCHOR UNITS	2 EA		
0011	4457000000-N	SP	TEMPORARY TRAFFIC CONTROL	Lump Sum	L.S.	
0012	7279000000-E	1715	TRACER WIRE	1,080 LF		
0013	7300000000-E	1715	UNPAVED TRENCHING (*****) (1, 2")	2,100 LF		
0014	7301000000-E	1715	DIRECTIONAL DRILL (*****) (1, 2")	2,580 LF		
0015	7312000000-N	1716	JUNCTION BOX (*****) (SPECIAL OVERSIZED HEAVY-DUTY)	9 EA		
0016	7324000000-N	1716	JUNCTION BOX (STANDARD SIZE)	25 EA		
0017	7348000000-N	1716	JUNCTION BOX (OVER-SIZED, HEAVY DUTY)	8 EA		
0018	7360000000-N	1720	WOOD POLE	5 EA		
0019	7384000000-E	1722	*** RISER WITH ***** (1-1/4", WEATHERHEAD)	5 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0020	7516000000-E	1730	COMMUNICATIONS CABLE (**FIBER) (12)	3,070 LF		
0021	7516000000-E	1730	COMMUNICATIONS CABLE (**FIBER) (144)	38,870 LF		
0022	7540000000-N	1731	SPLICE ENCLOSURE	9 EA		
0023	7566000000-N	1733	DELINEATOR MARKER	1 EA		
0024	7613000000-N	SP	SOIL TEST	9 EA		
0025	7614100000-E	SP	DRILLED PIER FOUNDATION	14 CY		
0026	7980000000-N	SP	GENERIC SIGNAL ITEM 10KVA SINGLE PHASE TRANSFORM- ER	1 EA		
0027	7980000000-N	SP	GENERIC SIGNAL ITEM 5/8" X 10' GROUNDING ELECTRODE	57 EA		
0028	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV CAMERA ASSEMBLY	7 EA		
0029	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV CAMERA LOWERING SYSTEM	7 EA		
0030	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV FIELD EQUIPMENT CABINET	7 EA		
0031	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV METAL POLE	7 EA		
0032	7980000000-N	SP	GENERIC SIGNAL ITEM CENTRAL VIDEO DECODER UNIT	7 EA		
0033	7980000000-N	SP	GENERIC SIGNAL ITEM DMS ACCESS LADDER	2 EA		
0034	7980000000-N	SP	GENERIC SIGNAL ITEM DMS PEDESTAL STRUCTURE	2 EA		
0035	7980000000-N	SP	GENERIC SIGNAL ITEM DYNAMIC MESSAGE SIGN	2 EA		
0036	7980000000-N	SP	GENERIC SIGNAL ITEM EQUIPMENT CABINET DISCONNECT	8 EA		

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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0037	7980000000-N	SP	GENERIC SIGNAL ITEM FIELD ETHERNET SWITCH	9 EA		
0038	7980000000-N	SP	GENERIC SIGNAL ITEM FURNISH CCTV CAMERA ASSEMBLY	1 EA		
0039	7980000000-N	SP	GENERIC SIGNAL ITEM FURNISH FIELD ETHERNET SWITCH	1 EA		
0040	7980000000-N	SP	GENERIC SIGNAL ITEM GIGABIT TRANSCEIVER MODULE-ZX	4 EA		
0041	7980000000-N	SP	GENERIC SIGNAL ITEM HUB ETHERNET SWITCH	1 EA		
0042	7980000000-N	SP	GENERIC SIGNAL ITEM INTERCONNECT CENTER (12 FIBER)	9 EA		
0043	7980000000-N	SP	GENERIC SIGNAL ITEM INTERCONNECT CENTER (144 FIBER)	2 EA		
0044	7980000000-N	SP	GENERIC SIGNAL ITEM MASTER DISTRIBUTION AMPLIFIER	1 EA		
0045	7980000000-N	SP	GENERIC SIGNAL ITEM METER BASE/DISCONNECT COMBINA- TION PANEL (PEDESTAL MOUNTED)	2 EA		
0046	7980000000-N	SP	GENERIC SIGNAL ITEM METER BASE/DISCONNECT COMBINA- TION PANEL (POLE MOUNTED)	5 EA		
0047	7980000000-N	SP	GENERIC SIGNAL ITEM MODIFY EXISTING ELECTRICAL SERVICE EQUIPMENT	2 EA		
0048	7980000000-N	SP	GENERIC SIGNAL ITEM MODIFY INTERCONNECT CENTER	4 EA		
0049	7980000000-N	SP	GENERIC SIGNAL ITEM PORTABLE CCTV CAMERA LOWERING TOOL	1 EA		
0050	7980000000-N	SP	GENERIC SIGNAL ITEM RACK-MOUNTED VIDEO DECODER CHASSIS	1 EA		
0051	7985000000-N	SP	GENERIC SIGNAL ITEM INTEGRATION AND CONFIGURATION	Lump Sum	L.S.	



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Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0052	7990000000-E	SP	GENERIC SIGNAL ITEM #4 SOLID BARE GROUNDING CONDUCTORS	740	LF	
0053	7990000000-E	SP	GENERIC SIGNAL ITEM 3 WIRE COPPER FEEDER CONDUCTORS	2,930	LF	
0054	7990000000-E	SP	GENERIC SIGNAL ITEM 3 WIRE COPPER SERVICE ENTRANCE CONDUCTORS	150	LF	
0055	7990000000-E	SP	GENERIC SIGNAL ITEM 4-WIRE COPPER FEEDER CONDUCTORS	850	LF	
0056	7992000000-E	SP	GENERIC SIGNAL ITEM DMS FOUNDATION	16	CY	

1518/Mar25/Q54170.5/D379774300000/E56

Total Amount Of Bid For Entire Project :